

JOB OPPORTUNITIES IN ADVANCED ENERGY

High-Growth Occupations for Workers of All Backgrounds



ADVANCED
ENERGY
ECONOMY

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ABOUT ADVANCED ENERGY ECONOMY

[Advanced Energy Economy \(AEE\)](#) is a national association of businesses that are making the energy we use secure, clean, and affordable. AEE is the only industry association in the U.S. that represents the full range of advanced energy technologies and services, both grid-scale and distributed. Advanced energy includes energy efficiency, demand response, energy storage, wind, solar, hydro, nuclear, electric vehicles, and more. AEE's mission is to transform public policy to enable rapid growth of advanced energy businesses. Engaged at the federal level and more than a dozen states around the country, AEE represents more than 100 companies in the \$240 billion U.S. advanced energy industry, which employs 3.4 million U.S. workers. AEE's [PowerSuite](#) online platform allows users to track regulatory and legislative issues in state legislatures, U.S. Congress, state PUCs, RTOs/ISOs, and FERC. Sign up for a free trial at powersuite.aee.net. Follow us at [@AEEnet](#).

ABOUT THE BURNING GLASS INSTITUTE

Situated at the intersection of learning and work, [The Burning Glass Institute](#) advances data-driven research and practice on the future of work and of workers. We work with employers, educators, and policy makers to develop solutions that build mobility, opportunity, and equity through skills. Through our expertise in mining new datasets for actionable insight, The Burning Glass Institute's discourse-shaping research draws attention to pressing problems and frames the potential for new approaches. Building on a legacy of breakthrough innovation in labor market analytics, the Institute serves as a trusted source bridging industry, educators, policy makers, and workers. As rapid change increasingly challenges employers and workers alike, the Institute delivers insightful analysis of labor market trends and develops innovative, data-first models of economic mobility and workforce equity.



EXECUTIVE SUMMARY

Since 2016, Advanced Energy Economy (AEE) has quantified advanced energy jobs nationally and in selected states, relying on data provided by BW Research Partnership in connection with the annual *U.S. Energy and Employment Report*, published in some years by the U.S. Department of Energy and in others by the National Association of State Energy Officials (NASEO) and Energy Futures Initiative. The national and state fact sheets produced by AEE¹ have been valuable in tracking the size and growth of the advanced energy industry, but not the specific job opportunities generated by the sector and the education, training, and experience required to qualify for such jobs.

Understanding the employment opportunities available in the advanced energy industry becomes particularly important as passage of the federal Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) has set the stage for rapid industry expansion, and as questions of equity are raised about who will gain access to jobs gained in the energy transition now poised to accelerate.

For more insight into job opportunities in advanced energy, AEE partnered with the Burning Glass Institute, a nonprofit labor market analytics firm, to research jobs in demand by advanced energy employers as manifested in online job postings and applying that analysis to the distribution of new advanced energy jobs on a granular basis, identifying the top job opportunities for those with and without college degrees, what those positions require in terms of education, training, and experience, and the salaries those positions provide. Findings from this analysis include:

- **Demand for advanced energy workers is accelerating.** Job postings across the advanced energy industry grew almost twice as fast as all job postings nationally the first eight months of 2022 compared to the same period in 2021 (46% versus 27%). This marked a big jump from 2021, when advanced energy industry job postings grew 26% compared to 21% for all postings nationally.
- **Nearly half of all new advanced energy jobs created in 2021 were divided between two large occupational categories:** Engineering and IT Professionals (26%) and Installation/Repair/Construction (22%).
- **Advanced energy is creating good jobs that don't require a college degree.** Fully 42% of all new jobs created in 2021 by the broad industry segments we examined – over 50,000 total – required less than a Bachelor's (BA) degree, most with median salaries above the 2021 national median of \$45,760.

