

Closing the Skills Gap for Coal Mine Workers

Voinovich School of Leadership and Public Affairs

June 28, 2018



VOINOVICH SCHOOL OF LEADERSHIP AND PUBLIC AFFAIRS

Webinar Overview

- Project Overview and Project Team
- Recap of Webinar #1
- Trends in Ohio coal generation and employment
- Workforce analysis of coal mine workers
- careeronestop
- Final Observations
- Q&A

Project Overview

- Ohio University's Voinovich School is assessing the skills of displaced coal economy workers and matching those skills to emerging occupations in the Appalachian region
- Supported by generous investment from U.S. EDA

Project Team



G. Jason Jolley, Ph.D.
Associate Professor of Rural Economic Development

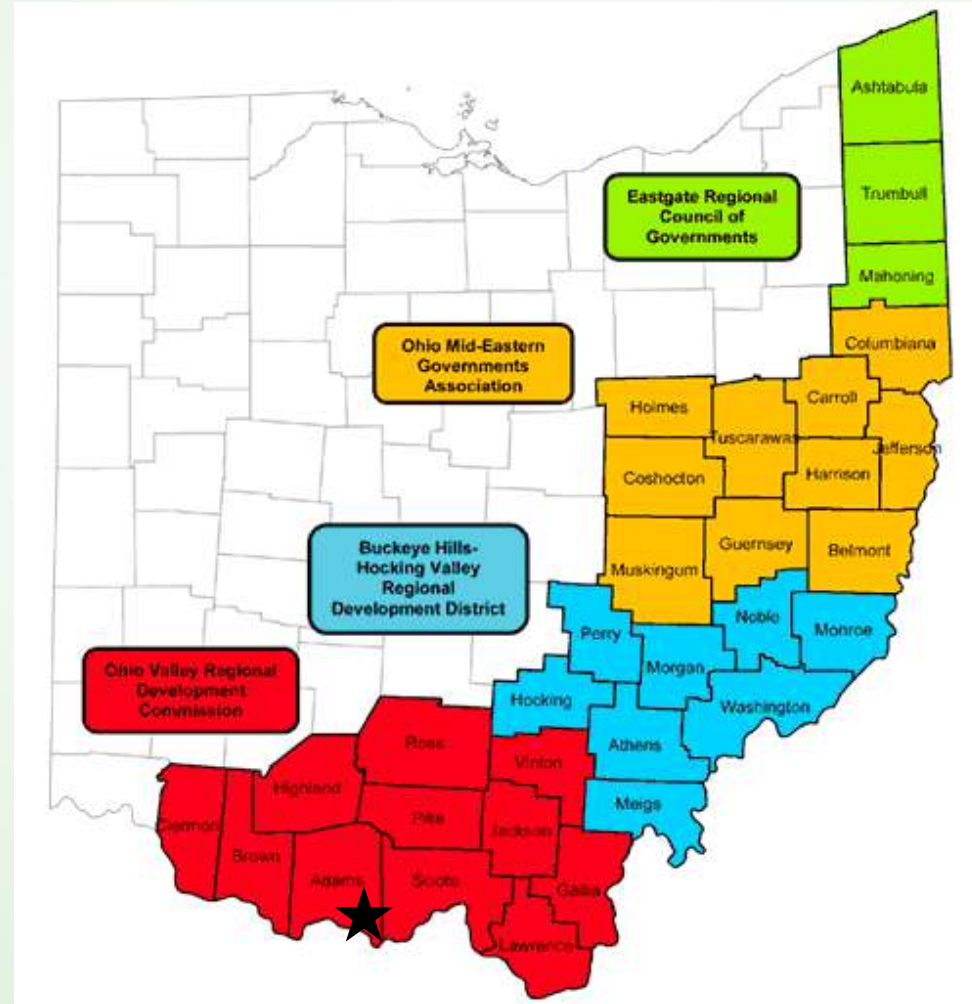


Gilbert Michaud, Ph.D.
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Christelle Khalaf, Ph.D.
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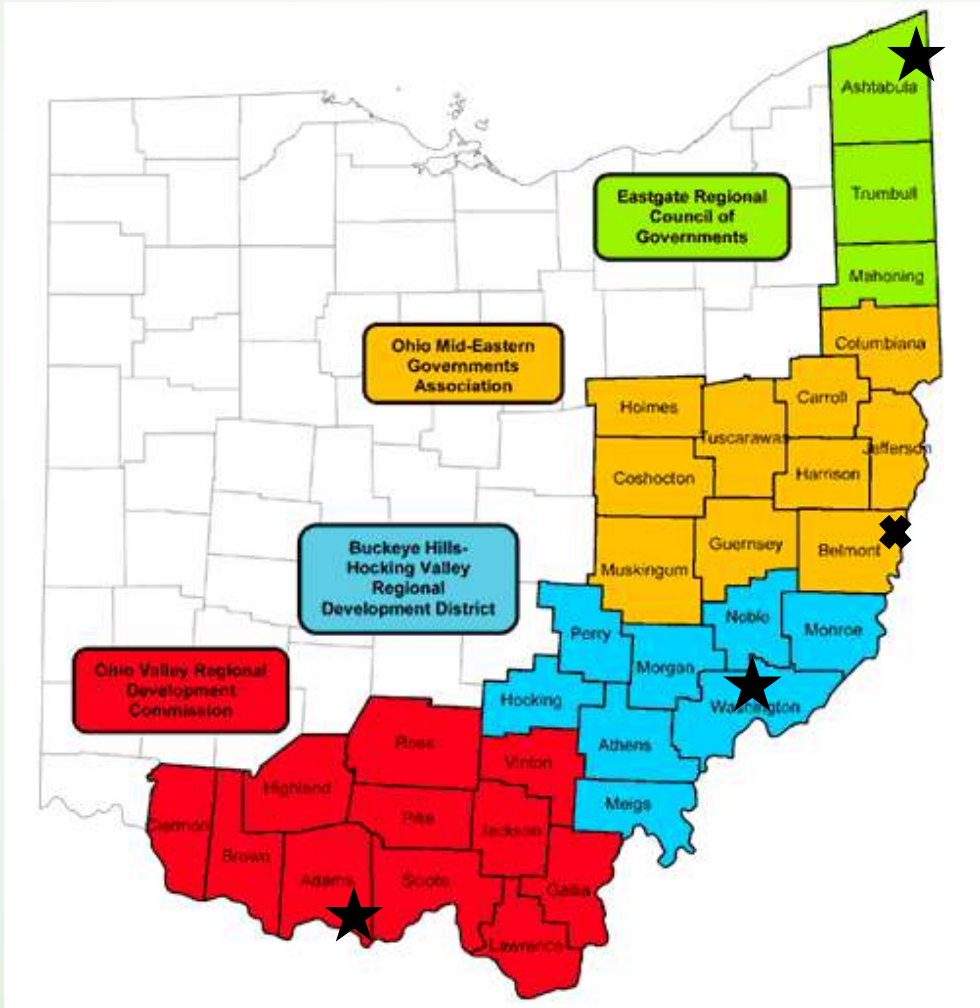
Project Scope



