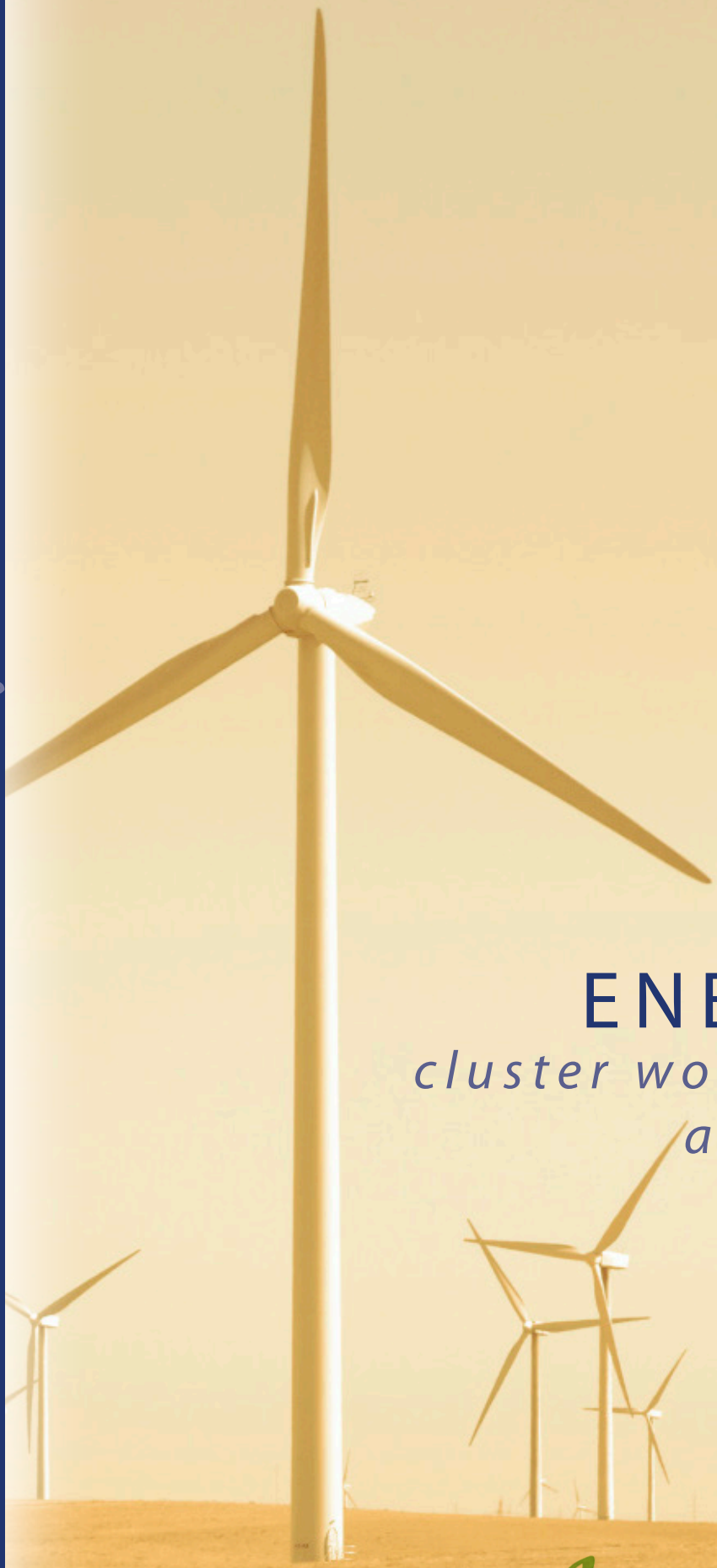




*distribution biofuel transportation
production exploration extraction wind
hydra advanced energy storage solar*



ENERGY
*cluster workforce
analysis*

January, 2013

Dear Colleagues:

Thank you for your interest in Michigan's workforce development industry clusters. The vitality of our state's priority industry clusters – Agriculture, Energy, Health Care, Information Technology, and Manufacturing – are essential components of a thriving economy. There is growing evidence that industry clusters are an effective organizing framework for positively impacting economic and workforce development activities. It is critical that we examine these clusters to understand job opportunities, industry talent needs, as well as workforce supply; and the Workforce Development Agency, in partnership with the Office of Labor Market Information and Strategic Initiatives is pleased to make this resource available.

This industry cluster briefing analyzes several labor market measures including employment concentration, trends, and forecasts; key occupations; education program completers; and workforce demographics. It is an additional tool to assist in the implementation of the Michigan Industry Cluster Approach (MICA). MICA focuses on aligning efforts – initiatives, programs, and funding – around priority clusters for a demand-driven workforce system. This approach, led by the Workforce Development Agency is being implemented in partnership with employers, the Michigan Works! System, the Michigan Economic Development Corporation and local economic development entities, education and training providers, and statewide trade associations. A key activity of MICA is the convening of groups of employers to identify and develop solutions to address workforce needs.

We hope that you find this information valuable. It should provide a road map that leads to stronger partnerships and a more effective workforce development system. Please contact us if you have questions about this analysis, or would like more information about the Michigan Industry Cluster Approach.

Respectfully,



Christine Quinn, Director

Workforce Development Agency





Michigan's Energy Cluster Workforce: **KEY FINDINGS**



- Michigan's Energy cluster is in the process of a transformation with efforts to develop cleaner technology and utilize more energy efficient practices.
- The Energy cluster has experienced job losses over the last decade (2001 – 2010); however, job levels have stabilized as the economy recovers and new and emerging industries provide job opportunities. Of the four sub-sectors comprising the Energy cluster, employment in *Energy efficiency* and *Oil and gas exploration* has displayed job growth in Michigan since 2009.

Southeast Michigan has an extensive amount of very experienced automotive engineers; however, as technologies for advanced propulsion systems, such as electric, hybrid electric and fuel cell vehicles are so advanced, it requires a specific set of skills. We need engineers educated in these progressing technologies in order to stay competitive.

—Kevin Pavlov
Chief Operating Officer
Magna E-Car Systems

- The workforce is aging and the cluster is having a difficult time attracting younger workers. About 20 percent of the workforce is 55 years or older, compared to only 10 percent in 2001. Furthermore, a smaller share of younger workers (age 34 years or younger) is working in the Energy cluster. Younger workers accounted for 26 percent in 2011 when their share was 35 percent in 2001.
- Between 2008 and 2018, occupations in the Energy cluster are expected to advance by 5.6 percent, keeping pace with statewide projected growth. Increased demand for energy-related activities and technological advances will provide employment opportunities for a broad range of occupations. In addition, hiring will expand as older workers head into retirement.
- According to the Michigan's Green Jobs Survey, the auto industry is the largest source of green-related jobs in Michigan, as it leads the way in advancing clean technology and research on fuel efficiency and alternative fuels. Although all automobile industry jobs are not included in the Energy cluster totals, the auto sector employs a significant share of the *Engineering* and *Production* workforce in Michigan, which is integral to the research and manufacturing components of the cluster.