¹ <https://www.aee.net/aee-reports/2022-advanced-energy-employment-fact-sheets>



- **The share of sub-BA jobs varied significantly by segment**, from 60% of new jobs in Distributed Solar to 12% in Grid Technology. Energy Efficiency, reflecting both its large size and large share of sub-BA job opportunities, generated over half of all new jobs for those with less than a bachelor's degree (29,500). The Electric Vehicle segment was second in total sub-BA job creation (8,300), followed by Distributed Solar (7,800).
- The top two jobs not requiring a BA degree varied by segment:
 - **Distributed Solar:** Sales Representative and Solar PV Installer
 - **Energy Efficiency:** Building Automation Specialist and HVAC Mechanic
 - **Electric Vehicles:** Automotive Service Technician and Customer Service Representative
 - **Large Scale Renewables:** Wind Turbine Service Technician and Maintenance and Repair Worker
 - **Energy Storage:** Team Assembler and Warehouse Worker.
- For those with a college degree and professional credentials, **the top new job in advanced energy in 2021 was Software Developer** (6,250 new jobs); it also boasts the highest median salary for non-managers. This reflects the increasing technical sophistication of products and services provided by the industry, but it also puts advanced energy in direct competition with the broad technology industry for software talent.
- **The second highest number of professional jobs created was Sales Representative** (just under 6,000 new jobs), representing positions conducting business-to-business transactions.
- There is a high degree of **cross-fertilization between technical skills and business skills across the high-growth professional positions** in advanced energy. Nearly half of management and fully half of non-technical professional jobs require engineering or IT knowledge, and a small but significant share (9% of management, 13% other non-technical professions) require both sets of technical skills. Conversely, half or more of engineering and IT technical jobs also call for business skills.

Based on this analysis of job posting data, advanced energy offers a wide variety of in-demand positions by which individuals of many backgrounds can gain from the industry's growth, with or without technical training or experience. Policymakers and industry leaders alike should attend to the workforce needs of an industry poised to take the United States by storm.

These needs will include expanded vocational training capacity in post-secondary technical schools and community colleges, as well as company-based internships and apprenticeships; a particular challenge will be the training of electricians, which requires a four-year union- or company-based apprenticeship. In the professional realm, the industry will be challenged to fill its multifaceted roles requiring a mix of business and technical skills as the industry ramps up – and amid ongoing competition for talent with other technology industries. State university systems, in particular, which



typically include economic development as part of their missions, will need to rethink the design of their professional-track programs to produce more well-rounded graduates.

New programs and incentives provided by the IIJA and IRA legislation are all important steps toward growing the advanced energy industry in a way that provides economic opportunity on an equitable basis. But with advanced energy employers routinely reporting a high level of difficulty in filling positions today – in 2021, 40% nationally said hiring was “very difficult” – meeting workforce needs will become more pressing as the advanced energy industry grows in response to this historic federal commitment.



INTRODUCTION

Since 2016, Advanced Energy Economy (AEE) has quantified advanced energy jobs nationally and in selected states, based on data provided by BW Research Partnership in connection with the annual U.S. Energy and Employment Report, published in some years by the U.S. Department of Energy and in others by the National Association of State Energy Officials (NASEO) and Energy Futures Initiative. In national and state fact sheets we have shown the total number of advanced energy jobs (total and by broad industry segment), year-over-year growth, and expected growth in the coming year (based on employer reports of anticipated hiring). While these facts sheets and their data have been extremely valuable in establishing the size of the advanced energy industry, the largely static jobs data have limitations. Specifically, they do not identify the jobs that present the most immediate opportunities for individuals looking to join the advanced energy industry, and they do not show what education, training, and experience are required to qualify for such jobs.

In order to fill this information gap, AEE partnered with the Burning Glass Institute, a nonprofit labor market analytics firm, to research jobs in demand by advanced energy employers as manifested in online job postings. Analysis of job posting data, combined with data on year-over-year job growth, reveals the occupations accounting for the jobs being created in advanced energy in both professional and non-professional spheres, as well as providing insights into the qualifications necessary to join this industry.

Understanding employment opportunities in the advanced energy industry becomes particularly important today. Passage of the federal Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) has set the stage for massive industry growth in the coming years. AEE's initial estimate is that the \$444 billion in spending and tax incentives provided by these two laws will result in an increase of \$2.8 trillion in U.S. GDP, producing 23 million job-years of employment.² The growth of advanced energy should provide a wealth of opportunities for Americans of all backgrounds to join the industry. At the same time, the energy transition heralded by the advanced energy investments already under way and to be accelerated by IIJA and IRA – away from the polluting fossil fuels of the past and toward the clean electricity and transportation of the future – has raised questions of equity in the jobs gained and lost. It is vital to know what jobs will be available as we move toward an advanced energy economy and who will have access to them.