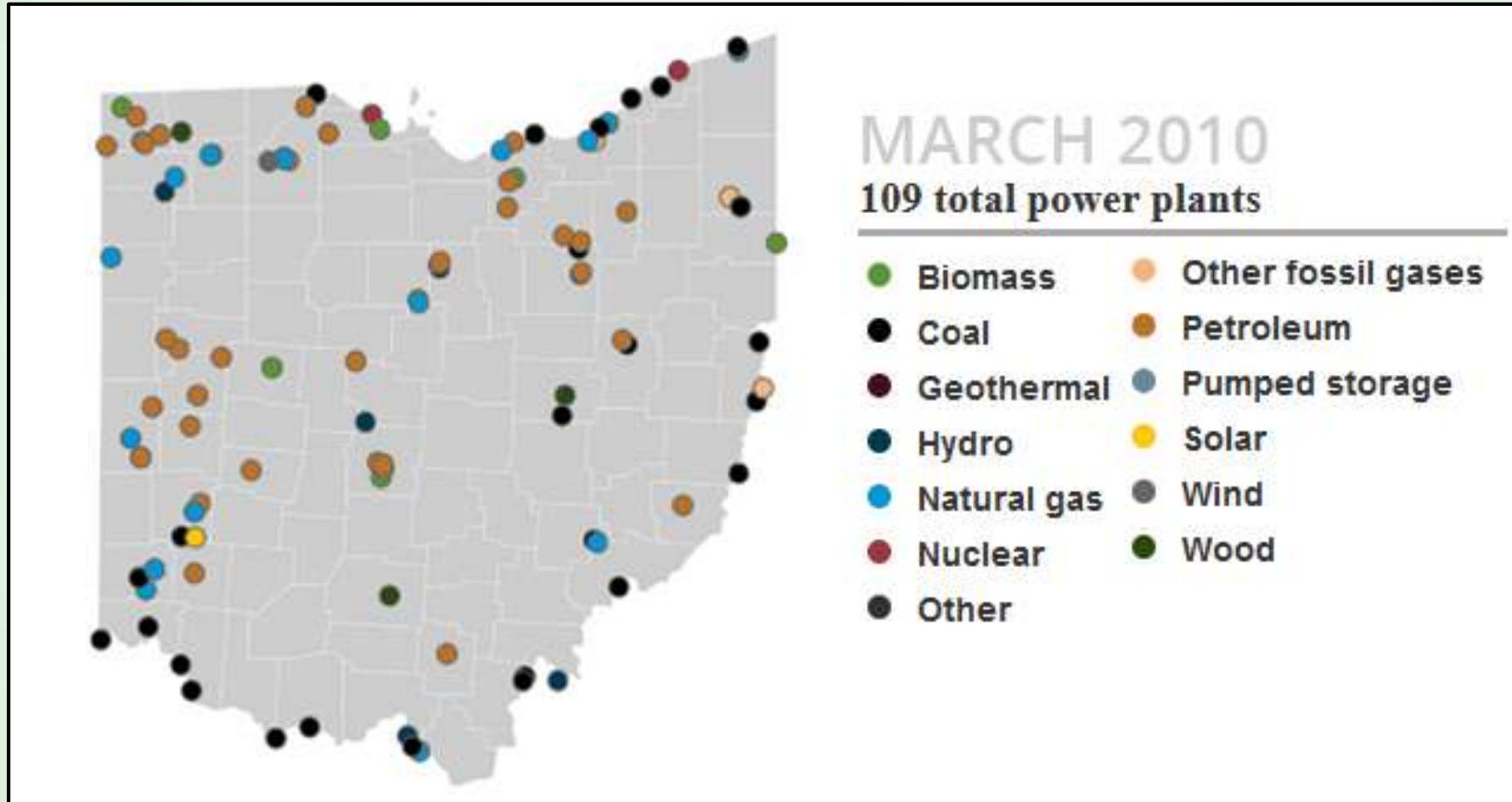
Key Findings from Webinar #1

- For every DP&L job lost, another 2 jobs will be lost in regional economy
- Tax base loss will have detrimental impact on local government budgets, especially the local school system
 - Even if Adams County can replace these jobs, it will be extremely difficult to replace the tax base
 - State and/or Federal government assistance will be required
- Transition to new employment opportunities will require retraining
- Most emerging occupations pay less than the lost DP&L jobs

