

MICHIGAN ENERGY

INDUSTRY CLUSTER WORKFORCE ANALYSIS



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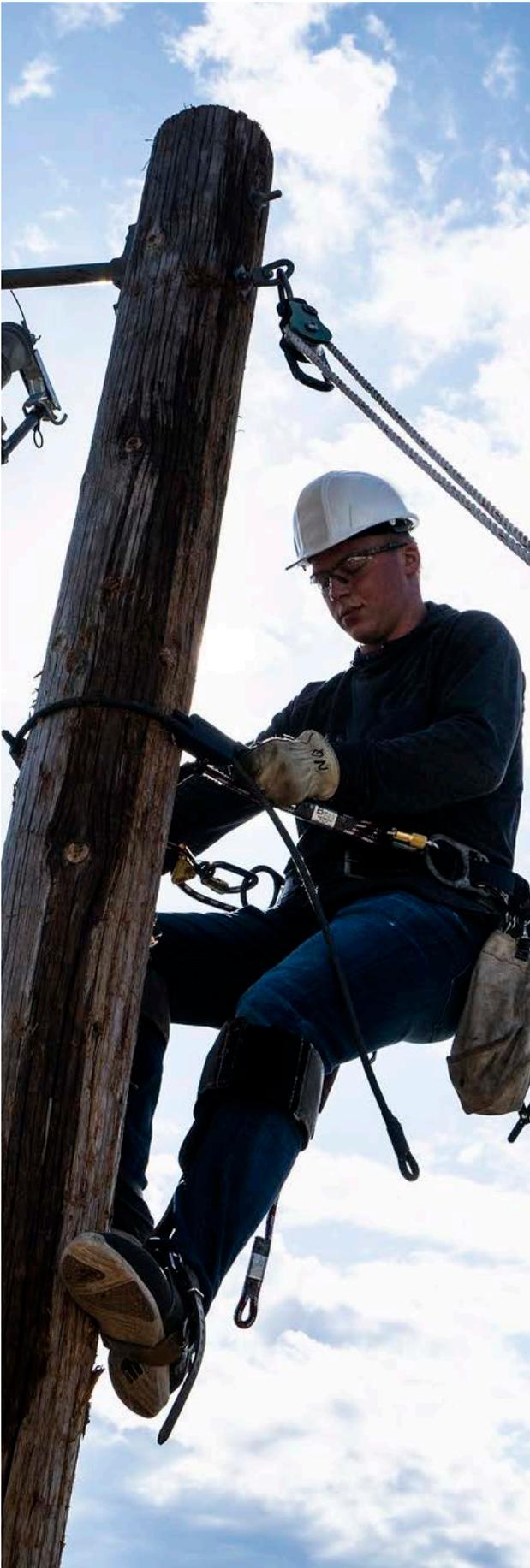
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ABOUT THIS REPORT

This report is the product of a partnership between the Michigan Center for Data and Analytics and the Michigan Department of Labor and Economic Opportunity. It is designed to explore the Energy industry cluster in Michigan through a variety of data sources, including key occupations, education and training requirements, real-time online job ad demand, labor force projections, workforce demographics, the talent pipeline and more. The intention of this report is to support workforce development across the state and to highlight the position of Energy in Michigan.



Key Findings

- Employment in the Energy cluster has experienced strong growth since 2011. After decreasing slightly in 2020, Energy cluster employment has since recovered to exceed pre-pandemic levels and currently employs just over 119,300 individuals.
- The Energy cluster is high paying with an average annual salary of \$90,100—substantially higher than the statewide average of \$61,700. At the subcluster level, average salaries range from \$74,300 for the *Energy efficiency* subcluster to \$115,00 for the *Utilities* subcluster.
- Most of the key occupations in the Energy cluster only require a high school diploma or less along with some on-the-job training and have the potential to offer wages exceeding the statewide median of \$21.73.
- Individuals age 25 to 64 make up 86.8 percent of Energy cluster employment, 8.2 percentage points higher than their statewide share of employment. Correspondingly, the Energy cluster has an underrepresentation of workers under 25 or over 64. This could be due to factors such as the physical demands and training requirements of Energy cluster occupations.
- Nearly 75 percent of employees in the Energy cluster are men, similar to other male-dominated clusters such as Construction, Manufacturing, and Mobility. Men also earn more than women in this cluster at every educational attainment level. To earn what a man with less than a high school diploma makes, a woman in Energy typically requires a bachelor's degree or higher.



Introduction

An **industry cluster** is a strong concentration of related industries in one location.

These clusters consist of related employers, suppliers, and support institutions in a product or service field. Industry clusters that are heavily prevalent in a particular region fuel the regional economy, generate payrolls, and create innovation by leveraging the knowledge and resources of all involved.

The Energy cluster provides essential goods and services to the state economy. Consisting of a diverse array of industries that support the generation and utilization of energy sources, this cluster, though small, plays an outsized role in the day-to-day functioning of people and businesses throughout the state. The Energy cluster will also play a vital role in providing technical expertise and infrastructure as the state continues its move toward more efficient and renewable sources of energy.

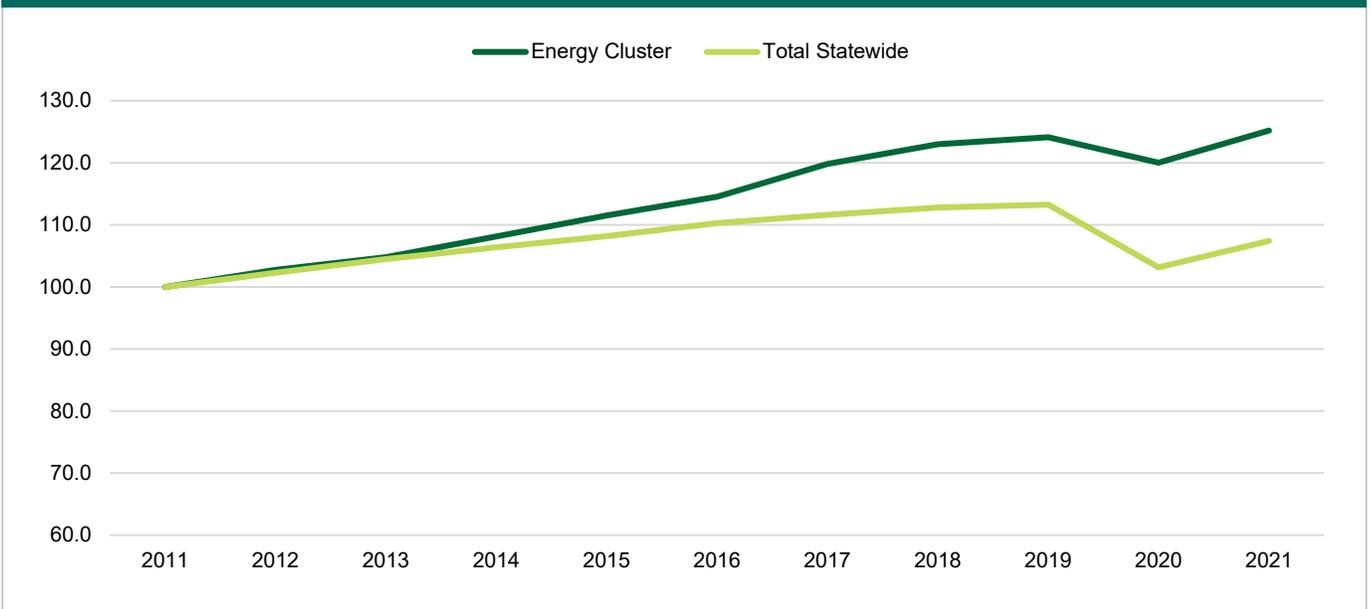
The Energy cluster consists of five subclusters:

- Energy Efficiency
- Utilities
- Wholesale
- Electric Manufacturing
- Oil and Gas Exploration, Extraction, Wholesaling



Employment and Wages

FIGURE 1: EMPLOYMENT INDEX, MICHIGAN ENERGY CLUSTER (INDEX YEAR: 2011)