CLUSTER HIGHLIGHTS

	ENERGY CLUSTER	TOTAL, ALL INDUSTRIES
Employment	84,000	3,270,400
Energy Efficiency	46,000	N/A
Utilities	23,000	N/A
Renewable and Alternative Energy	7,700	N/A
Oil & Gas Exploration, Extraction, Wholesale	6,900	N/A
<hr/>		
Short Term Job Change (2009 – 2011)	-1.0%	+3.2%
Long Term Job Change (2005 – 2011)	-19.7%	-11.2%
Projected Job Change (2008 – 2018)	+5.6%	+5.6%
<hr/>		
Online Job Vacancies	1,000	132,000
Over-the-Year Change in Online Job Vacancies	+18.7%	+6.0%
<hr/>		
Total Wages	\$1.27 Billion	\$35.1 Billion
Average Weekly Wage	\$1,168	\$827
Change in Average Weekly Wage	+5.9%	+4.7%
<hr/>		
% of workers under 34 years old	26%	35%
% of workers over 55 years old	19%	18%
<hr/>		
Educational Program Completers	2,100	282,800
% Post-secondary*	61%	61%
% Bachelor's Degree*	28%	27%

* Highest level of education completed by individuals working in Energy-related industries.

Source: Bureau of Labor Market Information & Strategic Initiatives

BOTH TRADITIONAL AND EMERGING INDUSTRIES COMPRISE MICHIGAN'S ENERGY CLUSTER



A cluster is a geographic concentration of related employers, industry suppliers, and support institutions in a product or service field. In a practical sense, clusters are an organizing framework to permit the selection of significant industry sectors for which in-depth knowledge and expertise on workforce issues are developed by service providers that convene employers. A cluster leverages the knowledge and resources of all involved, decreases duplication of effort, and often achieves cost savings for recruitment and training.

The industry employment data presented in this briefing reflects key detailed sectors directly related to the production and distribution of energy, and the enhancement of energy efficiency, which does not fully represent the supply chain of the cluster.

chart 1:
**Energy Cluster Employment
by Sub-sector**

84,000
CLUSTER JOBS



The Energy cluster reflects both traditional and emerging industries, which engage in the generation and utilization of energy through the extraction and conversion of either non-renewable (e.g. coal, natural gas, petroleum) or renewable resources (e.g. solar, wind, hydro). Environmental and security concerns have fueled the exploration and development of renewable sources for energy and environmentally friendly practices.

ENERGY EFFICIENCY

(46,000 jobs) Demand for energy efficiency practices and services have increased as consumers seek ways to reduce energy costs in their homes and businesses. The majority of the industries revolve around the construction-related activities that improve energy efficiency of buildings.

- 236118 Residential remodelers
- 238210 Electrical contractors and other wiring installation
- 238220 Plumbing, heating, and air-conditioning contractors
- 335110 Electric lamp bulb and part manufacturing

UTILITIES

(23,000 jobs) The Utilities sub-sector consists of private firms that produce and deliver utility services to the public, such as: electricity, natural gas, water, and waste treatment. Energy production within this sub-sector typically uses a majority of non-renewable resources (e.g. fossil fuels.)

- 221112 Fossil fuel electric power generation
- 221113 Nuclear electric power generation

- 22112 Electric power transmission, control, and distribution
- 2212 Natural gas distribution
- 2213 Water, sewage, and other systems
- 237110 Water and sewer line and related structures construction
- 486110 Pipeline transportation of crude oil
- 486210 Pipeline transportation of natural gas
- 486910 Pipeline transportation of refined petroleum products
- 541618 Other management consulting services
- 562213 Solid waste combustors and incinerators

ALTERNATIVE AND RENEWABLE ENERGY

(7,700 jobs) Michigan has the potential for development of alternative and renewable energy sources due to an abundant supply of natural resources. This sub-sector includes industries engaged in the generation of energy from renewable resources; the manufacturing of components utilized in clean technology; and the consulting elements within the environmental field.

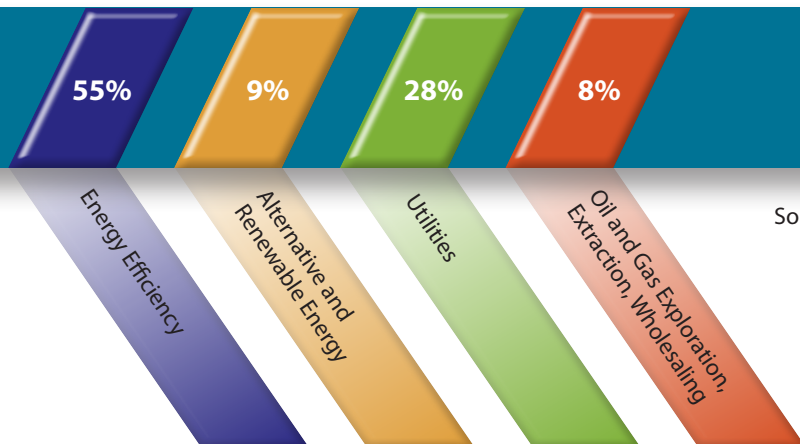
- 221111 Hydroelectric power generation
- 221119 Other electric power generation
- 237130 Power and communication line and structures construction

- 333611 Turbine and turbine generator manufacturing
- 334413 Semiconductor and related device manufacturing
- 335911 Storage battery manufacturing
- 335912 Primary battery manufacturing
- 541620 Environmental consulting services

OIL AND GAS EXPLORATION, EXTRACTION, WHOLESALING

(6,900 jobs) Establishments in this sub-sector primarily focus on the extraction, production, and transmission of minerals and gases derived from the Earth. Support activities that include site exploration, wholesaling, and the manufacturing of mining equipment are also categorized in this sub-sector.