Project Scope

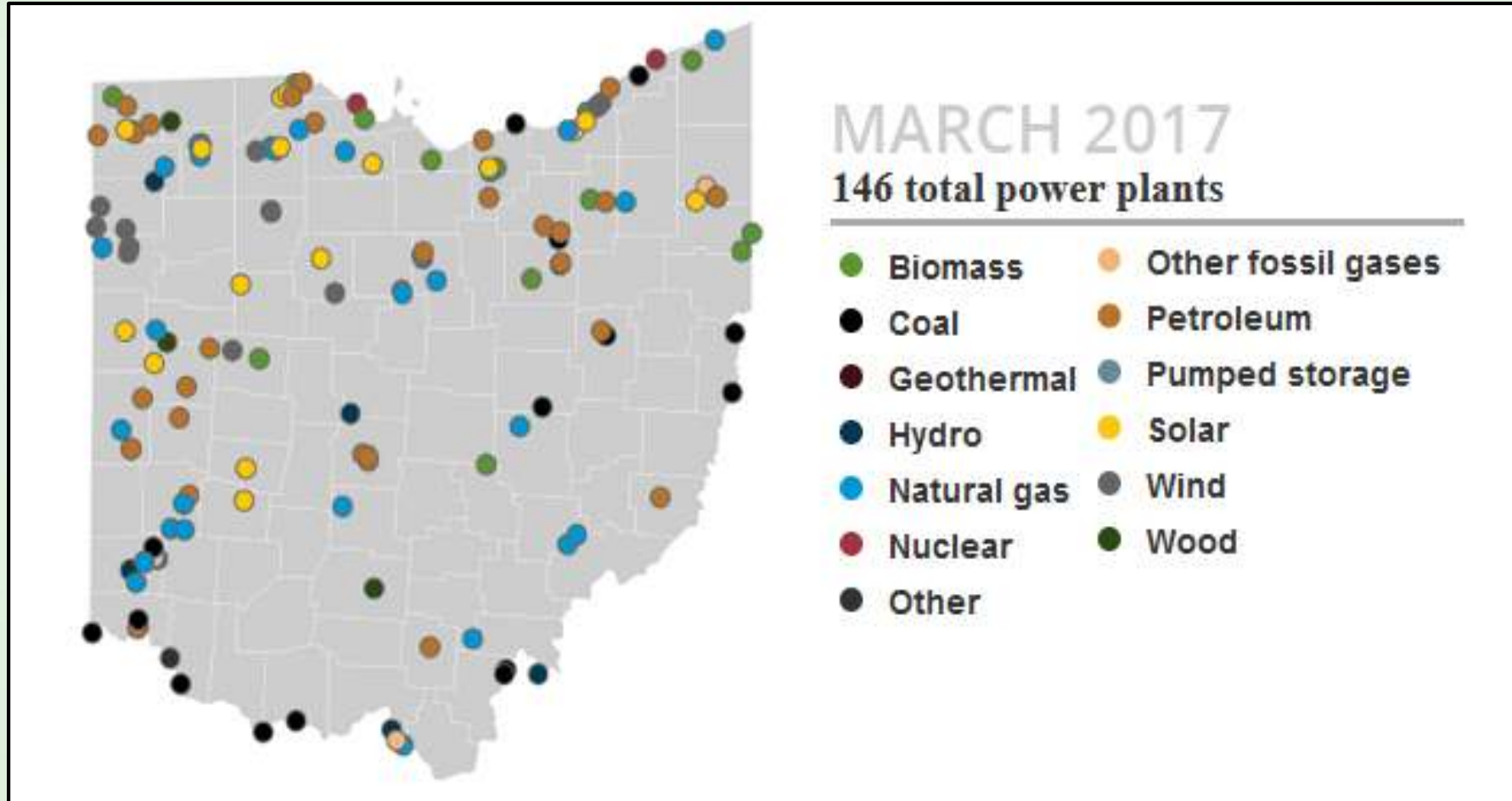


Ohio Energy Generation, 2010



Source: E&E News. (2017). *Ohio's economy: A test case for Trump's climate decision*. Retrieved from <https://www.eenews.net/stories/1060055447>