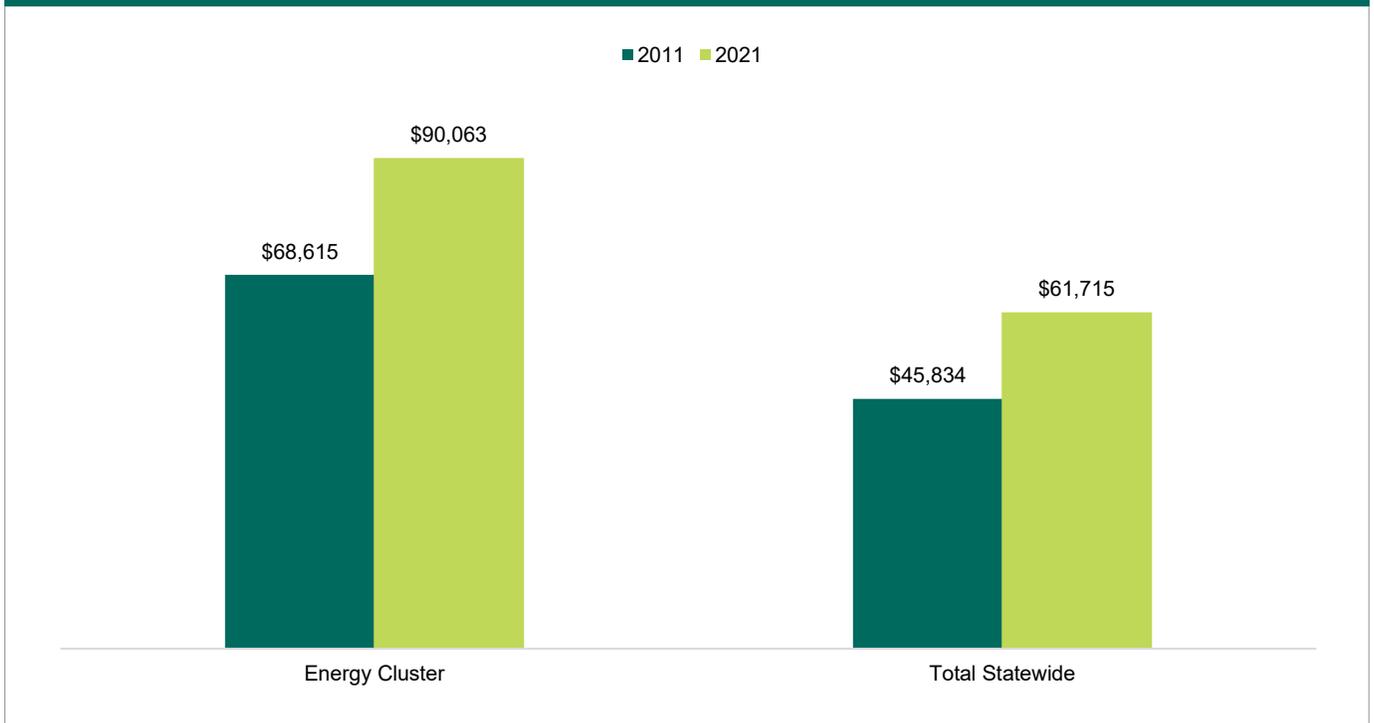


Source: Quarterly Census of Employment and Wages, Michigan Center for Data and Analytics

Growth in the Energy cluster outpaced total statewide employment during the 2011 to 2021 period. Figure 1 displays employment statewide and in the Energy cluster indexed to 2011 levels. From 2011 to 2013, employment grew at a similar rate for the cluster and the state. By 2019, employment levels in the cluster were 24.1 percent higher than they were in 2011, much greater than the 13.3 percent increase experienced statewide. After a 3.3 percent decrease in 2020, employment in Energy rebounded to 119,300 employees in 2021, exceeding pre-pandemic levels. Comparatively, total statewide employment in 2021 was 5.2 percent below 2019 pre-pandemic levels.



FIGURE 2: NOMINAL WAGE* CHANGE, MICHIGAN ENERGY CLUSTER, 2011–2021

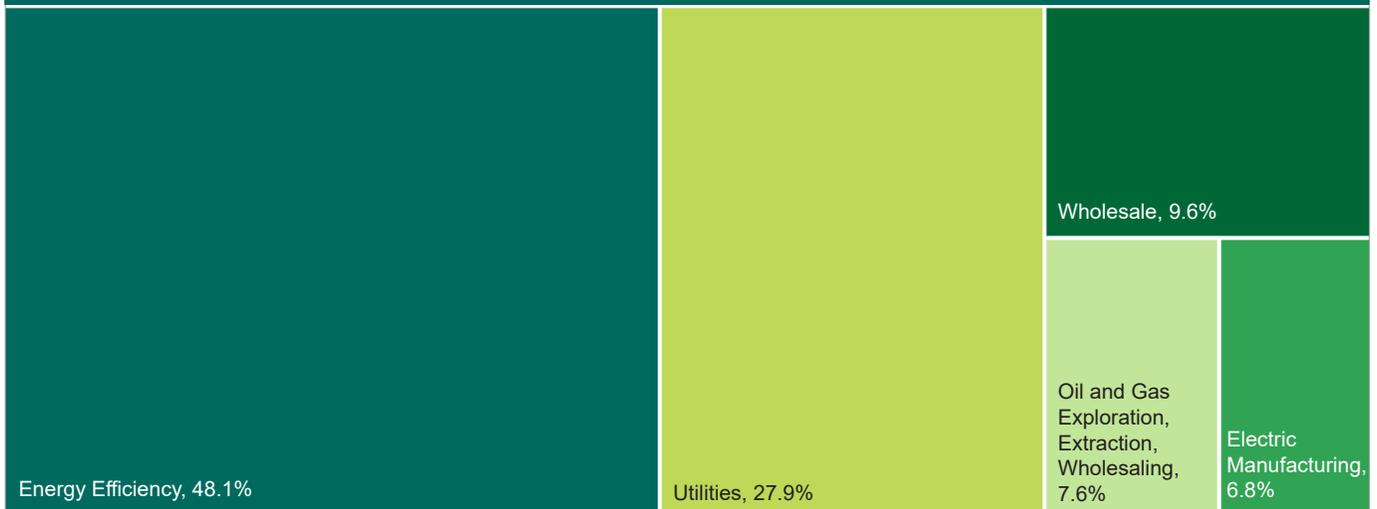


Source: Quarterly Census of Employment and Wages, Michigan Center for Data and Analytics
*Nominal wages are not adjusted for inflation.

Increases in the nominal average salary in the Energy cluster have been closely aligned with the growth in salaries statewide. From 2011 to 2021, nominal salaries in the cluster increased by 31.3 percent while statewide salaries increased by 34.6 percent. Although they exhibit similar growth trends, Energy is one of the highest-paying clusters in the state. In 2021, the average nominal salary in the cluster was \$90,100, substantially higher than the statewide average of \$61,700.

Subclusters

FIGURE 3: SUBCLUSTER EMPLOYMENT DISTRIBUTION, MICHIGAN ENERGY CLUSTER, 2021



Source: Quarterly Census of Employment and Wages, Michigan Center for Data and Analytics

Energy Efficiency

Building Equipment Contractors

The *Energy efficiency* subcluster employs 57,400 individuals, accounting for 48.1 percent of Energy cluster employment. This subcluster consists solely of the *Building equipment contractors* industry where the average salary of \$74,300 is relatively low compared to the cluster average of \$90,100. However, this is still much higher than the state average salary of \$61,700.

Utilities

Electric Power Generation, Transmission and Distribution

Natural Gas Distribution

Other Management Consulting Services

Power and Communication Line Construction

Solid Waste Combustors and Incinerators

Water, Sewage and Other Systems

Water and Sewer Line Construction

The *Utilities* subcluster is the second-largest subcluster and employs 27.9 percent (33,300) of those in

Energy. This group is also the highest-paying with an annual average salary of \$115,000. Over half of the employment in *Utilities* is concentrated in the *Electric power generation, transmission and distribution* industry where the average salary of \$136,800 is substantially higher than the subcluster average. *Power and communication line construction* is the second-largest industry employing 14.6 percent of the subcluster.

Wholesale

Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers

Other Electronic Parts and Equipment Merchant

Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers

The *Wholesale* subcluster employs 9.6 percent (11,500) of the Energy cluster. This subcluster is the second highest-paying with an average annual salary of \$101,900. The industries making up this subcluster have average annual salaries that exceed the state average, ranging from \$76,700 for *Plumbing and heating equipment and supplies merchant* to \$136,800 for *Other electronic parts and equipment merchant wholesalers*.



Electric Manufacturing

- All Other Miscellaneous Electrical Equipment and Component Manufacturing
- Electrical Equipment Manufacturing
- Heating Equipment (Except Warm Air Furnaces) Manufacturing
- Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
- Oil and Gas Machinery Manufacturing
- Other Electrical Equipment and Component Manufacturing
- Power Boiler and Heat Exchanger Manufacturing
- Semiconductor and Related Device Manufacturing
- Turbine and Turbine Generator Manufacturing

The *Electric manufacturing* subcluster consists of a variety of manufacturing industries and employs 6.8 percent (8,100) of the Energy cluster. Most of the employment (85.8 percent) in this subcluster is concentrated in the *Electrical equipment manufacturing* and *Other electrical equipment and component manufacturing* industries. Annual salaries for the industries making up this subcluster vary widely and include the lowest and highest salaries considered in this analysis. Overall, this subcluster has an annual average salary of \$81,900, approximately \$8,200 below the cluster average.

Oil and Gas Exploration, Extraction, Wholesaling

- Drilling Oil and Gas Wells
- Geophysical Surveying and Mapping Services
- Oil and Gas Extraction
- Oil and Gas Pipeline Construction
- Petroleum and Petroleum Products Merchant Wholesalers
- Petroleum Refineries
- Pipeline Transportation
- Support Activities for Oil and Gas Operations

The *Oil and gas exploration, extraction, wholesaling* subcluster employs 7.6 percent (9,000) of the Energy cluster. The *Petroleum and petroleum products merchant wholesalers* industry accounts for the largest share of employment at 38.5 percent. An additional 33.3 percent of jobs are either in the *Oil and gas pipeline construction* or *Pipeline transportation* industries. With an average salary of \$90,600, the pay in this subcluster slightly exceeds the cluster average.

Key Occupations

Occupational analysis is a primary component to the understanding of an industry cluster. Key occupations are chosen by a favorable mix of criteria: the occupation's share of the cluster's total employment, the concentration within the cluster, and the projected outlook for that occupation. Due to the occupations having large volumes within the cluster, they are generally representative of the expected wages, education, and skills within the industry cluster.