- 211 Oil and gas extraction
- 213111 Drilling oil and gas wells
- 213112 Support activities for oil and gas operations
- 237120 Oil and gas pipeline and structures construction
- 324110 Petroleum refineries
- 333132 Oil and gas field machinery and equipment manufacturing
- 4247 Petroleum and petroleum products merchant wholesalers
- 541360 Geophysical surveying and mapping services



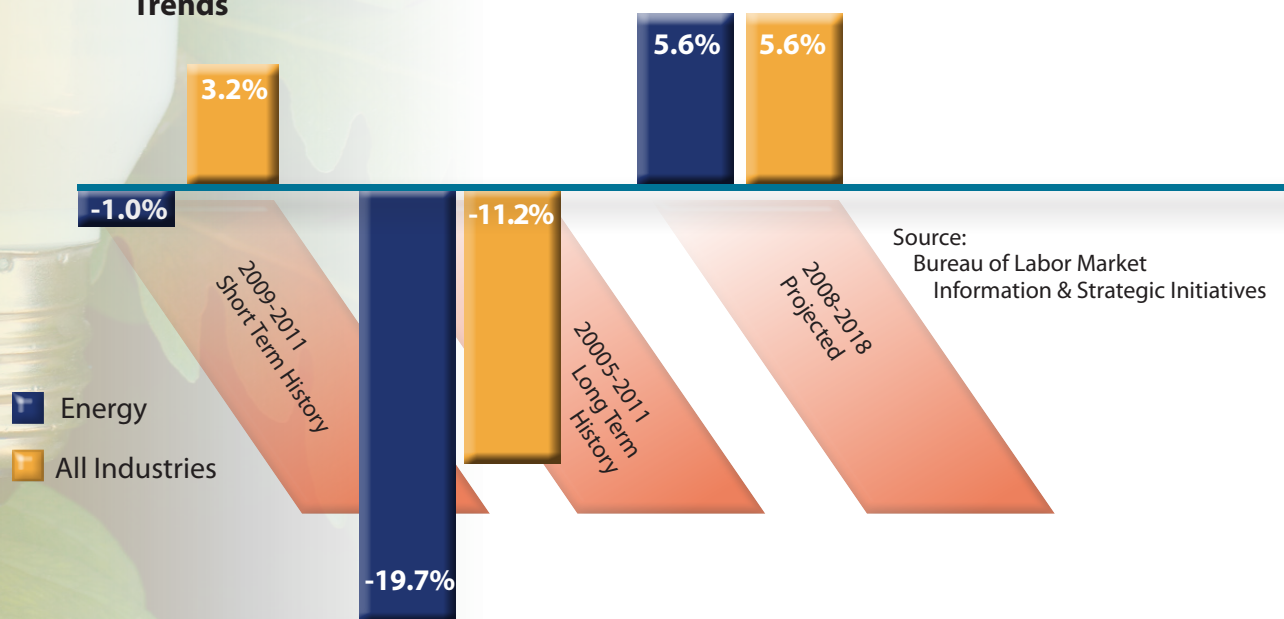
Source: Bureau of Labor Market Information & Strategic Initiatives

ENERGY SECTORS SHOWING RECENT JOB GAINS



Jobs in the Energy cluster were impacted by the national recession, but some Energy sectors have been showing job gains in recent years. Due to extensive job cuts in the *Construction* industry, it is no surprise that the Energy cluster has posted long term overall job losses (2005 – 2011). However, those job reductions have moderated in recent years, with jobs in the cluster declining by only one percent between 2009 and 2011. By 2018, Energy cluster employment is projected to grow by 5.6 percent, identical to the statewide forecast all-industry job growth rate of 5.6 percent.

chart 2:
Employment Growth Trends



- Four of the top five largest industries in Energy are construction related. Overall, the detailed construction industries within the cluster accounted for nearly two-thirds of total cluster employment. Therefore, job growth in the cluster will be strongly linked to the performance of the *Construction* sector.
- The *Oil and gas exploration* sub-sector was the least affected by the economic downturn with employment remaining flat since 2005. On the other hand, *Energy efficiency* jobs were largely impacted by the housing crisis, but have been gradually recovering. Since 2009, jobs in the *Energy efficiency* sub-sector have advanced by nearly 2 percent.
- Between 2009 and 2011, employment was essentially flat in the cluster; however, thirteen detailed industry sectors within the cluster grew faster than the statewide industry average of 3.2 percent. Table 2 highlights industries that recorded the fastest job growth rates during this time period. *Primary battery manufacturing*, a relatively new industry, led the growth, adding nearly 500 jobs.

table 1:


EMPLOYMENT CHANGE BY ENERGY SUB-SECTORS		
SUB-SECTOR	LONG-TERM	SHORT-TERM
Energy Efficiency	-27.1%	+1.5%
Utilities	-15.7%	-4.0%
Alternative and Renewable Energy	+13.0%	-8.2%
Oil and Gas Exploration, Extraction, Wholesaling	-0.1%	+1.8%

Source: Bureau of Labor Market Information & Strategic Initiatives

table 2:

INDUSTRIES SHOWING SHORT-TERM EMPLOYMENT GROWTH (2009-2011)		
DETAILED INDUSTRIES	CHANGE	% CHANGE
Primary Battery Manufacturing	+463	+625%
Petroleum Bulk Station/Terminals	+115	+24.2%
Support Activities, Oil/Gas	+104	+8.2%
Residential Plumbing/Heat/AC Contractors	+537	+6.4%

Source: Bureau of Labor Market Information & Strategic Initiatives



ENERGY CLUSTER OCCUPATIONS PROVIDE MANY OPPORTUNITIES FOR WORKERS TO LEARN ON THE JOB



The diverse group of industries categorized under the Energy cluster lead to a wide range of occupations with different educational backgrounds and requirements. The three largest occupational groups represented in Energy are: *Construction and extraction*; *Installation, maintenance, and repair*; and *Office and administrative support*. Although, the shares of cluster jobs in *Architecture, Engineering, and Production* occupations were more modest, these positions have a significant impact on the research and manufacturing of Energy-related goods. In particular, these jobs are an essential part of the effort to advance the use of clean technology and renewable energy.

- The Energy cluster provides competitive wages for a number of occupations requiring different educational levels. Among the largest Energy occupations in terms of employment size, 13 recorded an average wage higher than the statewide hourly mean of \$21 and only three of these job titles required a bachelor's degree. Occupations in the Energy cluster present many opportunities for workers to learn on the job.
- *Construction and extraction* is the largest occupational group in the cluster, accounting for nearly one-third of total cluster employment. Even though the housing crisis has led to stalled demand for new construction, the increasing demand for improved energy efficiency in buildings may lead to enhanced job opportunities for skilled workers.
- *Installation, maintenance, and repair* occupations account for 19 percent of total cluster employment, making it the second largest occupational group in the cluster. Detailed occupations in this group, such as: *Electrical line installers and repairers* and *Electrical and electronics repairers*, are vital to upgrading and maintaining the state's Utilities infrastructure.

table 3:

KEY OCCUPATIONS IN THE ENERGY CLUSTER						
OCCUPATION	2008 JOBS	JOB OUTLOOK 2018	ANNUAL OPENINGS GROWTH	ANNUAL OPENINGS REPLACEMENT	HOURLY WAGE RANGE (\$)	MINIMUM TRAINING
Heating/AC/Refrigeration Mechanics and Installers	5,725	26.6%	153	92	\$14 - \$33	Vocational
Electricians	5,075	12.5%	63	123	\$16 - \$36	Long Term OJT
Construction Laborers	4,600	9.6%	44	31	\$10 - \$27	Moderate OJT
Plumbers, Pipefitters, and Steamfitters	3,500	10.8%	38	70	\$14 - \$36	Long Term OJT
Bookkeeping, Accounting, and Auditing Clerks	2,550	9.8%	25	31	\$10 - \$24	Moderate OJT
First-Line Supervisors/Managers Construction Trades and Extraction	2,425	5.9%	14	47	\$19 - \$45	Work Experience
Cost Estimators	2,350	20.4%	48	52	\$16 - \$43	Bachelor's
Operating Engineers and Other Construction Equipment Operators	1,925	9.9%	19	33	\$14 - \$32	Moderate OJT
Construction Managers	1,750	6.5%	11	14	\$22 - \$74	Bachelor's
Telecommunication Line Installers and Repairers	1,175	7.2%	8	18	\$12 - \$31	Long Term OJT
Sales Representatives, Wholesale and Manufacturing, Except Tech	1,125	7.1%	8	26	\$12 - \$52	Work Experience
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	900	8.7%	8	16	\$23 - \$36	Vocational
Sheet Metal Worker	750	6.7%	5	18	\$15 - \$36	Long Term OJT
Telecommunication Equipment Installers and Repairers, Except Line	700	17.9%	13	12	\$13 - \$34	Vocational
Accountant and Auditors	700	9.5%	7	12	\$19 - \$51	Bachelor's

OJT = On-the-Job Training

Source: Bureau of Labor Market Information & Strategic Initiatives

MANY ENERGY JOBS ARE HIGH-DEMAND, HIGH WAGE

Even during the automotive downturn, hybrid vehicle technology is becoming mainstream, and there is a current and projected skill shortage at several levels: First, upskilling current engineers; then creating a pipeline of new engineering talent and developing the technicians that can work in the new, rapidly changing technologies. By actively engaging the industry-education-public partnership, The Michigan Academy for Green Mobility Alliance (MAGMA) became the catalyst for generating the resources that are closing that skill gap.

— Greg Moss
Senior Training and
Industrial Design Specialist
DENSO International America, Inc.



- Employment in *Installation* has also benefited from the increasing demand for Alternative and Renewable Energy generation. These emerging sectors of energy generation will require traditional workers to acquire additional skills in order to connect the population to these new energy supplies. For example, *HVAC installers* (+26.6 percent) are expected to record the fastest job gains among *Installation* occupations in Michigan.
- *Engineering* occupations only account for two percent of cluster employment; however they are critical to the ongoing research and development activities in the Energy sector. *Electrical, Nuclear, Mechanical, and Civil engineers* are employed in this cluster.
- All jobs in the auto industry are not included in the cluster, but the auto sector has an extremely large employment base of engineers in Michigan. Many auto engineers are currently working to improve the fuel efficiency of vehicles, or working to develop alternative fuel sources. According to the Michigan Green Jobs Survey, a significant share of engineers in the auto industry are engaged in activities related to improving energy efficiency. The Workforce Development Agency has partnered with automotive manufacturers and suppliers, creating the *Michigan Academy for Green Mobility Alliance* (MAGMA) to address engineering and technical skill needs associated with hybrid and electric vehicle design and development.

- Advanced batteries and other energy storage systems have been identified as key components to building cleaner automobiles. More than two dozen firms in Michigan have made investments in the state's advanced battery industry. Production workers that should benefit from this new development are *Assemblers and fabricators* and *Metal and plastic workers*. Battery manufacturers in West Michigan have partnered with *Michigan's Smart Coast Advanced Energy Storage Alliance* to train workers in new manufacturing processes for battery production.
- Solar and wind energy production have seen significant growth in recent years as a large number of states look to increase their share of Alternative and Renewable Energy usage. This is a potential market for Michigan's production base. The manufacturing of components of wind turbines and solar panels provide new employment opportunities for skilled Michigan production workers (i.e. *Welders* and *Assemblers*.)
- The Environmental Law and Policy Center identified nearly 250 Michigan businesses that were part of either the wind or solar supply chain. The majority of these firms were in Southeast Michigan, Mid-Michigan, and West Michigan.
- Table 4 highlights 15 high demand, high wage occupations in the Energy cluster. From this list, *HVAC installers* (+1,530) and *Electricians* (+630) are expected to display the largest numeric job growth between 2008 and 2018.
- Three occupational groups were highly represented among the high demand, high wage occupations in the Energy cluster: *Installation, Construction, and Engineering*. The highest wages were primarily recorded by the various *Engineering* positions.

table 4:

HIGH-DEMAND, HIGH WAGE OCCUPATIONS	
OCCUPATIONS	MEAN HOURLY WAGE
Nuclear Engineers	\$ 56.87
Construction Managers	\$ 44.25
Mechanical Engineers	\$ 41.63
First-Line Supervisor/Manager: Construction and Extraction	\$ 30.84
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	\$ 29.99
Cost Estimators	\$ 28.53
Gas Plant Operators	\$ 28.15
Sheet Metal Workers	\$ 27.30
Electricians	\$ 26.60
Plumbers, Pipefitters, and Steamfitters	\$ 26.05
Electrical and Electronics Repairers, Commercial and Industrial Equipment	\$ 25.32
Industrial Machinery Mechanics	\$ 23.52
Telecom. Equipment Installers and Repairers, Except Line Installers	\$ 23.13
HVAC Installers	\$ 22.54
Operating Engineers and Other Construction Equipment Operators	\$ 22.11

