



Photo by First Wind, NREL 16738

# Wind Energy Workforce: Who Are We Today and Where Do We Need to Go Tomorrow?

Initial Results – Publication Forthcoming

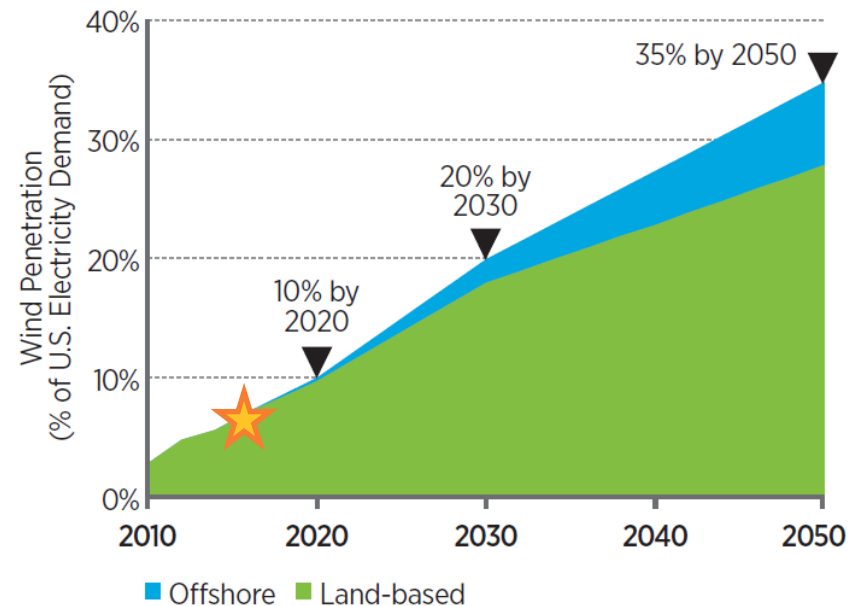
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National Renewable Energy Laboratory