- While there are a few occupations that require a postsecondary degree, many of the key occupations in the Energy cluster only require a high school diploma coupled with moderate-to long-term training or an apprenticeship. This presents opportunities for individuals who are not seeking to further their formal education and prefer to learn on the job or through shorter trainings and certifications.
- The Energy cluster is the second highest-paying cluster with a median wage of \$29.48 across all occupations. This is substantially higher than the statewide median of \$21.73. With training and experience, many of the key occupations have the potential to offer wages that meet or exceed the cluster median.
- Annual openings for an occupation occur for a variety of reasons; retirements and labor force exits, career transfers, or due to expansion of the occupation. The key occupations in Energy are expected to offer just under 18,500 total average annual openings between 2020 and 2030. A small part of this can be attributed to openings caused by growth in the cluster, but an additional component is the base year of 2020, where employment levels were relatively low.

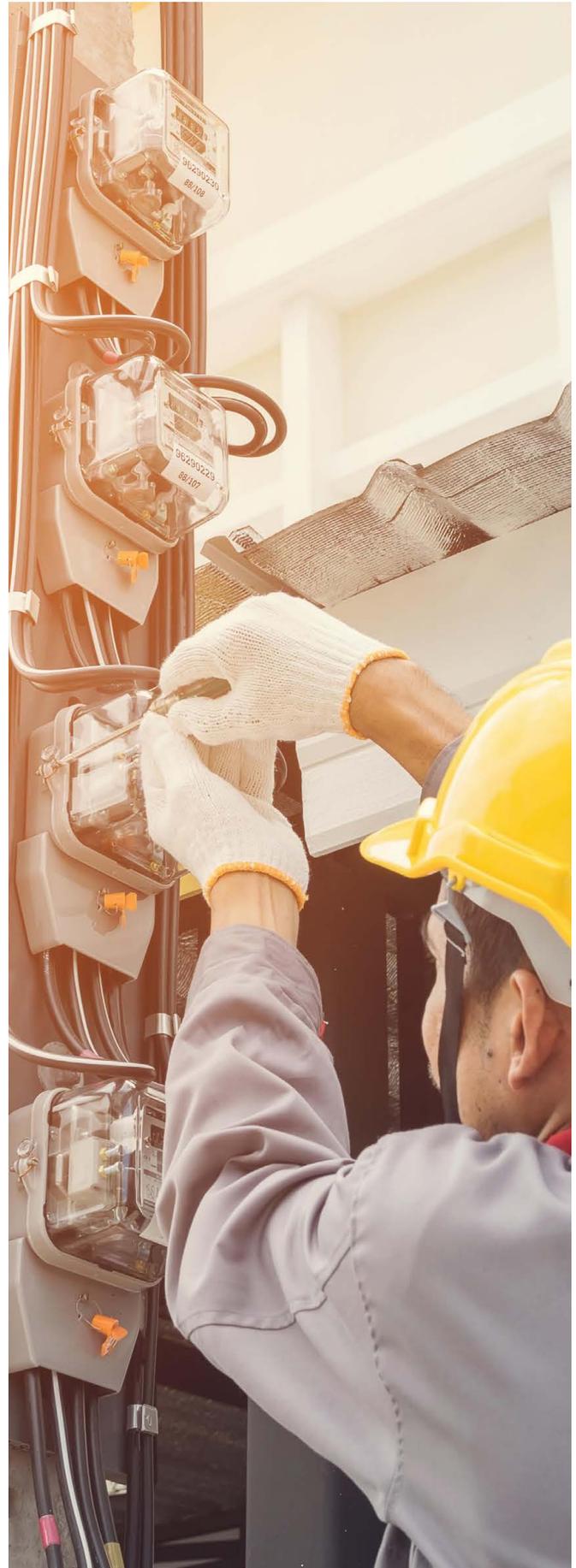


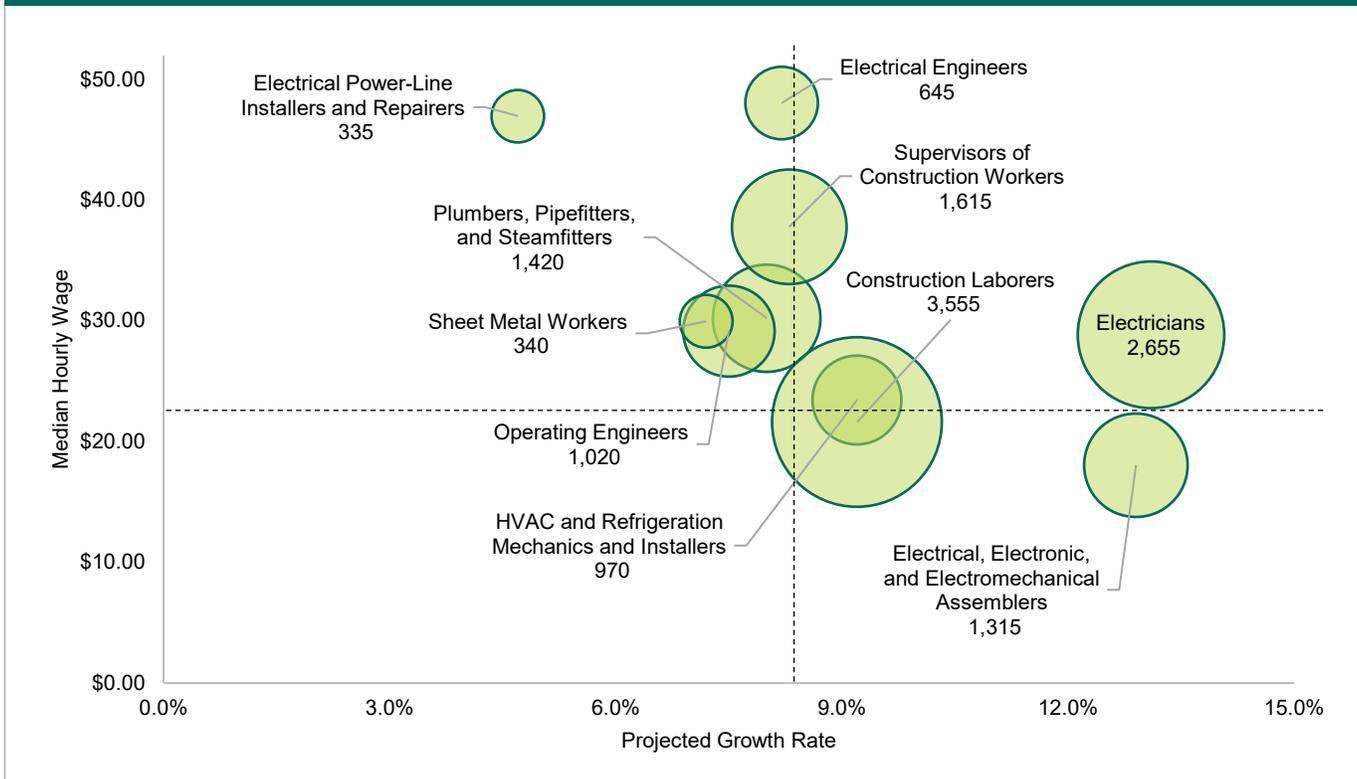
FIGURE 4: KEY OCCUPATIONS, MICHIGAN ENERGY CLUSTER, 2021

KEY OCCUPATION	CLUSTER EMP.	MICH. EMP.	CLUSTER WAGE RANGE (HOURLY)	ANNUAL OPENINGS	TYPICAL EDUCATION AND TRAINING OJT: ON-THE-JOB TRAINING
Electricians	14,730	22,330	\$19–\$38	2,655	High School Diploma or Equivalent and Apprenticeship
Plumbers, Pipefitters, and Steamfitters	9,440	12,650	\$22–\$38	1,420	High School Diploma or Equivalent and Apprenticeship
HVAC and Refrigeration Mechanics and Installers	7,500	9,480	\$19–\$29	970	Postsecondary Nondegree Award and Long-term OJT
Electrical Power-Line Installers and Repairers	3,570	3,750	\$38–\$49	335	High School Diploma or Equivalent and Long-term OJT
First-Line Supervisors of Construction Trades and Extraction Workers	3,290	14,680	\$30–\$47	1,615	High School Diploma or Equivalent
Electrical Engineers	2,850	10,050	\$38–\$59	645	Bachelor's Degree
Construction Laborers	2,770	26,080	\$17–\$28	3,555	Short-term OJT
Electrical, Electronic, and Electromechanical Assemblers	2,430	8,670	\$15–\$22	1,315	High School Diploma or Equivalent and Moderate-term OJT
Operating Engineers	1,980	10,230	\$23–\$37	1,020	High School Diploma or Equivalent and Moderate-term OJT
Sheet Metal Workers	1,830	3,470	\$23–\$37	340	High School Diploma or Equivalent and Apprenticeship
First-Line Supervisors of Mechanics, Installers, and Repairers	1,710	12,890	\$37–\$58	1,340	High School Diploma or Equivalent
Control and Valve Installers and Repairers, Except Mechanical Door	1,630	2,030	\$37–\$47	190	High School Diploma or Equivalent and Moderate-term OJT
Construction Managers	1,380	6,030	\$38–\$60	750	Bachelor's Degree and Moderate-term OJT
Power Plant Operators	1,290	1,410	\$37–\$48	115	High School Diploma or Equivalent and Long-term OJT
Electrical Repairers, Power, Substation, and Relay	1,090	1,190	\$39–\$49	85	Postsecondary Nondegree Award and Moderate-term OJT
Cost Estimators	870	5,620	\$30–\$48	550	Bachelor's Degree and Moderate-term OJT
Electrical Engineering Technologists and Technicians	830	2,620	\$24–\$38	185	Associate Degree
Telecommunications Line Installers and Repairers	670	2,270	\$18–\$25	215	High School Diploma or Equivalent and Long-term OJT
Millwrights	480	2,520	\$24–\$37	310	High School Diploma or Equivalent and Apprenticeship
Gas Plant Operators	440	490	\$37–\$48	30	High School Diploma or Equivalent and Long-term OJT
Helpers - Installation, Maintenance, and Repair Workers	430	1,690	\$17–\$18	215	High School Diploma or Equivalent and Short-term OJT
Helpers - Pipelayers, Plumbers, Pipefitters, and Steamfitters	380	430	\$14–\$19	95	High School Diploma or Equivalent and Short-term OJT
Water and Wastewater Treatment Plant Operators	370	3,420	\$19–\$29	310	High School Diploma or Equivalent and Long-term OJT
Nuclear Engineers	320	380	\$40–\$62	25	Bachelor's Degree
Sales Engineers	260	1,720	\$38–\$63	190	Bachelor's Degree and Moderate-term OJT

Source: Cluster employment, Michigan employment, and Wage range: Occupational Employment and Wage Statistics, Michigan Center for Data and Analytics (2021); Annual Openings: 2020–2030 Long-term Occupational Projections, Michigan Center for Data and Analytics; Typical Education and Training: U.S. Bureau of Labor Statistics

Note: Cluster employment is the total count of the occupation within the defined industry cluster, while Michigan employment is the total count of that occupation in the state across all industries.