² [Economic Impact of Advanced Energy Investment from the Infrastructure Investment and Jobs Act and Inflation Reduction Act](#)



SECTION 1. ADVANCED ENERGY EMPLOYMENT AND EMPLOYER DEMAND

Total U.S. advanced energy employment grew from 2017 to 2019, took a sharp dip in the initial COVID-19 year of 2020, then rebounded in 2021.³ This pattern can be seen in the six broad technology segments of Distributed Solar, Large Scale Renewables, Energy Storage, Grid Technology, Energy Efficiency, and Electric Vehicles.⁴ (Table 1)

Table 1. U.S. Advanced Energy Employment, Select Segments, 2017-21

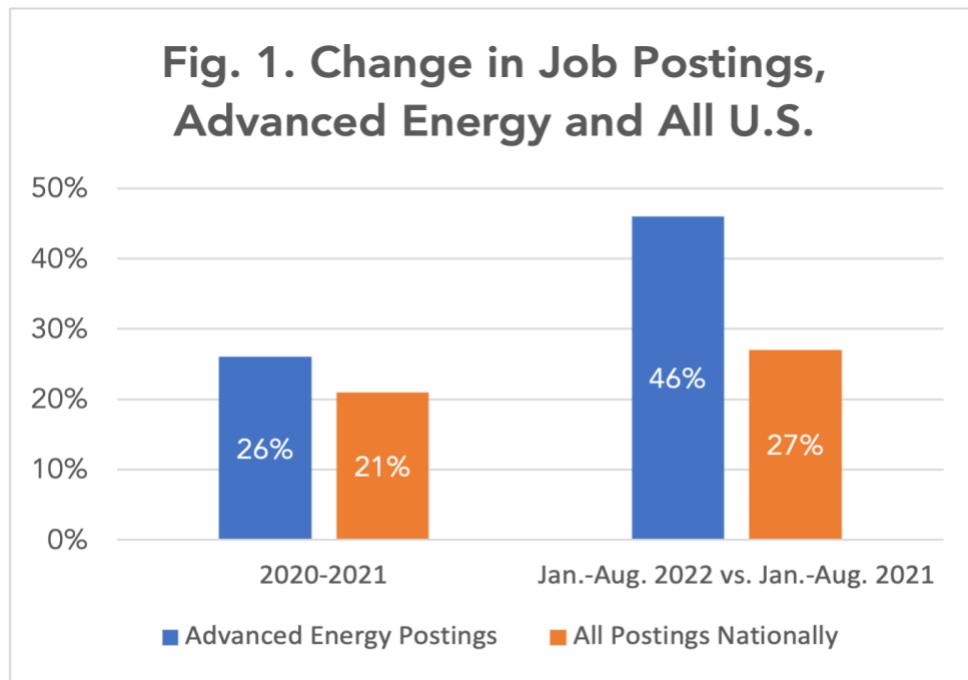
	2017	2018	2019	2020	2021
Distributed Solar	262,718	251,244	259,045	237,506	250,415
Large Scale Renewables	195,017	194,914	201,122	195,970	203,636
Energy Storage	65,146	74,569	79,699	78,040	80,813
Grid Tech	62,318	64,377	67,945	59,832	62,239
Energy Efficiency	2,248,524	2,324,866	2,378,893	2,107,174	2,164,914
Electric Vehicles	109,558	139,296	129,287	131,575	168,326
Total	2,943,282	3,049,266	3,115,990	2,810,097	2,930,343

³ BW Research Partnership, data collected and analyzed for Department of Energy, U.S. Energy & Employment Report. See <https://blog.aee.net/on-this-labor-day-we-celebrate-advanced-energy-jobs-today-and-those-to-come>.