May 23, 2017

AWEA WINDPOWER 2017, Anaheim, California

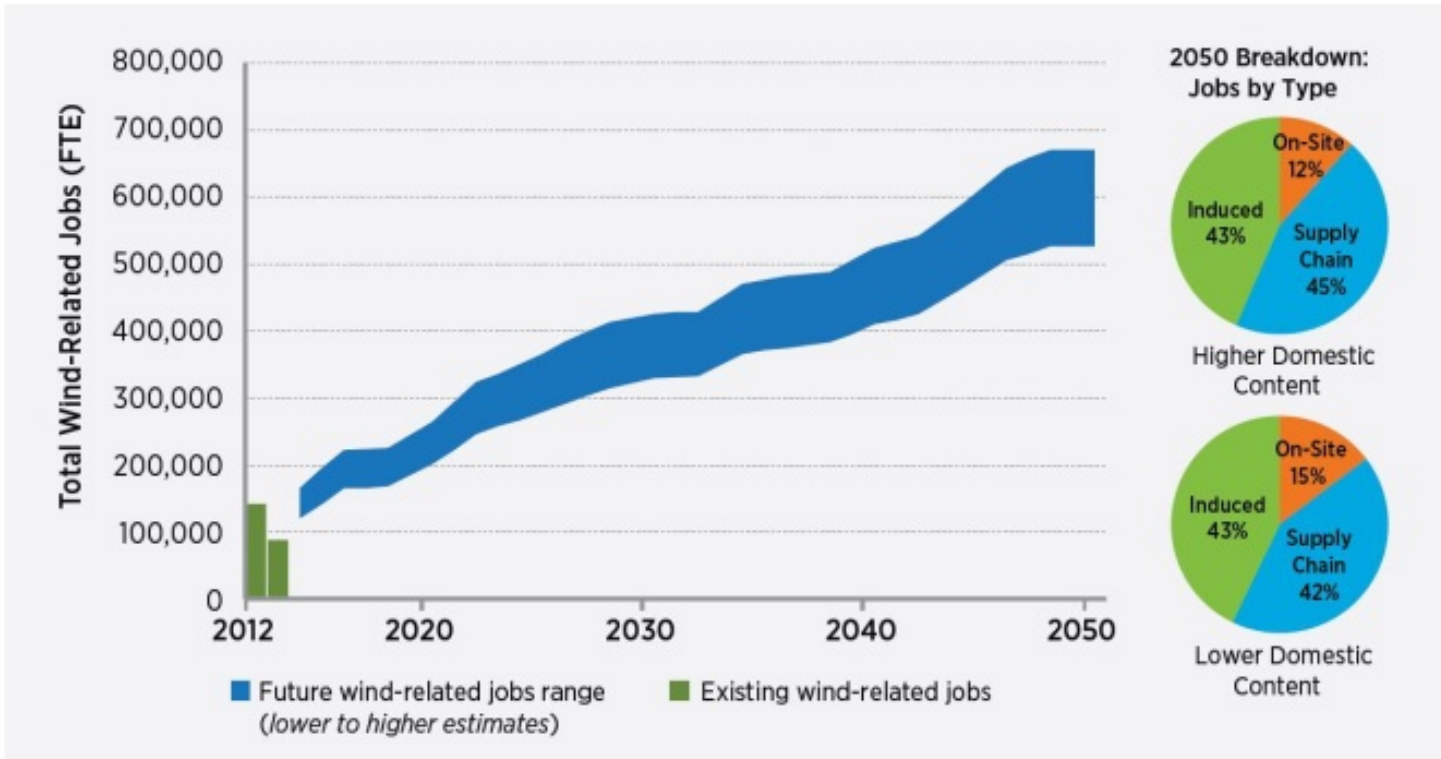
# What You Will Learn Today

- Wind energy workforce today
  - Who are we?
  - What are hiring managers looking for today? Finding?
- How are we educating the next workforce?
  - Are well-trained and educated graduates getting hired?
- There is already a gap.
- What is needed for the workforce to move the United States to 20% wind by 2030 and 35% wind by 2050?