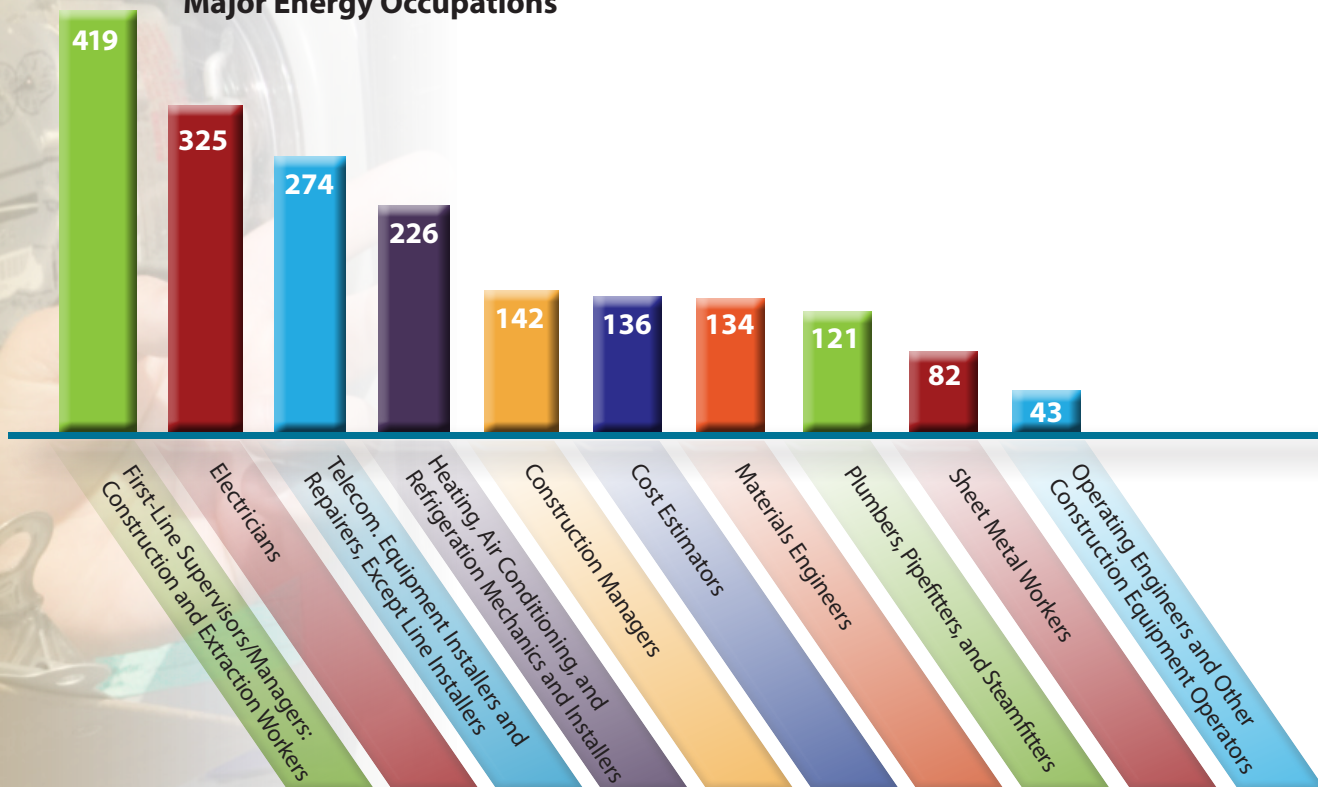
Source: Bureau of Labor Market Information & Strategic Initiatives

INCREASING REAL TIME DEMAND FOR A BROAD RANGE OF ENERGY OCCUPATIONS



Job seekers, employers, and workforce developers need current information so that they can better align their strategies to meet the demands of the economy. Compiling and aggregating real-time data on occupational vacancies from internet job sites provides information on job demand, and this information can shed light on recent hiring trends and lead to a better understanding of the immediate needs of the labor market. Within the Energy cluster, recent hiring has been distributed across a broad range of occupations.

chart 3:
Online Job Advertisements for Major Energy Occupations



Source: Conference Board, Help Wanted Online® (HWOL)

- Chart 3 displays the total number of online job postings in the state for key occupations in the Energy cluster. Some of the Energy occupations projected to grow the fastest in the long run also posted a notable number of vacancies in 2012. For example, there were over 600 advertisements combined for *HVAC installers* (+26.6 percent); *Cost estimators* (+20.4 percent); and *Telecommunication equipment installers and repairers* (+17.9 percent) in Second Quarter 2012.
- Many reasons can lead to difficulties when hiring for a position. For example, there may be a shortage of workers with the specific skills desired by employers. Table 5 provides some examples of “difficult to fill” occupations, which are ads posted for 90 days or longer. The most difficult jobs to fill in the Energy cluster generally require at least a bachelor’s degree and more specialized skills acquired through work experience and/or continuing education.
- High-tech equipment and software have become a standard part of the Energy cluster, therefore specific data management and programming skills have increasingly been in demand. Skills that remain highly valuable in the Energy cluster include managerial skills and knowledge of safety and regulatory standards.

table 5:

DIFFICULT TO FILL JOB VACANCIES
Industrial Engineers
Computer System Analyst
Mechanical Engineers
Accountants
Electrical Engineers

table 6:

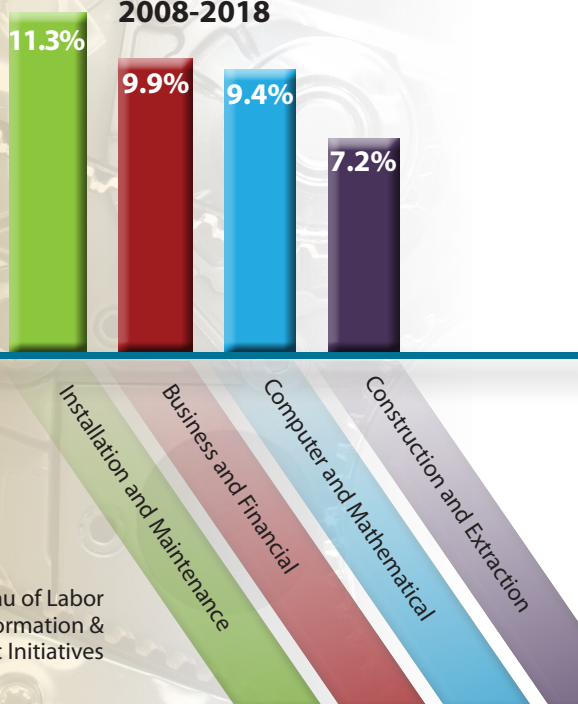
OCCUPATIONS WITH GROWING ONLINE VACANCIES
Computer Software Engineers, Applications
Network and Computer System Administrators
Heating and Air Conditioning Mechanics and Installers
Management Analyst
Electricians

table 7:

KEY SKILLS EMPLOYERS ARE SEEKING
Project Management
EPA Standards
Quality Assurance
Product Design
Autodesk AutoCAD

ENERGY OCCUPATIONS PROJECTED TO KEEP PACE WITH STATEWIDE FORECASTED JOB GROWTH

chart 4:
**Projected Job Growth Rates
2008-2018**



Source: Bureau of Labor
Market Information &
Strategic Initiatives

Keeping pace with the statewide trend, the Energy cluster is expected to increase by 5,600 jobs or 5.6 percent between 2008 and 2018. About 45 percent of the detailed occupations within the cluster will post employment gains during this time period. *Construction and extraction* and *Installation, maintenance, and repair* occupations are expected to add the largest number of jobs, with both occupational groups increasing by more than 2,000.

- Four occupational groups in the cluster will grow faster than the statewide average of 5.6 percent. These include *Installation and maintenance* (+11.3 percent); *Business and financial* (+9.9 percent); *Computer and mathematical* (+9.4 percent); and *Construction and extraction* (+7.2 percent).
- Although Energy-related *Computer* jobs are a minor share of total Energy cluster employment, their importance should not be overlooked. Many of the current job openings in the Energy sector are in technical and IT positions. In Michigan, this occupational group is projected to grow by 13.9 percent.
- The *Construction* and *Installation* occupational groups will provide the Energy cluster with the most annual openings with four of the top five detailed occupations belonging in the two groups. A significant number of openings will also be available in *Administrative and support* positions, mostly due to replacement needs.