FIGURE 5: KEY OCCUPATIONS, MICHIGAN ENERGY CLUSTER, 2021



Source: 2021 Occupational Employment and Wage Statistics, Michigan Center for Data and Analytics (Wages); 2020–2030 Long-term Occupational Projections, Michigan Center for Data and Analytics (Projected Growth Rate and Annual Openings)

Figure 5 displays several key occupations within the Energy cluster which show a mix of projected long-term growth, projected annual openings, and statewide median wages. The size of the bubbles in the chart are determined by projected annual openings. The lines at 8.8 percent and \$21.73 represent the statewide projected employment growth through 2030 and the 2021 statewide median wage.

As previously mentioned, Energy is one of the highest-paying clusters. Only two of the occupations displayed have median hourly wages slightly below the statewide median. Conversely, three occupations exceed the state median wage by more than \$10 per hour. These include *Electrical power-line installers and repairers*, *Electrical engineers*, and *Supervisors of construction workers*.

All the key occupations displayed are projected to experience employment growth between 2020 and 2030. Growth rates range from 4.7 percent for *Electrical power-line installers and repairers* to 13.1 percent for *Electricians*. Except for *Electrical power-line installers and repairers*, all the occupations in Figure 5 are projected to experience growth rates greater than 7 percent.

Potential Energy Career Pathway



Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic

- \$18.09
- High School Diploma or Equivalent
- Moderate-term On-the-Job Training

Service Unit Operators, Oil, Gas, and Mining

- \$22.72
- Moderate-term On-the-Job Training

Industrial Machinery Mechanics

- \$28.42
- High School Diploma or Equivalent
- Long-term On-the-Job Training

Industrial Engineers

- \$38.69
- Bachelor's Degree
- License

Electrical Engineers

- \$47.30
- Bachelor's Degree
- License

Pathway Source: <https://oklahomaworks.gov/energy-ecosystem-career-ladder/>

Wage Range: 2021 Occupational Employment and Wage Statistics, Michigan Center for Data and Analytics

Typical Education and Training: U.S. Bureau of Labor Statistics

High School Diploma or Equivalent and Short-term Training

Construction Laborers
Helpers—Installation, Maintenance, and Repair Workers
Light Truck Drivers
Meter Readers, Utilities
Pipelayers

There are a variety of opportunities available in the Energy cluster that require a high school diploma or equivalent and short-term training (one month or less). These occupations are relatively small with *Construction laborers*, the largest among the five selected occupations in this category, employing just under 2,800 individuals throughout the cluster. The median wages for these occupations range from \$17.78 for *Helpers—installation, maintenance, and repair workers* to \$29.78 for *Meter readers*, a very small occupation that only employs 90 individuals throughout the cluster.

Postsecondary Certificate or Moderate-term Training

Control and Valve Installers and Repairers, Except Mechanical Door
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
Petroleum Pump System Operators, Refinery Operators, and Gaugers
Service Unit Operators, Oil and Gas

The occupations in this tier require at most a postsecondary certificate and moderate-term training (more than one month and up to 12 months). Four out of the five occupations highlighted here require a high school diploma or less along with moderate-term training. *Electrical and electronics repairers*, the highest-paying occupation among the five highlighted, requires a postsecondary nondegree award and moderate-term training. The median wages for these occupations range from \$18.05 to \$47.33.

Associate Degree or Long-term Training or Apprenticeships

Electrical Power-Line Installers and Repairers
Electricians
Heating, Air Conditioning, and Refrigeration Mechanics and Installers
Plumbers, Pipefitters, and Steamfitters
Power Plant Operators

Occupations in this category require an associate degree, apprenticeship, or long-term training (12 months or longer). *Electricians* is the largest among the highlighted occupations and employs just over 14,700 individuals in the Energy cluster. The median wages for these occupations range from \$23.45 for *Heating, air conditioning, and refrigeration mechanics and installers* to \$46.98 for *Electrical power-line installers and repairers*.

Bachelor's Degree or Higher

Electrical Engineers
Environmental Scientists and Specialists, Including Health
General and Operations Managers
Industrial Engineers
Nuclear Engineers

Occupations in this category require a bachelor's degree or higher. At this education level, there are a variety of engineering positions and more general operations and business management occupations available in the Energy cluster. Median wages for the selected occupations range from \$48.06 to \$59.10.



Apprenticeships

In 2021, there were more than 5,100 active registered apprentices statewide in the Energy cluster. These active apprentices were mostly in the industries of *Building equipment contractors* (87.3 percent) and *Electric power generation, transmission and distribution* (11.3 percent). Statewide, 11.6 percent of active apprentices were women, 12.2 percent were people of color, and 6.2 percent were veterans. While the cluster had a below-average share of women (2.7 percent) and people of color (6.7 percent), there was an above-average share of veteran apprentices (9.0 percent). The Detroit Metro region had the largest share of active apprentices in the cluster at 37.2 percent. This was followed by West Michigan (18.9 percent) and South Central Michigan (15.2 percent).

From 2008 through 2014, the number of new registered apprentices in the Energy cluster remained below 1,000. Since 2015, there have been over 1,000 new apprentices in the cluster every year, peaking in 2017

with just over 1,800 new apprentices. In 2021, there were 1,545 new Energy apprentices, approximately 130 more than in 2020.

From 2014 through 2017, the Energy cluster had its lowest numbers of apprenticeship completers since 2008, reaching a low of 284 in 2014. However, since 2018 the number of completers has rebounded and remained above 600 each year. After peaking at 752 in 2020, there were 717 completers in 2021.

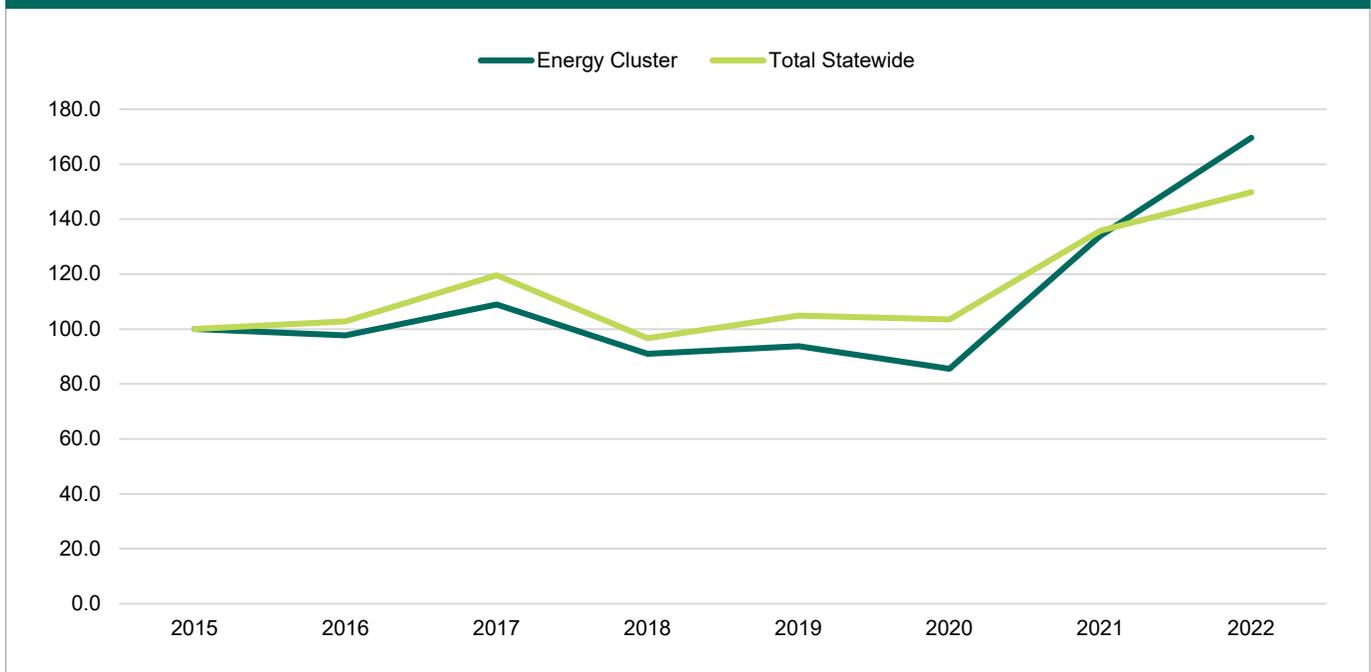
Real-Time Demand

Real-time demand is measured as the number of job advertisements posted online for an occupation or industry. The data is provided by Burning Glass Technologies and The Conference Board Help Wanted Online. Over time, online job advertisements have become more prevalent as technology becomes a more prominent method of communication. The use of online job postings still varies by industry with some areas of the economy being more reliant on methods such as word-of-mouth or local advertisements. Online job advertisements, however, can provide a mix of information about an industry cluster such as total available ads, top requested skills and certifications, minimum education requirements, and more.