Ohio Energy Generation, 2017

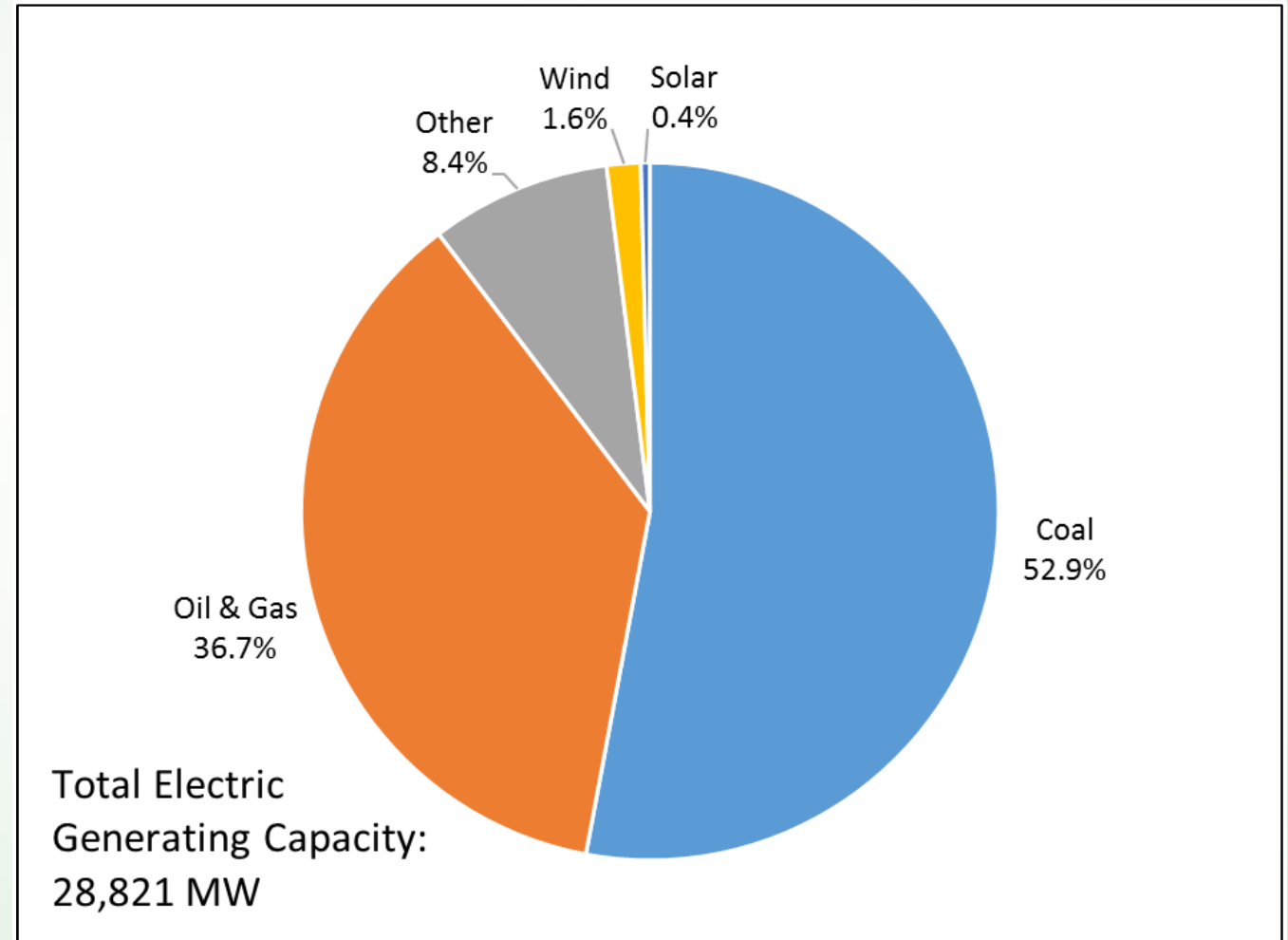


Source: E&E News. (2017). *Ohio's economy: A test case for Trump's climate decision*. Retrieved from <https://www.eenews.net/stories/1060055447>

Ohio Electricity Generation Capacity, 2015

- Coal = 15,260 MW
- Oil & Gas = 10,575 MW
- Wind = 455 MW
- Solar = 120 MW
- Other (nuclear, biomass, & hydro) = 2,413 MW

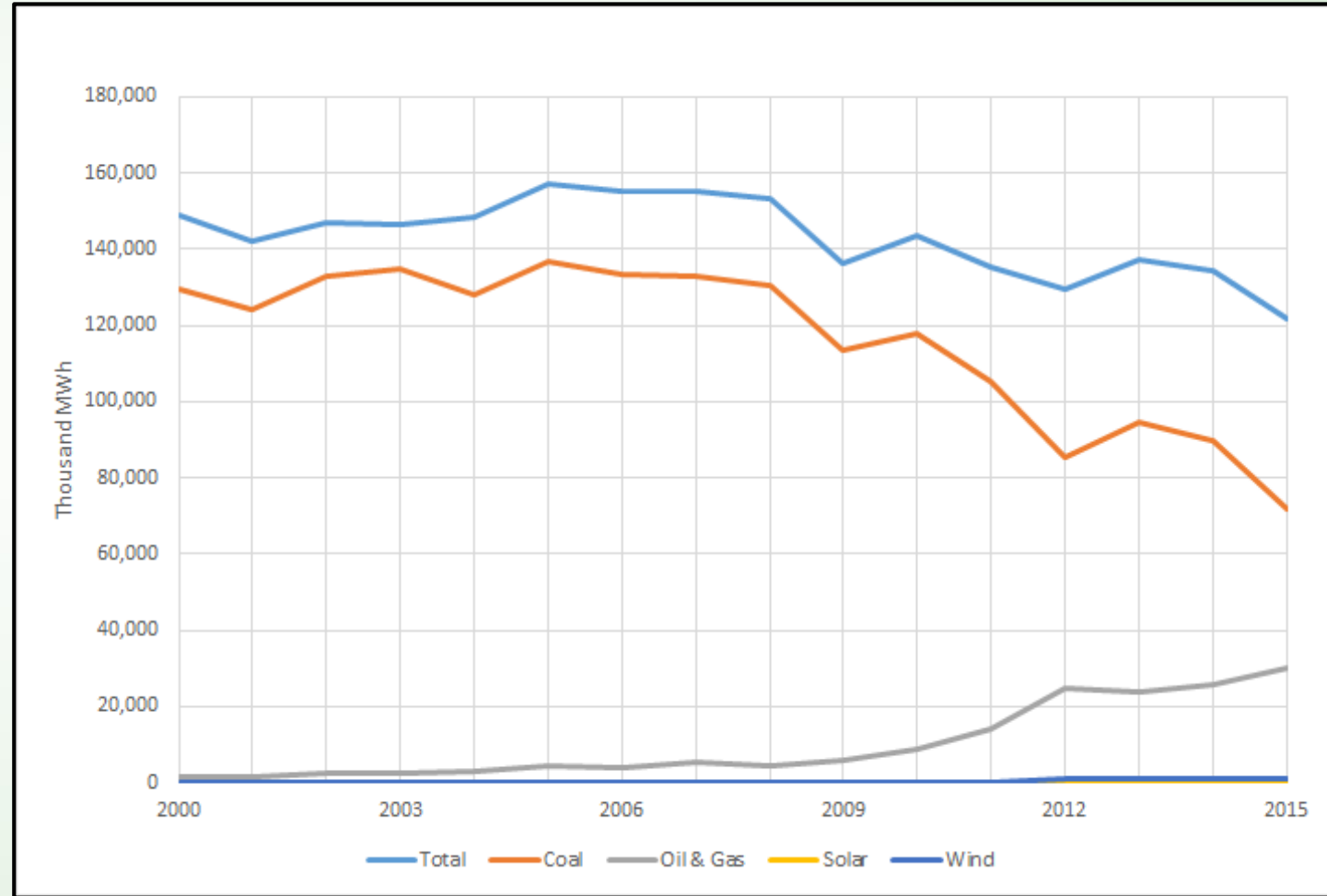
Source: Developed by author from the United States Energy Information Administration (2016). *Electric power industry capability by primary energy source, 1990 through 2015*. Retrieved from http://www.eia.gov/electricity/state/Ohio/state_tables.cfm