⁴ In this report, we have distinguished Distributed Solar (residential, commercial, community) from utility-scale solar, because the business types are so different. Based on the split in installation/construction jobs between distributed and utility-scale, per BW Research, and assuming the ratio of construction to non-construction jobs in distributed and utility-scale is roughly the same, we estimate that Distributed Solar represents at least 75% of all solar jobs. We then combine the remaining solar jobs in utility-scale with wind to create a segment of Large Scale Renewables, which is more representative of how these development companies operate.



The growing demand for advanced energy workers in the post-COVID recovery is reflected in advertised jobs. Job postings across the advanced energy industry grew almost twice as fast as all job postings nationally the first eight months of 2022 compared to the same period in 2021 (46% versus 27%), with approximately 250,000 advanced energy jobs posted from January to August of this year compared with 175,000 job postings during the same period last year. This marked a big jump from 2021, when advanced energy industry job postings grew 26% compared to 21% for all postings nationally.⁵ (Figure 1)



While advanced energy employment increased by 4% in 2021, job growth varied by segment. (Table 2). EV jobs grew 28% compared with 4% for these segments overall. While only growing 3%, the Energy Efficiency segment generated the largest number of new jobs (57,740), reflecting its oversized share of industry employment.

⁵ Burning Glass Institute analysis of Lightcast job posting data



Table 2.

	Employment Increase	
	2021-2022	% Change
Distributed Solar	12,909	5%
Large Scale Renewables	7,666	4%
Energy Storage	2,773	4%
Grid Tech	2,407	4%
Energy Efficiency	57,740	3%
Electric Vehicles	36,751	28%
Total	120,246	4%

SECTION 2. WHERE THE ADVANCED ENERGY JOBS ARE

Analysis of posting data also allows us to identify the specific jobs that employers are looking to fill and the requirements for these positions. It also allows us to estimate, on a granular level, the occupational distribution of the new jobs created in the industry's recent growth and likely to continue in the future.

To conduct this analysis, we constructed a sample of 210 companies and pulled the advanced energy jobs posted by these firms from January 2021 to June 2022. (Table 3) For firms active in industries beyond advanced energy we used additional keywords to isolate the advanced energy jobs posted by these firms. For example, for Ford Motor Co., we only pulled job postings that included the terms "electric vehicle" or "EV."



Table 3. Sample of Advanced Energy Employers for Job Postings

Segment	# Employers
Distributed Solar	55
Large Scale Renewables	41
Electric Vehicles	26
Energy Storage	17
Energy Efficiency	41
EV Charging	15
Grid Tech	15
Total	210

Major Trends in Job Demand and Qualifications

Applying the occupational distribution derived from analysis of January 2021-June 2022 posting data to the 120,000 jobs added in 2021, we can determine the types of jobs employers filled as the industry grew and what education, training, and experience employers look for in filling them.

We find that Engineering and IT Professional positions comprised the largest number of new jobs, roughly one quarter, followed closely by Installation and Repair positions. (Table 4)

Table 4. Distribution of New Jobs 2021, by Occupation

	# new jobs	% new jobs
Engineering + IT Professionals	31,837	26%
Installation/Repair/Construction	26,516	22%
Other Professionals	17,602	15%
Sales	17,423	14%
Management	12,561	10%



Production/Manufacturing	6,215	5%
Administrative	8,102	7%

The type of jobs generated varied significantly by segment. Installation and Sales comprised 70% of jobs created in Distributed Solar in 2021, compared with 22% of new jobs in EVs. Reflecting its ranking as the largest employment segment, Energy Efficiency generated the greatest number of new installation (14,600) and sales (9,390) jobs despite having a smaller share of these jobs than Distributed Solar. Energy Storage had the largest share of new manufacturing jobs (38%). (Table 5)

Table 5. Distribution of New Jobs 2021, by Segment

	Distributed Solar	Energy Efficiency	Electric Vehicles	Grid Tech	Large Scale Renewables	Energy Storage
Engineering & IT Professionals	8%	21%	41%	40%	23%	25%
Installation/Repair/Construction	35%	25%	15%	6%	22%	6%
Other Professionals	8%	17%	10%	26%	26%	12%
Sales	35%	16%	7%	17%	4%	6%
Management	6%	10%	11%	8%	18%	10%
Production/Manufacturing	2%	2%	9%	1%	3%	38%
Administrative	6%	8%	7%	2%	5%	4%