- Certain occupations are not expected to add a significant number of jobs, but they will still have notable hiring needs due to openings caused by attrition. Examples of occupations that have a higher share of replacement openings are: *Electric power line installers and repairers* and *Laborers and material movers*.
- Approximately 50 percent of utility workers will leave the industry over the next 3 to 5 years, requiring immediate efforts to increase worker skills and training programs. Understanding the need to adjust their recruitment and training strategies, Michigan's two largest utility providers partnered with the Workforce Development Agency, Michigan Works!, community colleges, and others to form the *Michigan Utility Workforce Development Consortium*. The consortium provides an avenue for Utilities to compare job classifications, share skill and competency requirements, and guide curriculum development that will meet each company's needs.
- *Production* occupations in the Energy cluster are projected to remain flat through 2018, but job expansion over the next year in the automotive and renewable energy sectors should bolster demand. By 2013, Michigan is expected to add a total of nearly 10,000 *Production* jobs. *Metals and plastic workers* and *Assemblers and fabricators* are examples of occupations with strong ties to Energy-related activities, and will account for three-fourths of that growth.

table 8:

FORECASTS OF OCCUPATIONAL JOB GROWTH AND ANNUAL JOB OPENINGS	
HIGHEST GROWTH RATE (2008-2018)	
Network Systems/Data Com Analysts	55%
Heat/AC/Ref Mechanics and Installers	27%
Purchasing Agents	22%
Cost Estimators	21%
Telecom Equipment Installers and Repairers	18%
MOST ANNUAL OPENINGS (2008-2018)	
Heat/AC/Ref Mechanics and Installers	245
Electricians	186
Plumbers, Pipefitters, and Steamfitters	108
Cost Estimators	100
Electrical, Power-Line Installers and Repair	81
MOST ANNUAL REPLACEMENT OPENINGS (2008-2018)	
Electricians	123
Heat/AC/Ref Mechanics and Installers	92
Electric Power-Line Installers and Repairers	81
Plumbers, Pipefitters, and Steamfitters	70
General and Operation Managers	55

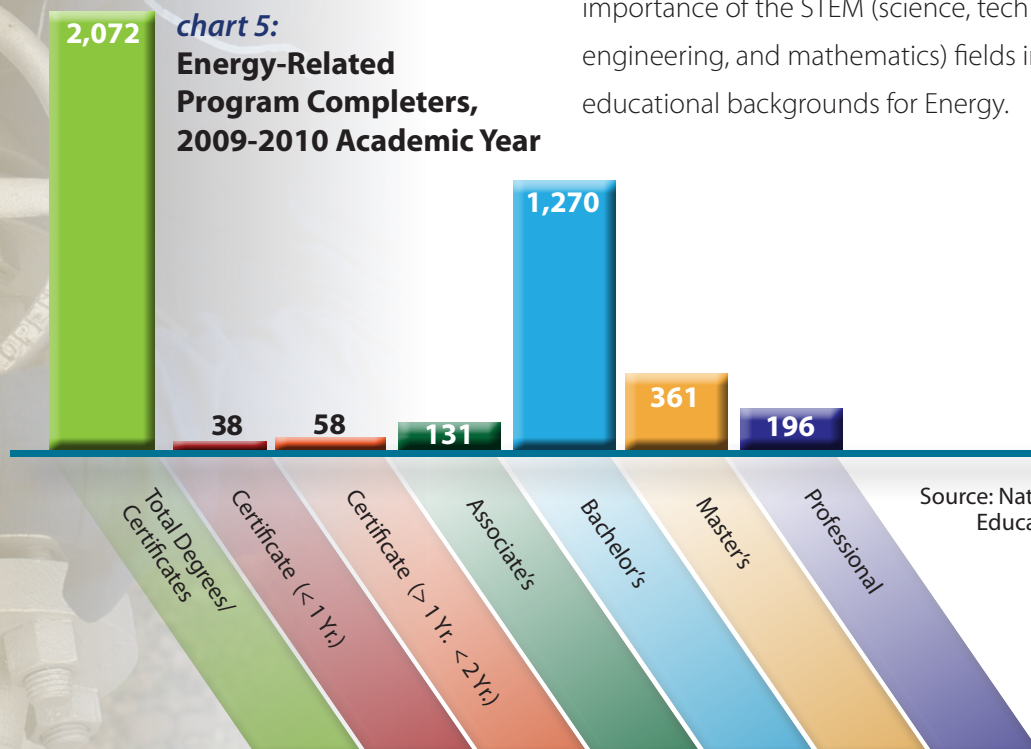
Source: Bureau of Labor Market Information & Strategic Initiatives

NUMBER OF PROGRAM COMPLETERS IN ENERGY ON AN UPWARD TREND



One important way to measure the labor supply in the Energy cluster is to look at the number of people completing postsecondary education programs related to Energy. According to the National Center for Education Statistics, over 2,000 degrees or certificates were granted in Energy-related programs in Michigan in 2010. The number of formal program completers in Energy is not a complete picture of future labor supply, however, as a large number of Energy jobs require only on-the-job training or apprenticeships.

- Since 2008, the number of individuals completing Energy-related programs has been in an upward trend, increasing by 11.8 percent. Nearly ninety percent of the program completers in Energy achieved a bachelor's degree or higher. Degrees in engineering and environmental science were prominent in recent years, marking the continued importance of the STEM (science, technology, engineering, and mathematics) fields in desired educational backgrounds for Energy.