Ohio Annual Electricity Generation, 2000-2015

Source	Generation (MWh)	Growth Rate 2010-2015
Coal	71,709,530	-9.5%
Oil & Gas	30,295,764	+27.9%
Wind	1,203,008	+34.3%
Solar	56,072	+148.9%
Nuclear	17,376,736	+1.9%
Biomass	472,855	+11.4%
Hydro	456,669	+1.3%

Source: Developed by author from the United States Energy Information Administration (2016). *Electric power industry generation by primary energy source, 1990 through 2015 [Data file]*. Retrieved from http://www.eia.gov/electricity/state/Ohio/state_tables.cfm



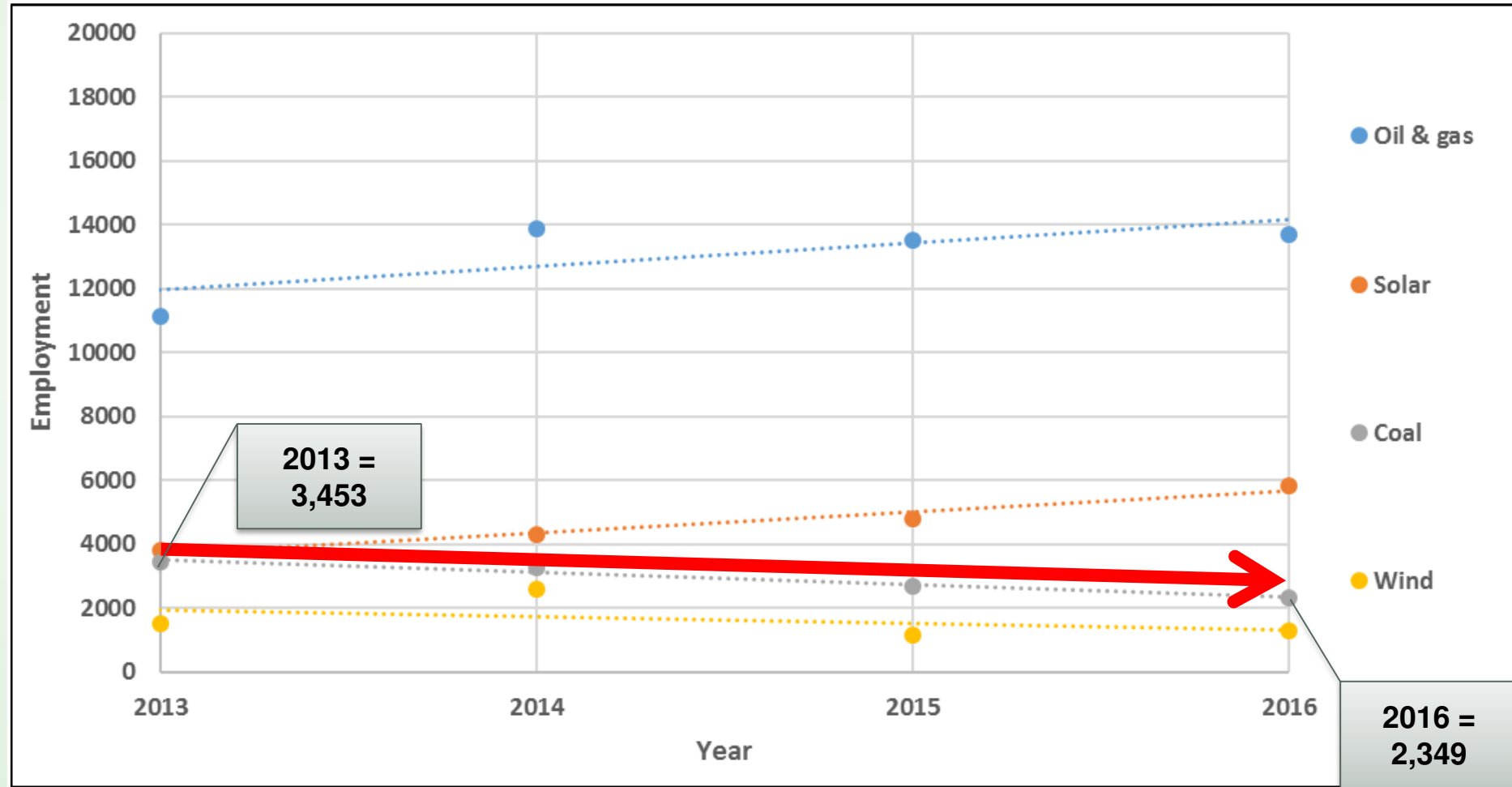
Ohio Energy Industry Employment Trends

- Energy Efficiency
= 78,764 (2016)

Source:

<https://www.energy.gov/sites/prod/files/2017/01/f34/us-energy-jobs-states-2017.pdf>

Source: Developed by author from the Bureau of Labor Statistics. (2016). *Quarterly census of employment and wages, NAICS 6-digit industries, one area*. Retrieved from https://data.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables. Solar data from TSF; Wind data from GEO, CJO, & CJM reports.



Workforce Impacts

- Mining occupations
- Skill identification
- Mapping to emerging occupations
- Using careeronestop “compare occupations” tool

Mining Occupations

Occupation	% Occupation	Employment Projections 2014-2024	Median Hourly wage	Education
Roof bolters, mining	88.7%	-9.09%	\$26.42+	High school diploma / eq.
Continuous mining machine operators	26.7%	-3.85%	\$20.05	No formal ed. credential
Excavating and loading machine and dragline operators	5.9%	0.00%	\$19.43	High school diploma / eq.
Mobile heavy equipment mechanics, except engines	2.0%	3.88%	\$22.83	High school diploma / eq.
Heavy and tractor-trailer truck drivers	0.1%	4.83%	\$19.65	Postsecondary non-degree award
Mine cutting and channeling machine operators	26.8%	-2.63%	\$20.17	High school diploma / eq.
Helpers--extraction workers	8.4%	-6.02%	\$19.52	High school diploma / eq.
Mine shuttle car operators	86.9%	-22%+	\$27.35+	High school diploma / eq.
Loading machine operators, underground mining	47.2%	-6.67%	\$25.15+	No formal ed. credential
Maintenance and repair workers, general	0.1%	4.65%	\$18.04	High school diploma / eq.