Fully 42% of all new jobs created by the industry in 2021 – over 50,000 total – required less than a Bachelor's degree. This percentage varied significantly by segment, from 60% of new jobs in Distributed Solar to 12% in Grid Technologies (advanced metering/smart grid, microgrids, etc.) (Table 6). Energy Efficiency, reflecting both its large size and large share of sub-BA job opportunities, generated over half of all new jobs for those with less than a bachelor's degree. The Electric Vehicle segment was second in sub-BA job creation, followed by Distributed Solar.

Table 6. New Jobs Requiring Less Than a Bachelor's Degree, by Segment



	New Jobs 2021	% Sub-BA	Total Sub-BA jobs
Distributed Solar	12,909	60%	7,761
Large Scale Renewables	7,666	41%	3,107
Energy Storage	2,773	55%	1,529
Grid Tech	2,407	12%	281
Energy Efficiency	57,740	51%	29,494
Electric Vehicles	36,751	23%	8,331
Total	120,246	42%	50,503

Top Advanced Energy Jobs for Professionals and Non-Professionals

In the end, what matters for job seekers looking for opportunities in the advanced energy industry is what positions are becoming available, what qualifications (education, experience) are required for them, and what they pay. In the next section, we identify the most advertised positions for different types of job seekers, how many jobs were created in 2021 in those occupations, their job requirements, and typical salary of the occupation.⁶ In this way, we can see how many opportunities for those of various backgrounds are being created as the industry continues to grow.

Top Advanced Energy Jobs for Non-Professionals

We begin with jobs for those without college degrees across our five select industry segments. (Table 7) This shows a wide range of occupations, both blue-collar (HVAC Mechanic, Solar Installer, Wind Turbine Technician) and white-collar (Sales Representative), learned on the job or with vocational training. It also suggests a number of step-up pathways for those without a BA degree, such as Customer Service to Sales, Operations Coordinator to Project Management Specialist, and Supervisor for various installation and construction workers.

Table 7. Top 15 Job Opportunities for People Without a College Degree

	New Jobs 2021	Typical Education	Median Salary
Building Automation Specialist	5,418	Vocational/Apprenticeship	\$52,530*

⁶ Bureau of Labor Statistics, May 2021 Occupational Employment and Wage Statistics (OES), except for occupations not covered by OES, estimated based on job postings and denoted by *.



Sales Representative	4,601	On-the-Job Training	\$67,500*
HVAC Mechanic	3,769	Vocational/Apprenticeship	\$48,630
Maintenance and Repair Worker	3,738	Vocational/Apprenticeship	\$43,180
Customer Service Representative	3,698	On-the-Job Training	\$36,920
Automotive Service Technician	3,045	Vocational/Apprenticeship	\$46,880
Construction/Install. Supervisor	2,209	Vocational Training	\$72,010
Operations Coordinator	1,991	On-the-Job Training	\$54,125*
Building Operations Manager	1,663	Some College	\$97,930
Solar PV Installer	1,499	On-the-Job Training	\$47,560
Electrician	1,382	Apprenticeship	\$60,040
Project Management Specialist	1,253	Some College	\$94,500
Wind Turbine Service Technician	1,165	Vocational Training	\$56,260
Building Automation Technician	930	Vocational/Apprenticeship	\$44,600*
Construction Manager	821	Some College	\$98,890

Once again, job opportunities for those without a BA vary by segment. (Table 8)



Table 8. Top 10 Job Opportunities for People Without a College Degree, by Segment

Distributed Solar

	New Jobs 2021	New Jobs	
		Typical Education	Median Salary
Sales Representative	2,396	On-the-Job Training	\$67,500*
Solar PV Installer	1,398	On-the-Job Training	\$47,560
Electrician	723	Apprenticeship	\$60,040
Sales Supervisor	669	On-the-Job Training	\$79,680
Construction Supervisor	650	Vocational Training	\$72,010
Roofers	581	On-the-Job Training	\$47,110
Sales Support Staff	540	On-the-Job Training	\$29,590
Maintenance and Repair Worker	369	On-the-Job Training	\$43,180
Operations Coordinator	368	On-the-Job Training	\$45,760*
Surveying & Mapping Technician	338	On-the-Job Training	\$46,910