Between 2015 and 2021 the Energy cluster closely followed the statewide change in annual online job advertisements. In 2022, the cluster outpaced the statewide rate of growth by nearly 20 percentage points. In Figure 6, online job advertisements in the Energy cluster and the state are indexed to 2015. Each level of advertisements in 2015 was set equal to 100 and percent changes were calculated from there. In 2022, the Energy cluster had 1.7 job advertisements for every one in 2015 compared to a rate of 1.5 statewide. The Energy cluster hit a peak increase in 2017 that was not exceeded until 2021, when the job market began to recover from the initial impacts of COVID-19.

Real-time demand is measured as the number of job advertisements posted online for an occupation or industry.

FIGURE 6: ONLINE JOB ADVERTISEMENTS INDEX, MICHIGAN ENERGY CLUSTER (INDEX YEAR: 2015)



Source: The Conference Board Help Wanted OnLine, Burning Glass Technologies

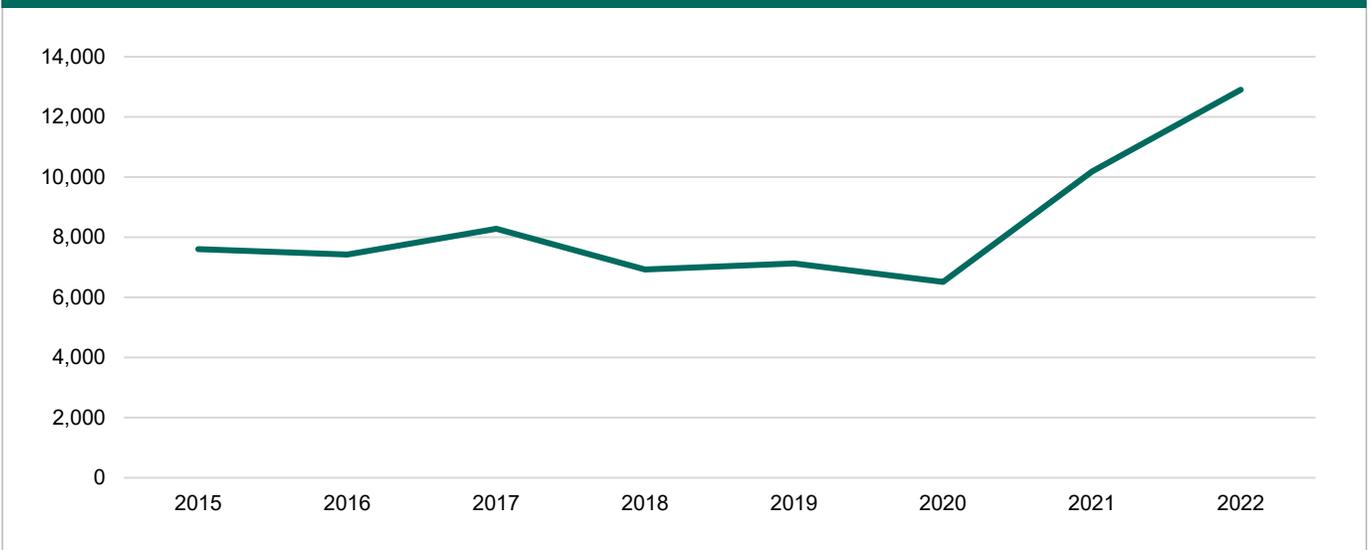


The sharp increase by more than 6,000 annual online advertisements between 2020 and 2022 (Figure 7) suggests not only an increased demand for workers, but also a possible shift toward more online advertising in the cluster following the start of the pandemic. Some of the most notable numerical increases among occupations in the cluster from 2020 to 2022 were *Software developers, applications*; *Maintenance and repair workers*; and *Managers, all other*. In terms of

percent growth, some of the most notable occupations were *Computer systems analysts*; *Human resources specialists*; and *Electrical engineers*.

Like the key occupations in the cluster, online job advertisements for Energy are typically a mix of minimum education levels. Most specify a minimum of a bachelor's degree or a high school diploma or equivalent.

FIGURE 7: ONLINE JOB ADVERTISEMENTS, MICHIGAN ENERGY CLUSTER



Source: The Conference Board Help Wanted OnLine, Burning Glass Technologies



The top 10 certifications and baseline or specialized skills are based on the number of times the skill or certification is listed in an online job advertisement for the specific time period (July 2021 to June 2022). Certifications are designated credentials earned by an individual to verify skills or knowledge gained to perform a job. Baseline skills are often called foundational skills and are defined as the common, nonspecialized skills that cut across a broad range of occupations. Lastly, specialized skills include professional and job-specific skills requested in job advertisements.

Certifications and Skills Requested in Michigan Energy Cluster Online Job Ads

Top 10 Certifications

American Board for Engineering and Technology (ABET) Accredited

CDL Class A

Certified Information Systems Security Professional (CISSP)

Certified Public Accountant (CPA)

Data Center Design Consultant

Electrician Certification

Licensed Professional Engineer

Project Management Certification

Project Management Professional (PMP)

Six Sigma Certification

Note: Driver's license is not listed here but did appear in the top 10 certifications for every industry cluster.

Top 10 Baseline Skills

Communication Skills

Creativity

Microsoft Excel

Microsoft Office

Organizational Skills

Physical Abilities

Planning

Problem Solving

Teamwork/Collaboration

Troubleshooting

Top 10 Specialized Skills

Budgeting

Customer Contact

Customer Service

HVAC

Plumbing

Project Management

Repair

SAP

Scheduling

Technical Support

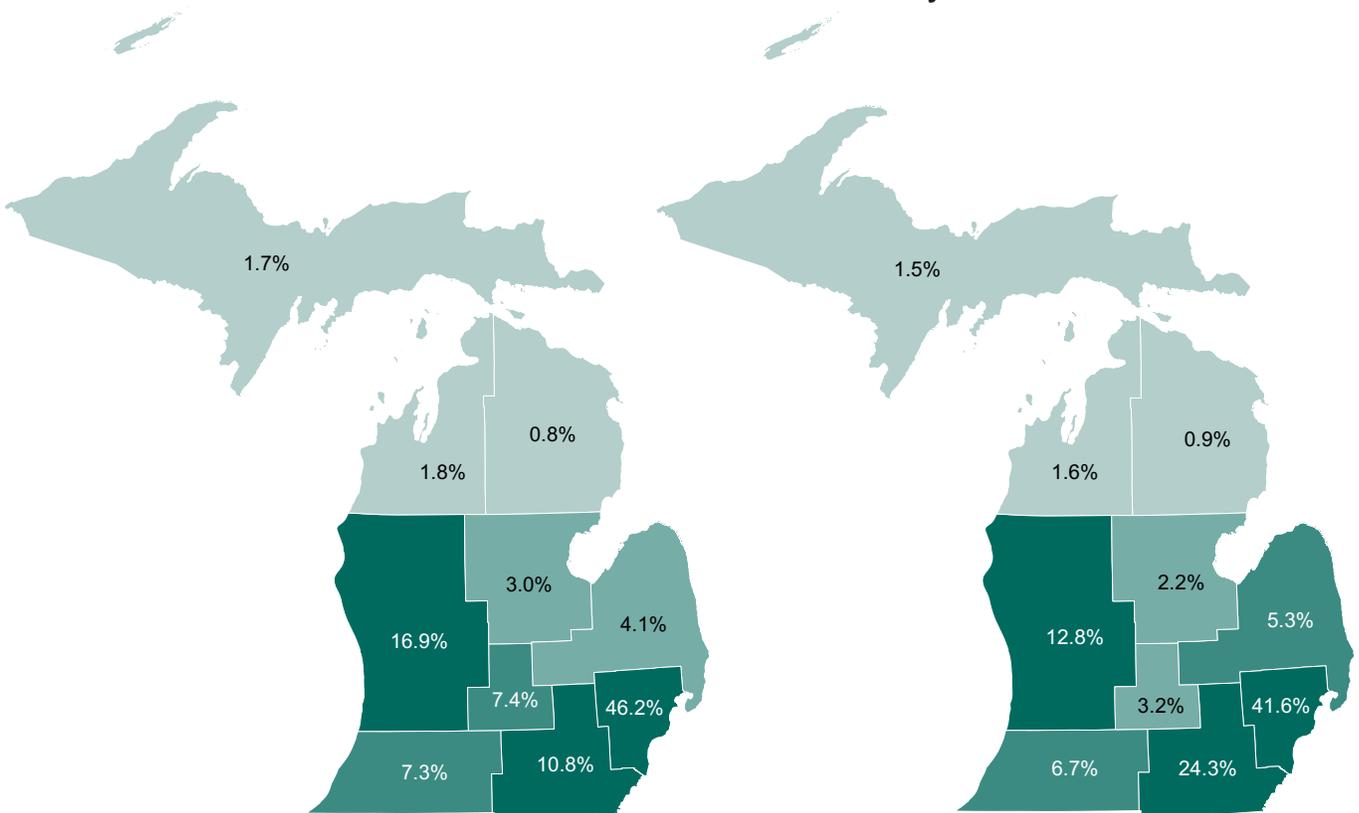
Source: The Conference Board Help Wanted OnLine, Burning Glass Technologies



Like the general statewide trends for online job advertisements, most Energy cluster ads are concentrated within the Detroit Metro, West Michigan, and Southeast prosperity regions. However, Southeast Michigan is notable as it holds just under 11 percent of all online advertisements in the state but holds over 24 percent of all Energy cluster online ads. Additionally, the West Michigan and Detroit Metro regions have slightly lower shares of Energy cluster ads compared to their overall state shares.