O*NET Data

- Create Occupational Transition maps using 110 variables describing 3 types of skills and the corresponding job zone
 - Knowledge: Obtained through formal education (e.g., biology)
 - Work activities: Job experience (e.g., assisting and caring for others)
 - Capacities: Basic and cross-functional skills (e.g., social perceptiveness)
 - Job zone: Grouping of occupations based on required education, experience, and on the job training
- Each skill (i.e., knowledge, work activities, and capacities) is associated with a value that represents the level of the skill needed in an occupation (0-7)

Top Skills for Roof Bolters

Skill type	Skill	Level	Explanation
Work activities	Monitor Processes, Materials, or Surroundings	5.5	Minimum of 2-4 years training or experience
Work activities	Controlling Machines and Processes	5.4	Minimum of 2-4 years training or experience
Work activities	Handling and Moving Objects	5.3	Minimum of 2-4 years training or experience
Work activities	Repairing and Maintaining Mechanical Equipment	5.2	Minimum of 2-4 years training or experience
Work activities	Operating Vehicles, Mechanized Devices, or Equipment	4.9	At least 1 year of training or experience
Work activities	Communicating with Supervisors, Peers, or Subordinates	4.9	At least 1 year of training or experience
Work activities	Performing General Physical Activities	4.9	At least 1 year of training or experience
Work activities	Training and Teaching Others	4.8	At least 1 year of training or experience
Work activities	Identifying Objects, Actions, and Events	4.7	At least 1 year of training or experience
Work activities	Making Decisions and Solving Problems	4.7	At least 1 year of training or experience
	Job Zone	2	Requires HS Some experience On the job training (few months to a year)

Occupation Level Comparison

Skill Type	Skill	Roof Bolters Level	Registered Nurses Level	Gap
	Top 5 skills for roof bolters			
Work activities	Monitor Processes, Materials, or Surroundings	5.5	5.6	0.1
Work activities	Controlling Machines and Processes	5.4	2.7	-2.7
Work activities	Handling and Moving Objects	5.3	3.8	-1.5
Work activities	Repairing and Maintaining Mechanical Equipment	5.2	0.9	-4.3
Work activities	Operating Vehicles, Mechanized Devices, or Equipment	4.9	1.2	-3.7
	Top 5 skills for registered nurses			
Work activities	Assisting and Caring for Others	3.4	6.1	2.7
Knowledge	Psychology	1.0	5.9	4.9
Work activities	Monitor Processes, Materials, or Surroundings	5.5	5.6	0.1
Work activities	Updating and Using Relevant Knowledge	4.3	5.6	1.3
Work activities	Identifying Objects, Actions, and Events	4.7	5.4	0.7
	Job zone	2	3	1

Regional Economic Drivers

APEG	OMEGA
Polymers & Plastics	Agriculture
Energy Production	Mining
Food	Manufacturing
Transportation & Aerospace	
Forestry & Wood Products	
Metals	
Logistics	
Consumer Products	

Mine Occupations into Top Growing Occupations

		Continuous mining machine operators	Mine cutting and channeling machine operators	Roof bolters, mining	Helpers--extraction workers	Mobile heavy equipment mechanics, except engines	Maintenance and repair workers, general	Heavy and tractor-trailer truck drivers	Excavating and loading machine and dragline operators	Loading machine operators, underground mining	Mine shuttle car operators
		\$20.05	\$20.17	\$26.42	\$19.52	\$22.83	\$18.04	\$19.65	\$19.43	\$25.15	\$27.35
Construction laborers	\$17.66	-\$2.39	-\$2.51	-\$8.76	-\$1.86	-\$5.17	-\$0.38	-\$1.99	-\$1.77	-\$7.49	-\$9.69
Industrial machinery mechanics	\$22.61	\$2.56	\$2.44	-\$3.81	\$3.09	-\$0.22	\$4.57	\$2.96	\$3.18	-\$2.54	-\$4.74
Computer-controlled machine tool operators, metal and plastic	\$17.71	-\$2.34	-\$2.46	-\$8.71	-\$1.81	-\$5.12	-\$0.33	-\$1.94	-\$1.72	-\$7.44	-\$9.64
Software developers, applications	\$40.83	\$20.78	\$20.66	\$14.41	\$21.31	\$18.00	\$22.79	\$21.18	\$21.40	\$15.68	\$13.48
Heating, air conditioning, and refrigeration mechanics and installers	\$21.23	\$1.18	\$1.06	-\$5.19	\$1.71	-\$1.60	\$3.19	\$1.58	\$1.80	-\$3.92	-\$6.12
Computer user support specialists	\$20.65	\$0.60	\$0.48	-\$5.77	\$1.13	-\$2.18	\$2.61	\$1.00	\$1.22	-\$4.50	-\$6.70

Mine Occupations into Engineering and Technology

		Continuous mining machine operators	Mine cutting and channeling machine operators	Roof bolters, mining	Helpers--extraction workers	Mobile heavy equipment mechanics, except engines	Maintenance and repair workers, general	Heavy and tractor-trailer truck drivers	Excavating and loading machine and dragline operators	Loading machine operators, underground mining	Mine shuttle car operators
		\$20.05	\$20.17	\$26.42	\$19.52	\$22.83	\$18.04	\$19.65	\$19.43	\$25.15	\$27.35
First-line supervisors of construction trades and extraction workers	\$28.71	\$8.66	\$8.54	\$2.29	\$9.19	\$5.88	\$10.67	\$9.06	\$9.28	\$3.56	\$1.36
First-line supervisors of mechanics, installers, and repairers	\$28.96	\$8.91	\$8.79	\$2.54	\$9.44	\$6.13	\$10.92	\$9.31	\$9.53	\$3.81	\$1.61
Construction managers	\$40.86	\$20.81	\$20.69	\$14.44	\$21.34	\$18.03	\$22.82	\$21.21	\$21.43	\$15.71	\$13.51
Mechanical engineers	\$35.10	\$15.05	\$14.93	\$8.68	\$15.58	\$12.27	\$17.06	\$15.45	\$15.67	\$9.95	\$7.75
Civil engineers	\$36.63	\$16.58	\$16.46	\$10.21	\$17.11	\$13.80	\$18.59	\$16.98	\$17.20	\$11.48	\$9.28