Energy Efficiency

	New Jobs 2021	New Jobs	
		Typical Education	Median Salary
Building Automation Specialist	5,418	Vocational/Apprenticeship	\$52,530*
HVAC Mechanic	3,769	Vocational/Apprenticeship	\$48,630
Maintenance and Repair Worker	2,579	Vocational/Apprenticeship	\$43,180
Customer Service Representative	2,180	On-the-Job Training	\$36,920
Sales Representative	1,901	On-the-Job Training	\$67,500*
Building Operations Manager	1,663	Some College	\$97,930



Operations Coordinator	1,521	On-the-Job Training	\$56,160*
Project Management Specialists	1,253	Some College	\$94,500
Building Automation Technician	930	Vocational/Apprenticeship	\$44,600*
Construction Manager	821	Some College	\$98,890



Electric Vehicles

	New Jobs 2021	Typical Education	Median Salary
Automotive Service Technician	3,045	Vocational/Apprenticeship	\$46,880
Customer Service Representative	1,406	On-the-Job Training	\$36,920
Maintenance Supervisor	785	Some College	\$71,260
Parts Salesperson	501	On-the-Job Training	\$34,260
Production Worker	495	On-the-Job Training	\$32,930
Maintenance and Repair Worker	491	Vocational/Apprenticeship	\$43,180
Industrial Engineering Technician	417	Some College	\$60,220
General Engineering Technician	405	Some College	\$61,950
Warehouse Worker	395	On-the-Job Training	\$31,230
Automotive Body Repairer	252	Vocational/Apprenticeship	\$47,270

Energy Storage

	New Jobs 2021	Typical Education	Median Salary
Team Assembler	396	On-the-Job Training	\$36,590
Warehouse Worker	202	On-the-Job Training	\$31,230
Maintenance and Repair Worker	98	Vocational Training	\$43,180
Production Supervisor	68	Some College	\$61,790
Production Worker	65	On-the-Job Training	\$32,930
Industrial Engineering Technician	58	Vocational Training	\$60,220
Sales Representative	55	On-the-Job Training	\$67,500
Machine Operator	50	On-the-Job Training	\$37,630
Inspectors	49	On-the-Job Training	\$38,580
CNC Tool Operator	37	Vocational Training	\$46,640



Large Scale Renewables

	New Jobs 2021	Typical Education	Median Salary
Wind Turbine Service Technician	1,165	Vocational Training	\$56,260
Maintenance and Repair Workers	177	Vocational Training	\$43,180
Installation Supervisor	121	Some College	\$71,260
Solar Photovoltaic Installer	101	On-the-Job Training	\$47,670
Electrical Engineering Technician	99	Some College	\$63,640
Power Plant Operator	90	Vocational Training	\$80,850
Customer Service Representative	79	On-the-Job Training	\$36,920
Sales Representative	78	On-the-Job Training	\$67,500*
Operations coordinator	66	On-the-Job Training	\$53,825
Office Supervisor	54	Some College	\$60,590

As with sub-BA jobs overall, there are several career advancement routes for those with less than a BA degree. Solar Installers and Roofers can move into higher paying supervisory roles, sales roles, operations coordinator roles or entry-level project management positions. Unfortunately, there is no direct route from Solar Installer to better-paying Electrician jobs. These require four years of training in a union- or company-sponsored apprenticeship program. In Energy Efficiency, HVAC techs can become Building Automation Specialists, as well as take on supervisory and entry-level project management roles. Customer service and administrative assistants can advance into Sales and Operations Coordinator positions, while Operations Coordinators can move into entry-level Project Management positions.