Share of Total Job Advertisements by Michigan Prosperity Region, July 2021 to June 2022

Share of Energy Cluster Job Advertisements by Michigan Prosperity Region, July 2021 to June 2022



Source: The Conference Board Help Wanted OnLine, Burning Glass Technologies

Employment Projections

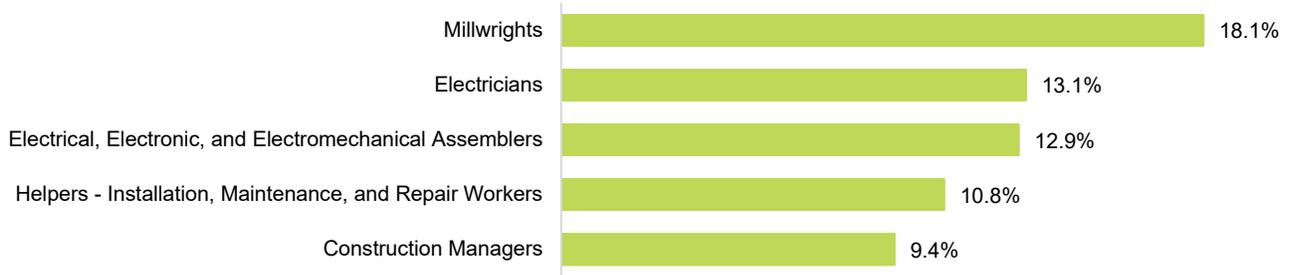
Projections do not exist for industry clusters, but they do exist for industries and occupations that make up the industry cluster. Although projections through 2030 show nearly 9 percent growth in total statewide employment, it is important to remember that these projections begin with a base year of 2020, where total employment was down compared to prior years.

The occupations with the highest projected growth rates through 2030 in the Energy cluster are shown in Figure 8. Apart from *Construction managers*, which requires a bachelor’s degree, these occupations are attainable with a high school diploma and on-the-job training or an apprenticeship. Among these five occupations,

there are expected to be over 5,200 average annual openings between 2020 and 2030.

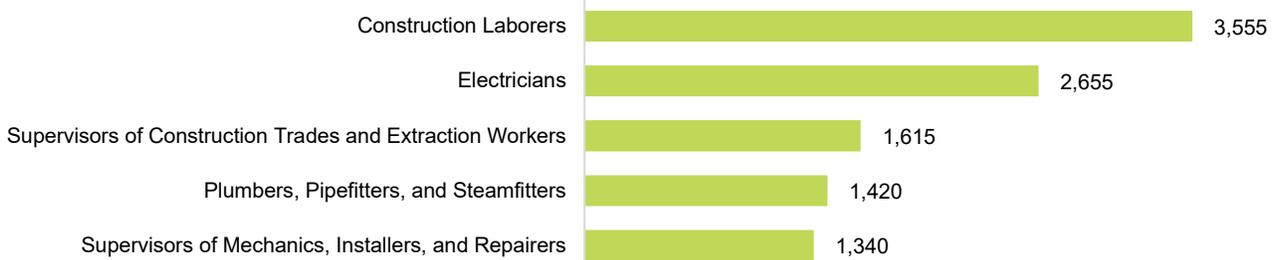
Figure 9 displays the occupations with the largest number of projected annual openings through 2030 in the Energy cluster. These occupations are all attainable with a high school diploma and training or an apprenticeship. Additionally, with the exception of *Construction laborers*, the median wages are substantially higher than the statewide median of \$21.73. These occupations are projected to experience employment growth at rates upwards of 8 percent and provide nearly 10,600 total annual openings between 2020 and 2030.

FIGURE 8: MICHIGAN ENERGY CLUSTER OCCUPATIONS WITH THE MOST PROJECTED GROWTH THROUGH 2030



Source: 2020–2030 Occupational Employment Projections, Michigan Center for Data and Analytics

FIGURE 9: MICHIGAN ENERGY CLUSTER OCCUPATIONS WITH THE MOST PROJECTED ANNUAL OPENINGS THROUGH 2030

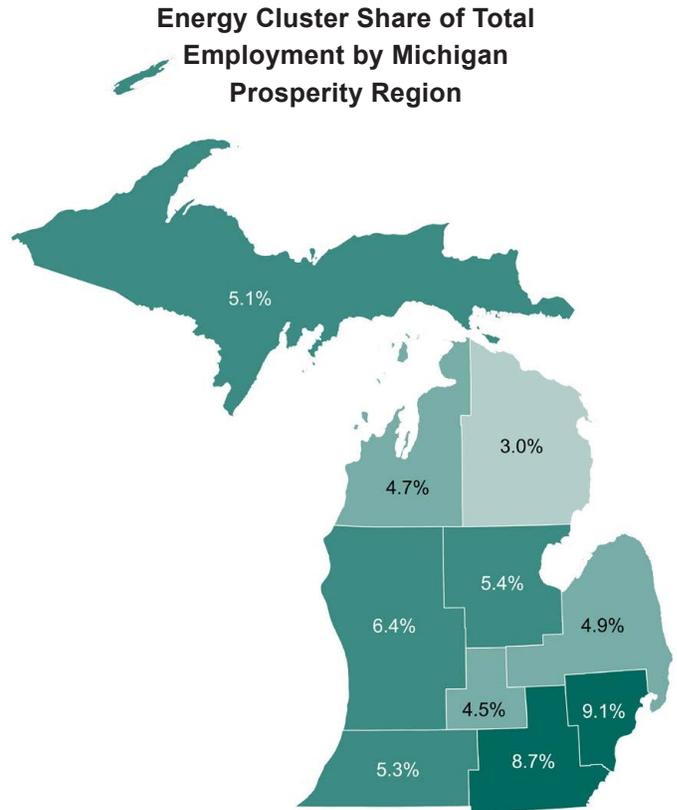


Source: 2020–2030 Occupational Employment Projections, Michigan Center for Data and Analytics

Workforce Demographics

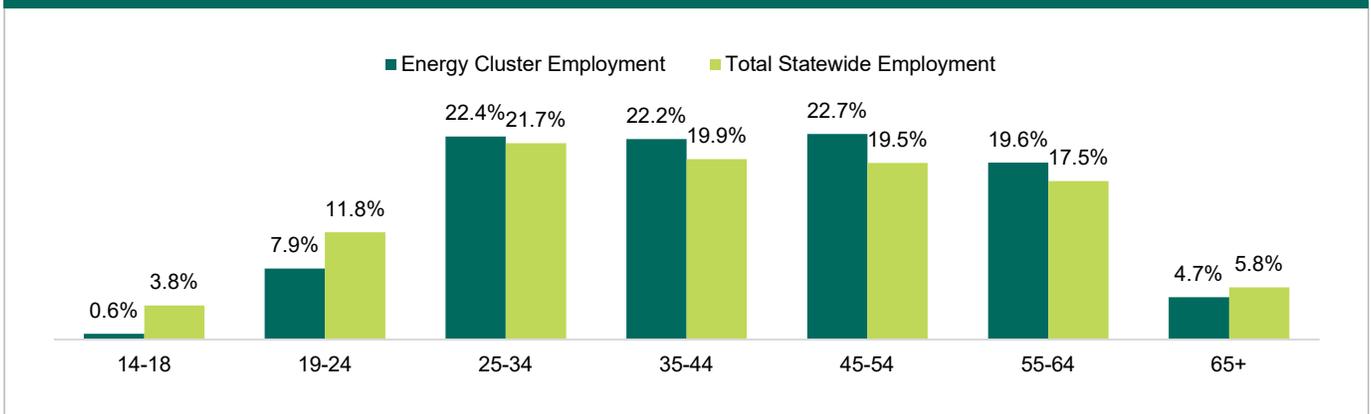
Data on workforce demographics such as gender, age, education, and race and ethnicity are important to identifying industry cluster characteristics and evaluating potential disparities. Understanding and addressing gaps in education and skills across demographic groups can aid the growth of an industry cluster. In order to maintain a young workforce across an industry cluster, employers may need to acclimate to what their workforce values, such as opportunities for financial and professional gain. The following section displays characteristics of the Energy cluster workforce in Michigan. These data analyses rely on the Longitudinal Employer-Household Dynamics program and may vary slightly from industry data published by the Quarterly Census of Employment and Wages due to limitations of data availability and differences in collection time periods.

The Detroit Metro region has the largest share of its employment in the Energy cluster at 9.1 percent. This is followed by the Southeast and West Michigan regions at 8.7 and 6.4 percent, respectively. For most of the other regions, the Energy cluster accounts for around 5 percent of employment. The Northeast region is slightly lower at 3.0 percent.