Mine Occupations into Mechanical

		Continuous mining machine operators	Mine cutting and channeling machine operators	Roof bolters, mining	Helpers--extraction workers	Mobile heavy equipment mechanics, except engines	Maintenance and repair workers, general	Heavy and tractor-trailer truck drivers	Excavating and loading machine and dragline operators	Loading machine operators, underground mining	Mine shuttle car operators
		\$20.05	\$20.17	\$26.42	\$19.52	\$22.83	\$18.04	\$19.65	\$19.43	\$25.15	\$27.35
Carpenters	\$21.05	\$1.00	\$0.88	-\$5.37	\$1.53	-\$1.78	\$3.01	\$1.40	\$1.62	-\$4.10	-\$6.30
Electricians	\$23.88	\$3.83	\$3.71	-\$2.54	\$4.36	\$1.05	\$5.84	\$4.23	\$4.45	-\$1.27	-\$3.47
Plumbers, pipefitters, and steamfitters	\$24.90	\$4.85	\$4.73	-\$1.52	\$5.38	\$2.07	\$6.86	\$5.25	\$5.47	-\$0.25	-\$2.45
Bus and truck mechanics and diesel engine specialists	\$21.12	\$1.07	\$0.95	-\$5.30	\$1.60	-\$1.71	\$3.08	\$1.47	\$1.69	-\$4.03	-\$6.23
Packaging and filling machine operators and tenders	\$14.38	-\$5.67	-\$5.79	-\$12.04	-\$5.14	-\$8.45	-\$3.66	-\$5.27	-\$5.05	-\$10.77	-\$12.97

Relatively Easy Transition


Type of skill	Skills	Roof bolters	Electricians	Gap
Knowledge	Building and Construction	1.6	5.5	3.8
Work activities	Performing for or Working Directly with the Public	0.2	3.7	3.5
Knowledge	Mathematics	1.7	4.3	2.6
Capacities	Installation	1.5	3.6	2.1
Knowledge	Physics	1.6	3.6	2.0
Knowledge	Telecommunications	1.1	3.0	1.9
Knowledge	Design	2.3	4.0	1.8
Knowledge	Customer and Personal Service	2.1	3.8	1.7
	Job Zone	2	3	1
	Median hourly wage	\$26.42	\$23.88	-\$2.54

More Challenging Transition


Type of skill	Skills	Roof bolters	Software developers	Gap
Work activities	Interacting With Computers	0.9	5.8	4.9
Knowledge	Computers and Electronics	2.0	6.8	4.8
Capacities	Programming	0.0	4.8	4.8
Capacities	Operations Analysis	0.3	3.8	3.5
Capacities	Technology Design	0.1	3.6	3.5
Knowledge	Mathematics	1.7	5.0	3.3
Work activities	Thinking Creatively	2.2	5.2	3.0
Knowledge	Engineering and Technology	2.5	5.2	2.7
Work activities	Establishing and Maintaining Interpersonal Relationships	1.9	4.4	2.5
Work activities	Analyzing Data or Information	2.5	4.9	2.5
Work activities	Staffing Organizational Units	0.6	3.0	2.4
Capacities	Systems Evaluation	2.1	4.5	2.4
Capacities	Science	0.8	3.0	2.3
Capacities	Systems Analysis	2.0	4.3	2.3
Knowledge	Telecommunications	1.1	3.3	2.2
	Job Zone	2	4	2
	Median hourly wage	\$26.42	\$40.83	\$14.41

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Compare Occupations	Scholarship Finder	Tools & Technology Finder	Resume Guide
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Fastest-Growing	Professional Association Finder		
Most Openings			
Largest Employment			
Declining Employment			
Compare Employment Trends			

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Compare *Roof Bolters, Mining* to *Electricians*

Location
US 

To view local salary data, enter a location. If no location is entered, national data are displayed.


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Comparison	Roof Bolters, Mining	Electricians
Salary View the mid-level salary in both your current job and your selected occupation. (Annual salaries apply to people who work full-time year-round.)	 \$58,400	 \$54,100
Similar skills & knowledge These skills are commonly used in both your current job and your selected occupation.	Public Safety and Security Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions. Coordination Changing what is done based on other people's actions. Active Learning Figuring out how to use new ideas or things. Monitoring Keeping track of how well people and/or groups are doing in order to make improvements. Equipment Maintenance	


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Occupations
Roof Bolters, Mining
Electricians

Location
BELMONT, OH

Select two occupations to compare salaries, skill requirements, typical education and more. Find data for national, state and local levels.

Compare *Roof Bolters, Mining* to *Electricians*



Location
BELMONT, OH 

To view local salary data, enter a location. If no location is entered, national data are displayed.

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Comparison	Roof Bolters, Mining	Electricians
Salary View the mid-level salary in both your current job and your selected occupation. (Annual salaries apply to people who work full-time year-round.)	 Not Available	 \$50,300
Similar skills & knowledge These skills are commonly used in both your current job and your selected occupation.	Public Safety and Security Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.	
	Coordination Changing what is done based on other people's actions.	
	Active Learning Figuring out how to use new ideas or things.	
	Monitoring Keeping track of how well people and/or groups are doing in order to make improvements.	

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Skills & Knowledge Gaps
These are areas where you might have skill gaps. People working in your selected job generally need higher levels in these skill and knowledge areas than people working in your current job.

Very Low

High

Building and Construction
Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
[Find Training for this Gap](#)

Very Low

Medium

Mathematics
Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
[Find Training for this Gap](#)
[View Additional Skills & Knowledge Gaps](#)

Typical Level Of Training
See how much education people typically have in your selected job, and then use the link to find training programs in your local area.