Top Advanced Energy Jobs for Professionals

For those with college degrees and professional credentials, there is a host of heavily advertised occupations with attractive salaries⁷ showing job growth in 2021. (Table 9)

It is noteworthy that the top new job in advanced energy in 2021 was Software Developer; it also boasts the highest median salary for non-managers. This reflects the increasing technical sophistication of products and services provided by the industry. But it is also a cautionary note, in

⁷ Bureau of Labor Statistics, May 2021 Occupational Employment and Wage Statistics (OES), except for occupations not covered by OES, estimated based on job postings and denoted by *.



that advanced energy companies will be competing with the entire tech industry for software talent as they grow.

The second-largest source of new advanced energy professional jobs is Sales Representative. In contrast with sales positions in Distributed Solar, these jobs, which require a BA degree, are generally business-to-business in nature, rather than consumer-focused, and involve more complex transactions. They also pay considerably better.

Table 9. Top Management and Professional Jobs

	New Jobs 2021	Median Salary	Require Engineering and/org IT Skills	Require Business Skills
Management				
General and Operations Manager	2,031	\$97,970	42%	91%
Construction Manager	1,265	\$98,890	66%	91%
Marketing Manager	1,192	\$135,030	40%	98%
Supply Chain Manager	791	\$98,230	54%	99%

Engineering and IT Professionals

Software Developer	6,250	\$120,730	96%	48%
Mechanical Engineer	2,520	\$95,300	94%	54%
Electrical Engineer	2,412	\$100,420	90%	64%
Engineer, All Other	2,221	\$100,640	84%	63%
Architectural and Engineering Manager	2,177	\$152,350	76%	87%
Computer Systems Engineer/Architect	1,990	\$95,270	97%	54%
Automotive Engineer	1,361	\$95,300	81%	51%
Energy Engineer, Except Wind and Solar	1,079	\$100,640	73%	77%
Industrial Engineer	1,038	\$95,300	89%	72%
Manufacturing Engineer	831	\$95,300	97%	65%
Business Intelligence Analyst	817	\$100,910	88%	94%



Computer Systems Analyst	695	\$99,270	62%	85%
Information Technology Project Manager	657	\$95,270	78%	82%
Data Scientist	644	\$100,910	100%	80%
Systems/Applications Engineer	554	\$100,640	94%	77%

Other Professionals

Project Management Specialist	3,710	\$94,500	64%	96%
Energy Efficiency Program Manager	2,009	\$89,475	52%	99%
Energy Auditor	1,426	\$61,640	38%	71%
Product Manager	1,423	\$115,000*	78%	97%
Management Analyst	1,015	\$93,000	59%	96%
Market Research Analyst and Mktg. Specialist	986	\$63,920	38%	97%
Human Resources Specialist	918	\$62,290	19%	91%
Financial and Investment Analyst	628	\$91,580	45%	99%
Accountants and Auditor	514	\$77,250	25%	97%

BA Level Sales Positions

Sales Representative	5,966	\$95,150*	18%	13%
Sales Manager	2,838	\$127,490	4%	19%

Of particular note is the high degree of cross-fertilization between technical skills and business skills across the high-growth positions in advanced energy. Not surprisingly, nearly all management positions explicitly require business skills or experience, but roughly half (ranging from 40% to 66%) also call for technical knowledge in engineering or information technology. Business skills are highly valued for non-technical professional positions, but many jobs, especially in project and product management roles, require engineering or IT expertise. The majority of product management positions involve development of IT-related products (user interfaces for building control systems, for instance). Indeed, nearly half of management and fully half of non-technical professional jobs require engineering or IT skills, and a small but significant share require both sets of technical skills. (Table 10). Conversely, half or more of engineering and IT technical jobs also call for business skills. The



exception to this apparent rule of advanced energy employment is sales, where neither technical nor broader business knowledge is routinely asked for in job postings.

Table 10. Professional Occupations Requiring Technical Skills

	Require Engineering Skills	Require IT Skills	Require Both Engineering and IT Skills	Require Engineering or IT Skills
Management	30%	24%	9%	45%
Non-Engineering/IT Professionals	30%	33%	13%	50%

SECTION 3. POLICY IMPLICATIONS

Based on analysis of job posting data and its application to job growth in 2021, advanced energy offers a wide variety of in-demand positions, both professional and non-professional, by which individuals of many backgrounds can gain from the industry's growth, with or without technical training or experience. Distributed Solar, in particular, is a source of entry-level jobs in both installation and sales and has room to grow in markets across the country. Energy Efficiency, the largest source of employment in advanced energy and still growing, creates jobs ranging from HVAC Mechanic and Building Automation Technician to Energy Auditor and Project Management Specialist. Though less in demand in industry segments other than Energy Storage, production jobs are likely to take off as the ample incentives to produce and buy domestic products provided by the Inflation Reduction Act jumpstarts U.S. manufacturing of advanced energy technologies.