Source: Longitudinal Employer-Household Dynamics, U.S. Census Bureau

FIGURE 10: MICHIGAN CLUSTER EMPLOYMENT BY AGE, THIRD QUARTER 2021

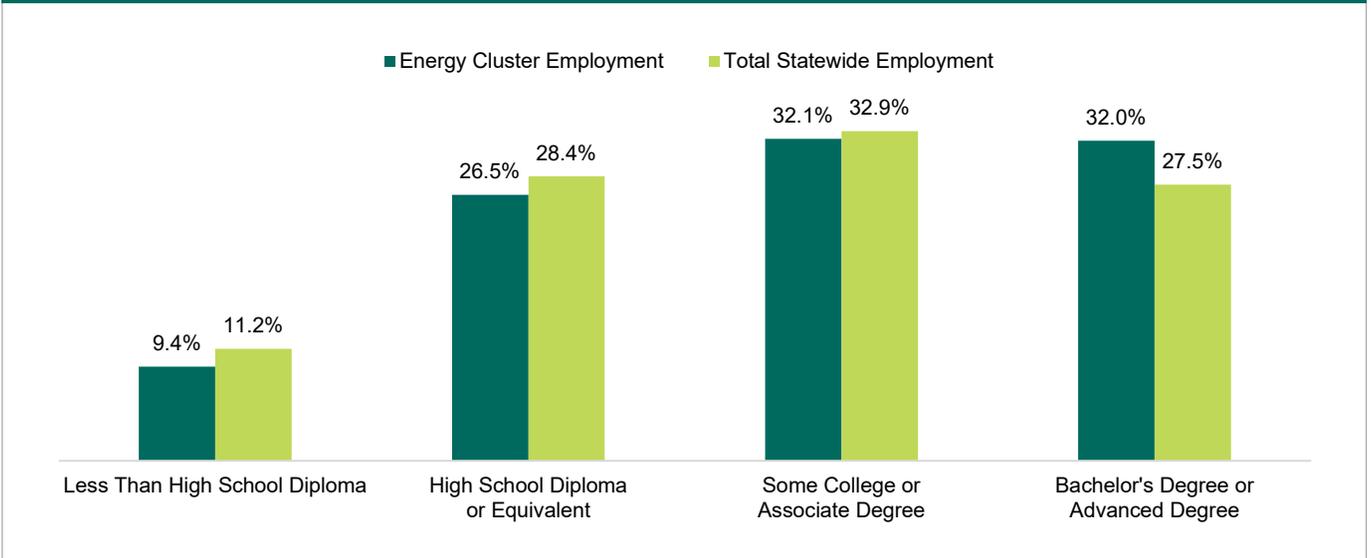


Source: Third Quarter 2021 Longitudinal Employer-Household Dynamics program, U.S. Census Bureau

Both older (65 and up) and younger workers (under 25) are underrepresented in the Energy cluster. This could be due to factors such as the physical demands and training requirements of the occupations making up this cluster. As a result, the share of workers age 25 to 64 in the Energy cluster is 86.8 percent, approximately 8.2 percentage points greater than their share of statewide employment.



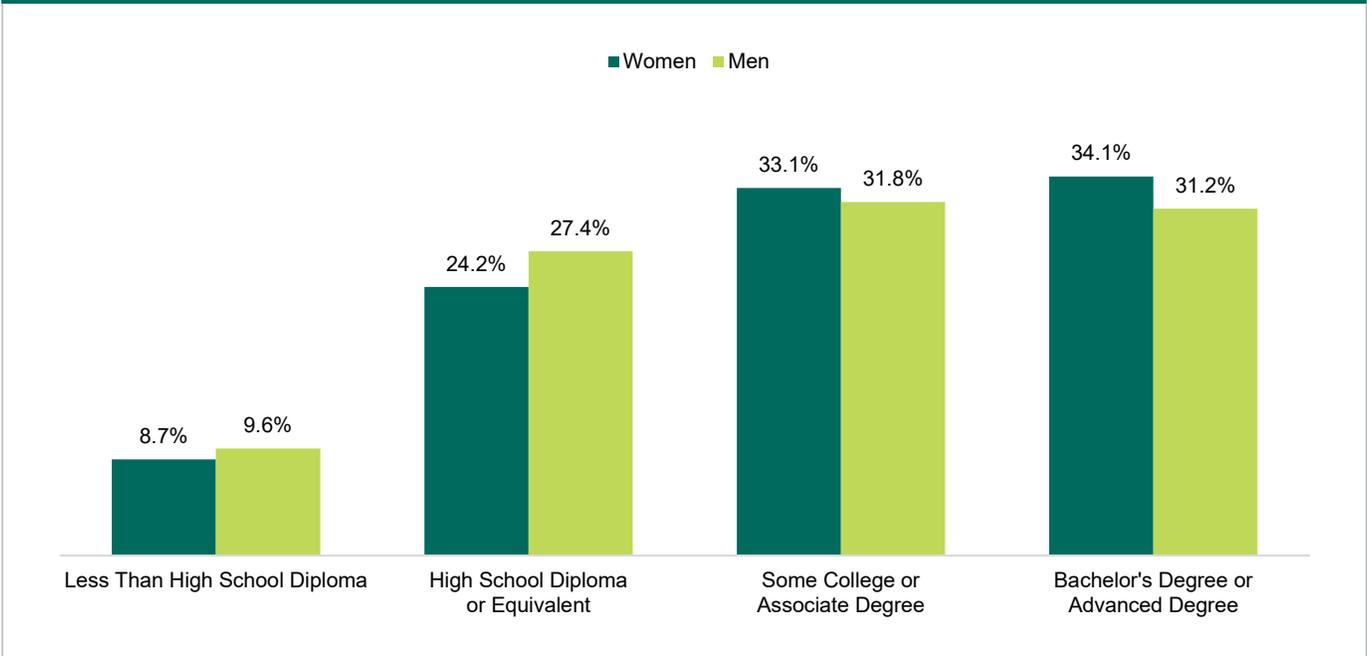
FIGURE 11: MICHIGAN ENERGY CLUSTER EMPLOYMENT BY EDUCATION, THIRD QUARTER 2021



Source: Third Quarter 2021 Longitudinal Employer-Household Dynamics program, U.S. Census Bureau

The share of workers in the Energy cluster with a bachelor's degree or advanced degree is 4.4 percentage points higher than their statewide share. This overrepresentation of highly educated workers is primarily accounted for by an underrepresentation of those with at most a high school diploma. However, as evidenced throughout this report, there are a variety of opportunities available to those without a postsecondary degree in the Energy cluster.

FIGURE 12: MICHIGAN ENERGY CLUSTER EMPLOYMENT BY EDUCATION AND GENDER, THIRD QUARTER 2021

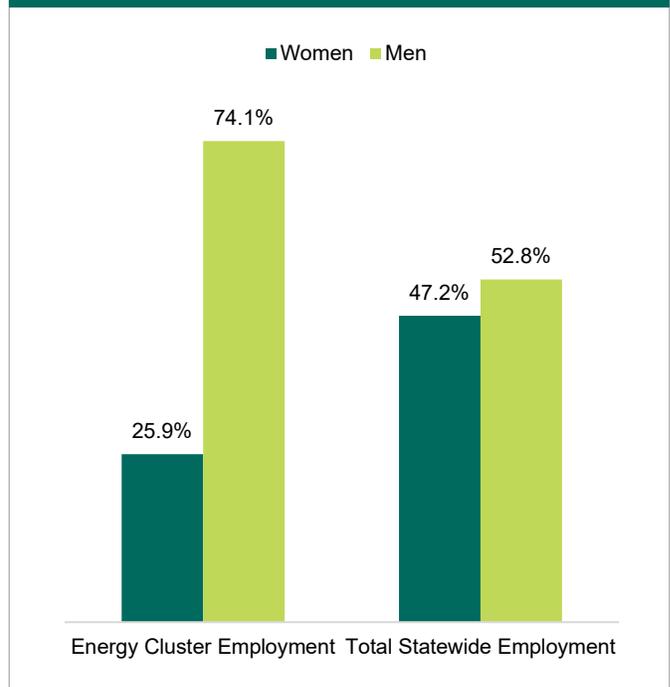


Source: Third Quarter 2021 Longitudinal Employer-Household Dynamics program, U.S. Census Bureau

The distribution of men and women by educational attainment is similar across each category. Those with a high school diploma or equivalent see the largest difference with men having a share 3.2 percentage points greater than women. This is mostly balanced out by a 2.9 percentage point deficit for men among those with a bachelor's degree or higher. Despite outpacing men at each level of postsecondary educational attainment, women earn less at all degree levels. On average, a woman in Energy with a bachelor's degree or higher only earns slightly more than a man with a high school diploma.

Nearly 75 percent of Energy cluster employment is male—substantially higher than the 52.8 percent of employment that is male statewide. This is similar to other clusters with a high concentration of men such as Construction, Manufacturing, and Mobility.