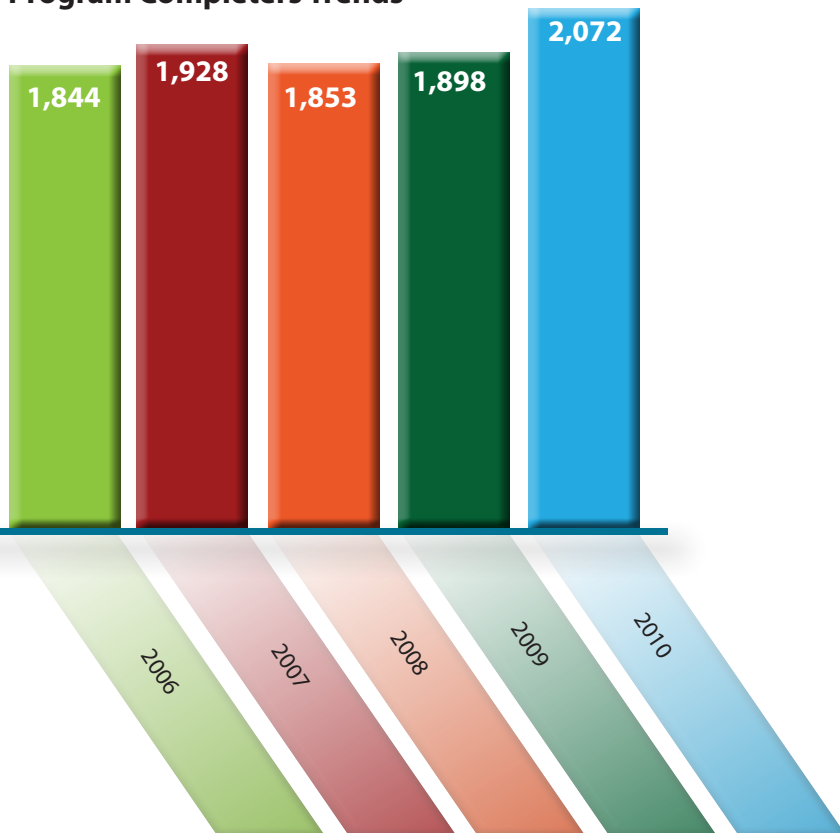


Source: National Center for Educational Statistics

- Although the number of certificates completed in Energy accounted for less than five percent of total completers in the state, new opportunities have been rising as more and more educational institutions offer programs related to *Alternative and Renewable Energy* to meet the demand for newer occupations, such as *Wind service technicians* and *Solar photovoltaic installers*.
- Apprenticeship programs are another avenue that provides the Energy cluster with a skilled workforce. Table 9 highlights major Energy occupations that have graduated a notable number of apprentices in 2011. Apprenticeships are an important part of Michigan's workforce training. Overall, about 1,200 individuals completed apprenticeship programs in Michigan during FY 2011. At the same time, roughly 3,200 additional students entered apprenticeship programs, indicating an increase in demand for these occupations.



chart 6:
Energy-Related Program Completers Trends



Source: National Center for Educational Statistics

table 9:

APPRENTICESHIP COMPLETERS BY MAJOR ENERGY-RELATED OCCUPATIONS
Electrician (290 Completers)
Pipefitter (165 Completers)
Carpenter (91 Completers)
Millwright (60 Completers)
Sheet Metal Workers (44 Completers)

Source: Department of Labor, Registered Apprenticeship Program Information Database System (RAPIDS)

ENERGY WORKFORCE HAS HIGHER THAN AVERAGE SHARE OF OLDER WORKERS

Having in-depth knowledge of the composition of the workforce is important for employers as challenges can arise from demographic shifts. For example, an older workforce can lead to labor shortages while a younger workforce can lead to a mismatch of skills. The following three charts provide a detailed breakdown of the demographic characteristics of the workforce so that employers can adequately assess the future workforce needs of the cluster.

chart7:
Energy Cluster
Employment by Gender

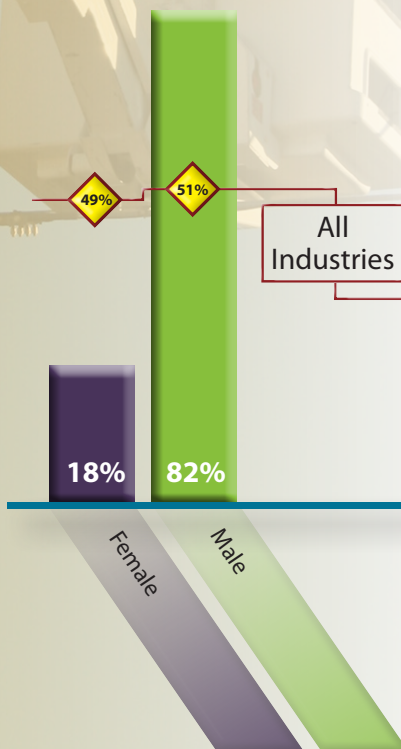
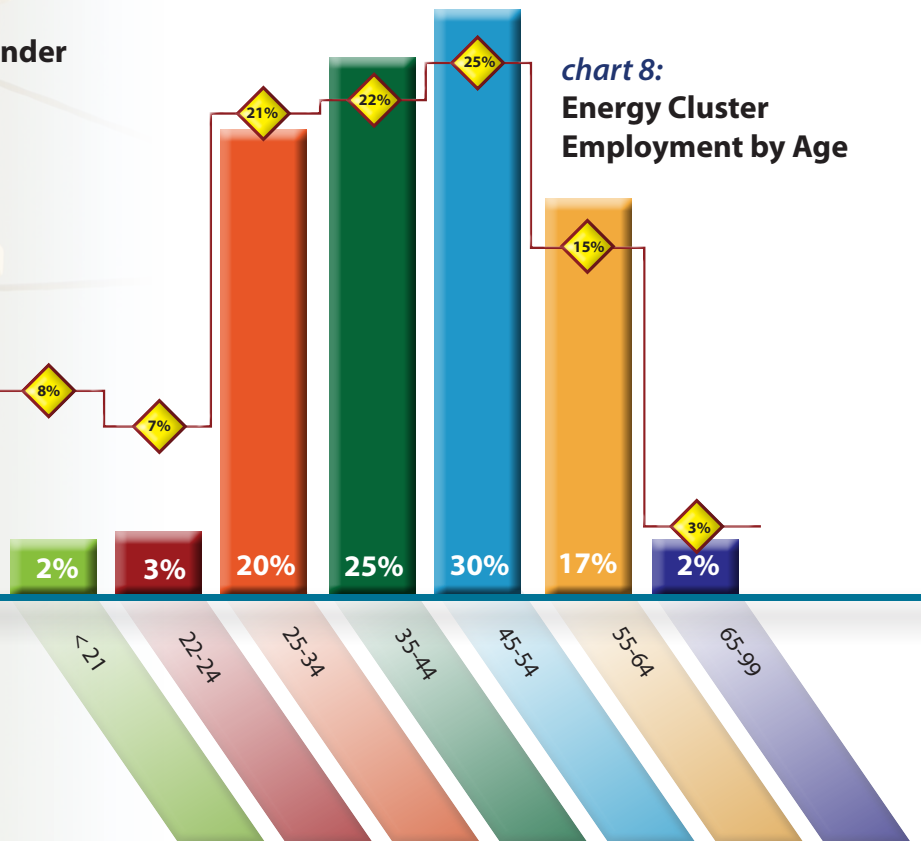