High school diploma or equivalent

High school diploma or equivalent
[Find Training for this Occupation](#)

Licenses
Many states require licenses for certain jobs. See if your selected occupation requires a license and if so, follow the link to find information for your state.

No license required in

License required in

Certification

0 related


30 related

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Typical Level Of Training See how much education people typically have in your selected job, and then use the link to find training programs in your local area.	High school diploma or equivalent	High school diploma or equivalent Find Training for this Occupation
Licenses Many states require licenses for certain jobs. See if your selected occupation requires a license and if so, follow the link to find information for your state.	No license required in	License required in
Certification	0 related	30 related

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Local Training Finder

About this data

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Find training programs, schools, or college majors in any local area across the United States.

Enter a type of job or training, or the name of a school. Then enter your city, state, or ZIP code and click "Search."

Search by Occupation, School, or Program **Location**

Electricians BELMONT, OH **Search** 

We found no matches for "Electricians" in BELMONT, OH.
Please enter a different keyword or location.

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Below is a list of schools that match your search.
Click on any school name to learn more about the school and programs.
Start a new search by entering a different keyword or location below.

Search by Occupation, School, or Program **Location**

[Search](#)

54 training program(s) found for Electricians within OHIO

School Name/Location	Program Name	Length / Graduates
Scioto County Career Technical Center Lucasville, OH	Electrician	At least one but less than two years / 11
Miami Valley Career Technology Center Englewood, OH	Electrician	At least one but less than two years / 14
O.C. Collins Career Center Chesapeake, OH	Electrician	At least one but less than two years / 13
Vatterott College-Cleveland Broadview Heights, OH	Electrician	2 years / 10
Northwest State Community College Archbold, OH	Electrician	At least one but less than two years / 19
Sinclair Community College Dayton, OH	Electrician	2 years / 7
		2 years / 1
		Less than one year / 5

Using careeronestop “compare occupations” tool

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careeronestop.org/Toolkit/Training/find-local-training.aspx?keyword=Electricians&location=OHIO&radius=25&post=y&tool=skillsgap&occfillall=y#Occ

Explore Careers ▼ Find Training ▼ Job Search ▼ Find Local Help ▼ Toolkit ▼ Resources For ▼

Electricians
Location
OHIO

Filter By
Occupation

- [Automotive Service Technicians and Mechanics \(23\)](#)
- [Electrical and Electronics Installers and Repairers, Transportation Equipment \(23\)](#)
- [Electronic Equipment Installers and Repairers, Motor Vehicles \(23\)](#)
- [Elevator Installers and Repairers \(19\)](#)
- [Industrial Machinery Mechanics \(19\)](#)
- [Maintenance Workers, Machinery \(19\)](#)
- [Millwrights \(19\)](#)
- [Refractory Materials Repairers, Except Brickmasons \(19\)](#)
- [Wind Turbine Service Technicians \(19\)](#)
- [Electricians \(11\)](#)**
- [First-Line Supervisors of Construction Trades and Extraction Workers \(11\)](#)
- [Security and Fire Alarm Systems Installers \(11\)](#)
- [Signal and Track Switch Repairers \(11\)](#)
- [Electronic Home Entertainment Equipment Installers and Repairers \(1\)](#)
- [Radio Operators \(1\)](#)
- [Radio, Cellular, and Tower Equipment Installers and Repairers \(1\)](#)
- [Telecommunications Equipment Installers and Repairers, Except](#)

Start a new search by entering a different keyword or location below.

Search by Occupation, School, or Program Location

Electricians OHIO Search

54 training program(s) found for **Electricians** within **OHIO**

School Name/Location	Program Name	Length / Graduates
Scioto County Career Technical Center Lucasville, OH	Electrician	At least one but less than two years / 11
Miami Valley Career Technology Center Englewood, OH	Electrician	At least one but less than two years / 14
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Sinclair Community College Dayton, OH	Electrician	2 years / 1 Less than one year / 5
Brightwood College-Dayton Dayton, OH	Electrician	At least one but less than two years / 12
Madison Adult Career Center Mansfield, OH	Electrician	Less than one year / 4
Mid-East CTC-Adult Education Zanesville, OH	Electrician	Less than one year / 7
Pickaway Ross Joint Vocational School District Chillicothe, OH	Electrician	At least one but less than two years / 4

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Using careeronestop “compare occupations” tool

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careeronestop.org/Toolkit/Training/find-local-training.aspx?keyword=Electricians&location=OHIO&radius=25&post=y&tool=skillsgap&occfillall=y&occfilter=4294966596&pagesize=25

Explore Careers Find Training Job Search Find Local Help Toolkit Resources For

OHIO

or Program
Electricians OHIO Search

Filter By

Occupation
[Electricians \(Undo\)](#)

Program Length
[At least one but less than two years \(7\)](#)
[2 years \(3\)](#)
[Less than one year \(3\)](#)

About this data
Information in this tool comes from the [U.S. Department of Education's Integrated Postsecondary Education Data System \(IPEDS\)](#).
[Help](#)

11 training program(s) found for **Electricians** within **OHIO**
Results Filtered by :
Occupation - **Electricians**

School Name/Location	Program Name	Length / Graduates
Scioto County Career Technical Center Lucasville, OH	Electrician	At least one but less than two years / 11
Miami Valley Career Technology Center Englewood, OH	Electrician	At least one but less than two years / 14
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Pickaway Ross Joint Vocational School District Chillicothe, OH	Electrician	At least one but less than two years / 4
EHOVE Career Center Milan, OH	Electrician	At least one but less than two years / 22

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Final Observations

- Transition to new employment opportunities will require retraining
- Challenges
 - Relatively easy transitions associated with a decrease in median hourly wage
 - Challenging transitions are not feasible for a majority of displaced workers
 - Transportation costs associated with retraining
 - Low digital literacy limits access to information

Closing the Skills Gap for Coal Mine Workers

Voinovich School of Leadership and Public Affairs

June 28, 2018



VOINOVICH SCHOOL OF LEADERSHIP AND PUBLIC AFFAIRS