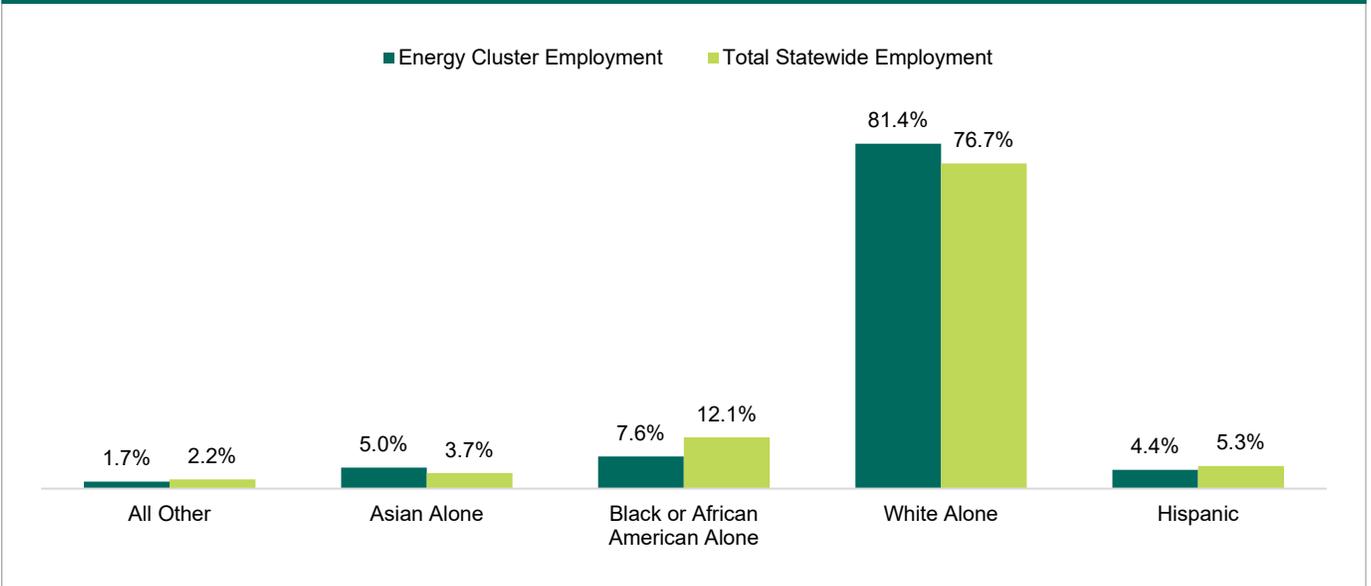
FIGURE 13: MICHIGAN ENERGY CLUSTER EMPLOYMENT BY GENDER, THIRD QUARTER 2021



Source: Third Quarter 2021 Longitudinal Employer-Household Dynamics program, U.S. Census Bureau



FIGURE 14: MICHIGAN ENERGY CLUSTER EMPLOYMENT BY RACE AND ETHNICITY, THIRD QUARTER 2021



Source: Third Quarter 2021 Longitudinal Employer-Household Dynamics program, U.S. Census Bureau

There are some notable differences in the racial composition of the Energy cluster compared to statewide employment. The largest difference exists for white workers where the share of cluster employment is 4.7 percentage points higher than the statewide share. Conversely, Black or African American workers have a share of cluster employment that is 4.5 percentage points lower than the statewide share. The Energy cluster also has a slight overrepresentation of Asians and underrepresentation of Hispanics relative to statewide employment.

Talent Pipeline

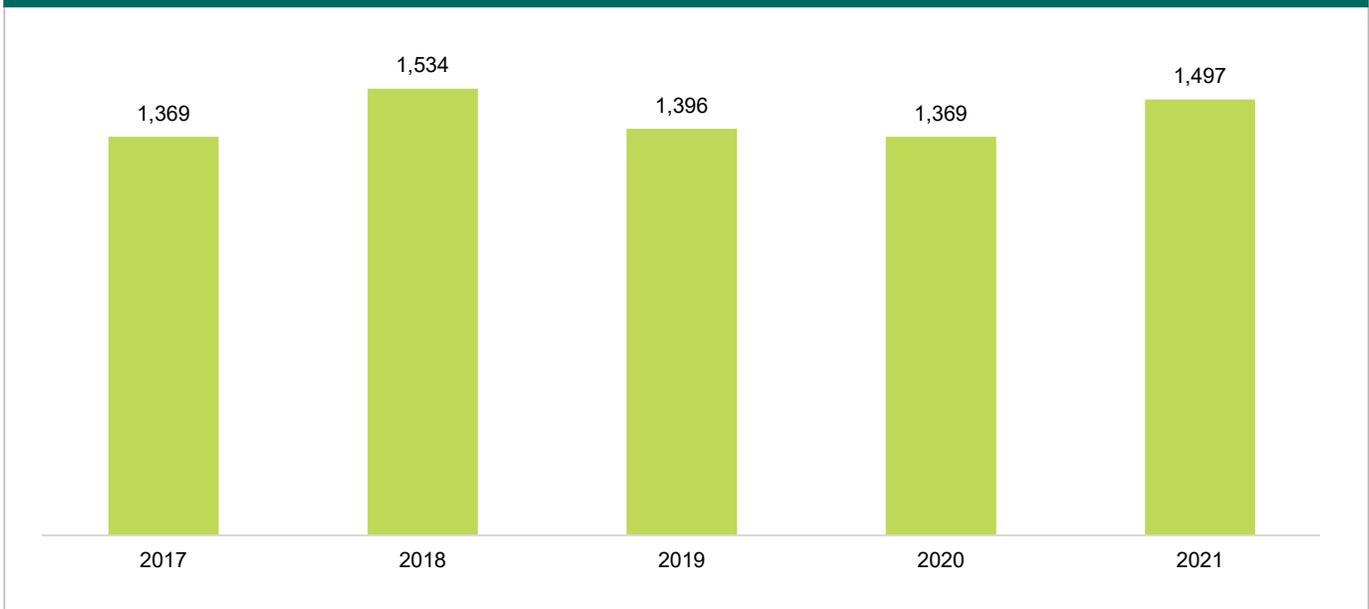
Data for education program completers of instructional programs are available from the National Center for Education Statistics. These data can be used to estimate ever-changing levels of supply for some occupations in the labor market. There are no officially defined programs for clusters. Certain programs are more likely to lead to work in the Energy cluster than others, but there are opportunities across the educational spectrum including business, architecture, and computer science programs. This section will highlight only a few of hundreds of possible programs that can lead to a job in the Energy cluster. Many factors can shift completers, such as increase in student enrollment during periods of high unemployment or difficulties attending school during a pandemic. For example, demand for workers may be causing upward pressures on programs while other factors such as a lack of instructors are causing total completers to decrease.

The Energy cluster is composed of occupations requiring various levels of education. For occupations

requiring less than a postsecondary certificate, the talent pipeline for a particular profession may not be best represented by completions of academic programs. For example, the two largest occupations in the cluster, *Electricians* and *Plumbers, pipefitters, and steamfitters*, require apprenticeships rather than postsecondary awards. While there were fewer than 100 combined completions of postsecondary programs providing preparation for these occupations in 2021, there were 470 and 235 apprenticeship completers for *Electricians* and *Plumbers, pipefitters, and steamfitters*, respectively.

The third-largest occupation in the Energy cluster, *Heating, air conditioning, and refrigeration mechanics and installers*, typically requires a postsecondary certificate. In 2021, there were 885 completions of programs preparing students for this profession at the certificate level or higher. Northwestern Technological Institute accounted for nearly 55.6 percent of these completions followed by MIAT College of Technology with 15.7 percent.

FIGURE 15: ELECTRICAL ENGINEERING-RELATED PROGRAM COMPLETIONS, MICHIGAN ENERGY CLUSTER, 2017–2021



Source: National Center for Education Statistics, Integrated Postsecondary Education Data System



In the Energy cluster, occupations requiring a bachelor's degree are typically either specialized engineering roles or more general business management positions. Among engineering occupations, *Electrical engineers* are the most prevalent with 2,850 employed within the cluster throughout the state. In 2021, there were nearly 1,500 completions of electrical engineering-related programs at the bachelor's degree level or higher. This was an increase of more than 100 from the year before and the highest number of electrical engineering-

related completions since 2018. On the business and management side, there were nearly 3,000 completions of *Business administration and management, general programs* that could potentially lead to a variety of careers in the Energy cluster such as *General and operations managers, Project management specialists, Construction managers, and Cost estimators*.

Conclusion

Although relatively small, the Energy cluster provides goods and services that are essential for the rest of the state economy. The cluster offers well-paying opportunities for all levels of education and has seen a steady increase in employment and wages since 2011. One drawback of this cluster could be its relatively small size and the somewhat limited number of opportunities available statewide.

Strengths

Above-Average Earnings

The annual average salary in the Energy cluster of \$90,100 is substantially higher than the statewide average of \$61,700. This is likely due in part to the prevalence of highly paid occupations requiring advanced levels of education within the cluster. However, there are also opportunities for those with a high school diploma or less to earn wages that exceed the statewide median with additional training and experience.

Growing Employment

Employment in the Energy cluster has grown steadily since 2011. Despite a relatively small decrease in 2020, employment has since grown to exceed pre-pandemic levels. In 2021, the cluster employed around 119,300 individuals.

Opportunities for all Education Levels

The Energy cluster relies on occupations that require varying skill levels. Even though the share of cluster employment with a bachelor's degree or higher is greater than the statewide share, many of the key occupations identified were available to those with a high school education or less.

Challenges

Gender Disparities

Energy is one of multiple clusters where women make up only about a quarter of all employment. This is a stark contrast to the statewide share where women make up about 47 percent of employment. Additionally, women earn less than male counterparts at every level of educational attainment. This is not specific to Energy, though, as this is the case across all clusters. Addressing the gaps between men and women in Energy may help to expand the cluster in Michigan.

Low Employment and Job Postings

Despite steady employment growth, the Energy cluster is one of the smallest in Michigan. Further, the cluster only accounts for 1.2 percent of online job postings statewide. Taken together with the higher concentration of Energy job ads in the Southeast region, this could suggest a limited number of employment opportunities within the cluster throughout much of the state.

Training Requirements

Whether through apprenticeships, moderate- to long-term on-the-job training, or licenses and certifications; many of the occupations highlighted throughout this report require substantial investments in training. With this in mind, continued development of talent pipelines will be important to support further growth within the Energy cluster.



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