chart 8:
Energy Cluster
Employment by Age

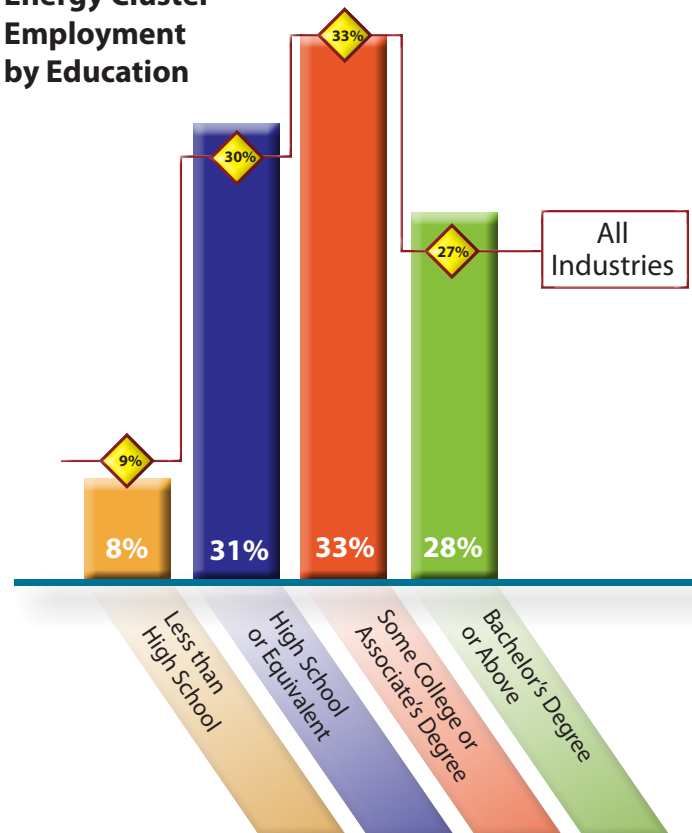


Source: U.S. Census Bureau, Local Employment Household Dynamics

- The Energy cluster is a male dominated cluster, accounting for 82 percent of the workforce. In Michigan, the gender distribution of the overall state workforce is fairly equal, with the male share at 51 percent. The Energy cluster includes industries, such as: *Mining, Construction, and Manufacturing*, which have historically employed a high share of male workers.
- Workers in the Energy cluster are aging. Currently, the share of older workers (aged 55 and older) is comparable to the state average at about 20 percent. In 2001, only 10 percent of the Energy workforce was age 55 or older. In particular, the shares of older workers in the *Utilities and Mining* industries were greater than the cluster average of 19 percent. These industries will need to address the repercussions of an aging workforce in the near future.
- Young workers in the Energy cluster are underrepresented, as only 26 percent of the workforce is younger than 34 years, compared to the state all-industry share of 35 percent. Also, this is well below the 35 percent share of Michigan Energy workers under the age of 34 back in 2001. The future growth of the cluster will largely depend on the ability to develop these workers and attract a larger share of young talent to replace retiring workers.

- The educational attainment distribution of workers in the Energy cluster has largely remained unchanged throughout the decade and is comparable to the statewide distribution. For the most part, high school or equivalent; some college or an associate's degree; and bachelor's degree or above each account for roughly 30 percent of the current workforce.

chart 9:
**Energy Cluster
Employment
by Education**



Source: U.S. Census Bureau, Local Employment Household Dynamics



TECHNOLOGICAL ADVANCES AND ENVIRONMENTAL ISSUES PRESENT ADVANTAGES AS WELL AS CHALLENGES

**ELECTRIC
VEHICLE
CHARGING
STATION**



Although the Energy cluster only accounts for three percent of Michigan's total employment, the goods and services it provides are essential to the population. Over the decade, Energy-related jobs have declined as the worldwide economic recession and the housing crisis led to reduced demand. With the economy gradually recovering, jobs in the Energy cluster are expected to move in a positive direction, with growth projected for a wide array of Energy-related occupations.

In addition to economic factors, this cluster has undergone a notable transformation over the years as technological advances and environmental issues have resulted in new developments. Both employers and the workforce are attempting to adapt to these changes.

ADVANTAGES

DIVERSIFYING MICHIGAN'S MANUFACTURING INDUSTRY

The Energy cluster provides Michigan the opportunity to diversify our manufacturing base and utilize the state's production expertise. Beyond manufacturing and assembling clean automotive technology, the wind and solar supply chain will provide additional employment opportunities.

CONTINUING DEMAND FOR ENERGY

The current infrastructure is transforming and employers will need to adapt, but the usage of energy is necessary for our society to function. From commuting to work to meeting the energy demands of sectors from agriculture to manufacturing, energy is vital to the health of the Michigan economy. Worldwide population growth and industrial activities in developing countries will only add to this demand and provide export opportunities.

EMPLOYMENT OPPORTUNITIES FOR VARIED SKILL LEVELS

The high share of construction and utilities-related jobs in the Energy cluster has led to many employment opportunities that provide competitive wages for workers with no post-secondary education. Workers can enter an occupation and become proficient by learning on the job and mentoring from more experienced workers. In addition, occupations that require more specialized skills and higher education are projected to see impressive demand in the future as research and technology play a larger role in the Energy sector.

CHALLENGES

BUSINESS RISKS OF STARTING NEW VENTURES

Factories and plants in Michigan have the potential to be retooled and be a part of the clean technology and energy supply chain. However, retooling requires new investments. Employers face many business risks, from financial to operational, when entering into new ventures.

REPLACING AN AGING WORKFORCE

The large share of older workers (ages 55 and older) in the Energy cluster will accelerate replacement needs in the future. However, employers will likely need a more skilled workforce with the ability to adapt to continually changing technologies in *Energy production and distribution*.

EVOLVING ENERGY INDUSTRIES REQUIRE NEW SKILLS

Emerging industries in the Energy cluster have provided new employment opportunities for the workforce. However, workers will need to obtain additional training, from either on-the-job or more formal programs, in order to be adequately equipped to tackle the new activities presented by these emerging industries. Furthermore, technological advances will also contribute to training needs as workers will need to remain knowledgeable about current software and equipment.

Across the nation, government, nonprofit, and for-profit sectors are making unprecedented investments in building a green economy; these investments will transform how we produce and use energy in response to the need to address global warming, increase energy security, and stimulate economic recovery and growth. But the success of these investments will depend on a workforce that can help drive changes in energy efficiency and renewable energy throughout our economy and society. To a great extent, this is a workforce that needs to be created through education, training, and re-skilling.

—Gloria Mwase,
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*If you found the information in this analysis of value,
you may be interested in other cluster-related publications:*

Michigan Industry Cluster Approach (MICA) Guidelines
http://web.michworks.org/OWD/index_wp.htm

Labor Supply / Demand and Labor Shed Studies
www.michigan.gov/lmi

The Michigan Department of Technology, Management and Budget, Bureau of Labor Market Information and Strategic Initiatives (LMISI) conducted the research, and compiled and analyzed the information for this report. Other publications authored by LMISI are available at www.michigan.gov/lmi.