Policymakers state and federal should attend to the workforce needs of an industry poised to take the United States by storm.

The advanced energy industry is producing good jobs that don't require a college degree. Some, like PV installer, can be trained on the job. But many others, like HVAC, auto mechanic, and electrician, require two- to four-year postsecondary vocational or apprenticeship programs. This will require the attention of a range of vocational training institutions – technical schools and community colleges, especially, working independently or in partnership with company-provided internships and apprenticeships.



There will also be a need for formal upskilling programs, whether in-house or in vocational institutions, to prepare HVAC technicians to move into higher-paid Building Automation Specialist or Building Operations Manager positions, for instance.

Then there is electrician training, which takes place exclusively in union- or company-sponsored apprenticeships. The Bureau of Labor Statistics is projecting a 9% increase in overall demand for electricians over the next 10 years, without taking into account advanced energy growth from the energy transition that will be accelerating. More electrician apprenticeships will be needed to support the growth of Distributed Solar, in particular.

Underwriting the cost of apprenticeships for companies is a particularly valuable role for government support. As it is, postsecondary programs get government money to support training, and hospitals get extra funding for the training of interns and residents. Apprenticeships, where trainees get paid, is the best way to expand access and equity while meeting employer needs for HVAC, electrical, auto techs, and similar occupations.

In the professional realm, the industry will be challenged to fill its multifaceted roles requiring a mix of business and technical (engineering and software) skills as the industry ramps up – and amid ongoing competition for talent with other technology industries. State university systems, in particular, which typically include economic development as part of their missions, will need to rethink the design of their professional-track programs to produce more ambidextrous graduates. The need for broader skills is evident in the paths to career advancement for non-college grads as well, which generally mean moving into supervisory and product management/coordination roles that require certain business and software skills.

Provisions of the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) begin to address the workforce challenges of accelerating industry growth with new programs and incentives for clean energy workforce development. IIJA promises the Department of Energy \$40 million for grants to states for training of energy auditors, \$10 million for grants to colleges for training building technicians and engineers, and \$10 million to pay the federal share of training programs in Energy Efficiency. This is in addition to DOE's existing Local Government Clean Energy Workforce program, currently funded with \$10 million. IIJA also requires DOE to establish a 21st Century Energy Workforce Advisory Board.

IRA gives DOE authorization of \$200 million for states and municipalities to train contractors about installing energy efficiency measures, \$330 million for states to adopt more energy efficient building codes and provide associated training, and \$670 million in grants to help states and municipalities to meet net-zero energy standards, including training and enforcement. To the Environmental Protection Agency, IRA allocates \$400 million for clean heavy-duty vehicles, including workforce training to maintain operations, and \$2.8 billion in Environmental and Climate Justice block grants, which would support workforce development projects.



In addition to broad incentives for domestic manufacturing, which should accelerate job creation, IRA's extended and restructured tax credits for clean energy projects of many types also provide specific incentives for workforce development and job equity. Clean energy tax credits include additional incentives for projects where 10% (rising to 15% after 2024) of the work is performed by apprentices – and paid apprenticeship, as we have seen, is a critical workforce development path. Another adder is available for projects located in “energy communities,” facilitating worker transitions in fossil fuel-dependent regions.

These are all important steps toward growing the advanced energy industry in a way that provides economic opportunity on an equitable basis. But with advanced energy employers routinely reporting a high level of difficulty in filling positions today – in 2021, 40% nationally said hiring was “very difficult”⁸ – meeting workforce needs will become more pressing as the advanced energy industry grows in response to this historic federal commitment.

⁸ Derived from BW Research Partnership’s annual survey for the U.S. Energy and Employment Report.