<https://energy.gov/eere/wind/wind-vision>

# Wind Vision Jobs Estimates

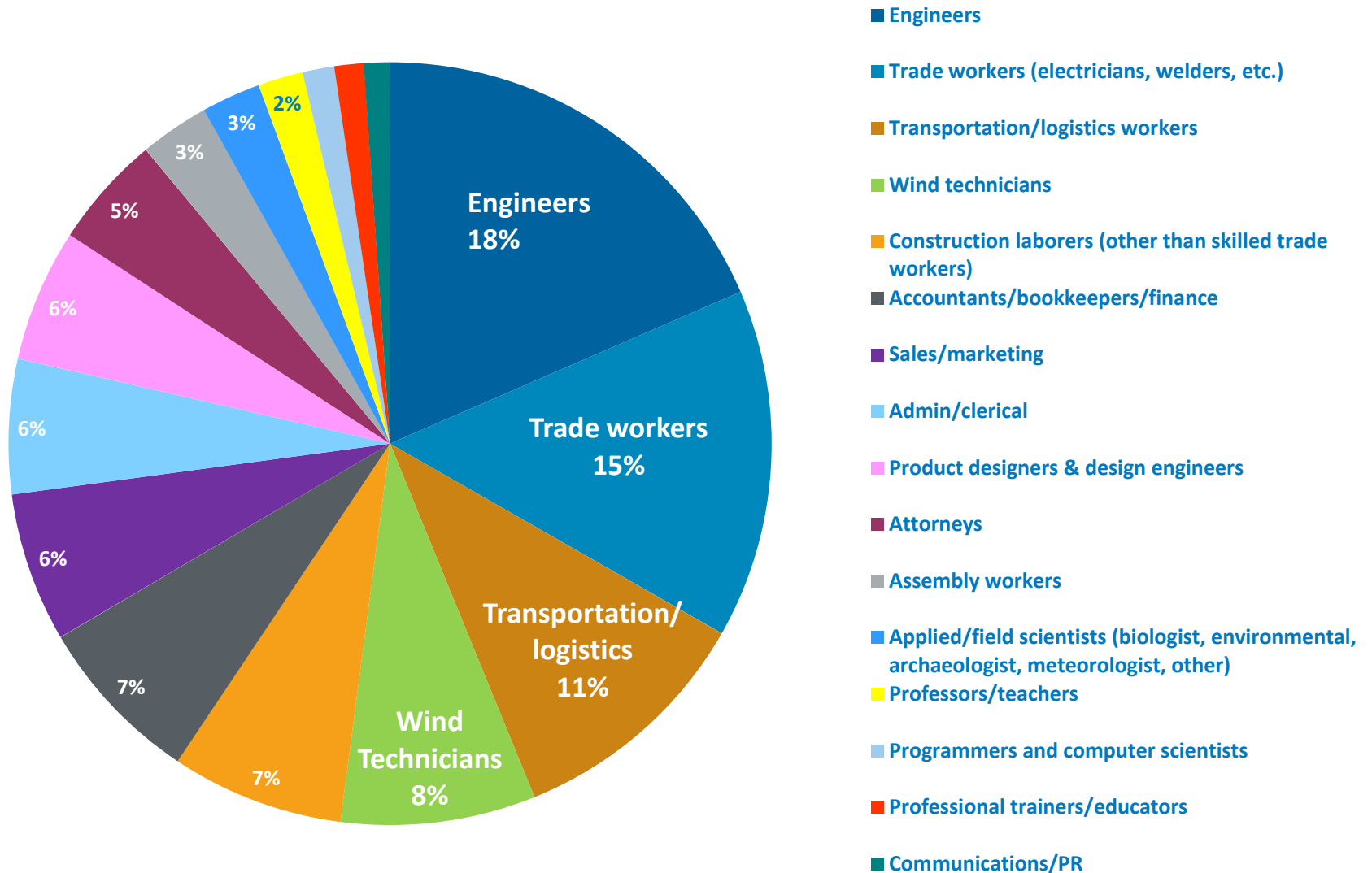


Note: Existing job estimates for 2012 and 2013 utilized American Wind Energy Association data for on-site and supply chain jobs and then the JEDI model to estimate the additional induced jobs.

**Figure 3-45.** Wind-related gross employment estimates, including on-site, supply chain, and induced jobs: 2012–2050

# U.S. Wind Energy Workforce by Occupation

## Subset of the Wind Energy Workforce We Captured (250 firms)



# Occupations with a Higher Representation of Select Groups

	Women	Minorities (Ethnic/Racial)	U.S. Veterans
Average representation of this group within all occupations	28%	25%	11%
	<ul style="list-style-type: none"> <li>• Admin/clerical 83%</li> <li>• Accountants/bookkeepers/finance 63%</li> <li>• Communications/PR 53%</li> <li>• Government/regulatory 50%</li> <li>• Applied/field scientists 45%</li> <li>• Engineer – civil 41%</li> <li>• Economists and policy experts 33%</li> </ul>	<ul style="list-style-type: none"> <li>• Construction laborers 73%</li> <li>• Wind technicians 53%</li> <li>• Civil engineers 45%</li> <li>• Transportation/logistics workers 45%</li> <li>• Assembly workers 38%</li> <li>• Resource assessors/surveyors 37%</li> </ul>	<ul style="list-style-type: none"> <li>• Construction laborers 44%</li> <li>• Wind technicians 37%</li> </ul>

Note: There is overlap in these groups. 51% of Americans are women; 38% are minorities; 7.5% are veterans.\*

\*Veterans Administration 2017

# Level of Difficulty Finding Qualified Applicants

Representatives from 2/3 of the firms we interviewed said they experienced some or great difficulty finding qualified applicants who meet their hiring standards. Qualified **research scientists** and **research engineers** are the most difficult to find.

## Top 8 Occupations Companies Have Some or Great Difficulty Hiring (Most Difficult to Less Difficult)

1. Research scientists and research engineers
2. Trade workers (electricians, welders, etc.)
3. Power systems/transmission engineers
4. Professors/teachers
5. Programmers/computer scientists
6. Product designers/design engineers
7. Developers
8. Accountants/bookkeepers/finance

## Top 8 Occupations Companies Have the Least Difficulty Hiring (Least Difficult to More Difficult)

1. Admin/clerical
2. Communications/PR
3. Accountants/bookkeepers/finance
4. Attorneys
5. Paralegals
6. Transportation/logistics
7. Assembly workers
8. Civil engineers

# Preferred Educational Attainment for New Hires

Educational attainment preferences vary widely from a high school diploma or GED to a Ph.D. Employers prefer a college degree for new hires for the majority of occupations included in this research.

Occupation	High school diploma or GED	Secondary professional certificate	Associate's degree	Bachelor's degree	Post bachelor professional certification	Master's degree	Ph.D. or J.D.
Research scientists and research engineers	0%	0%	5%	15%	0%	20%	60%
Attorneys	0%	0%	0%	5%	19%	21%	55%
Professors and teachers	0%	0%	11%	3%	14%	22%	51%
Engineer – power systems/ transmission	0%	0%	5%	11%	45%	31%	11%
Government employees - regulatory workers	0%	0%	0%	38%	25%	25%	13%
Economists and policy experts (government relations)	0%	5%	0%	23%	8%	43%	20%
Applied/field scientists (e.g., biologist, environmental, meteorologist)	0%	3%	0%	39%	9%	29%	20%
Developer	0%	0%	3%	52%	16%	29%	0%
Engineer – civil	0%	2%	2%	50%	15%	28%	2%
Resource assessors and surveyors	0%	6%	12%	60%	6%	12%	6%
Programmers and computer scientists	0%	6%	3%	59%	9%	20%	3%
Engineer - other	3%	3%	7%	42%	14%	22%	7%
Engineer – electrical or mechanical	0%	0%	1%	54%	20%	23%	1%
Product designers and design engineers	0%	3%	3%	75%	3%	9%	7%
Communications/PR	2%	2%	6%	78%	8%	6%	0%
Sales/marketing	5%	1%	5%	78%	1%	9%	0%
Professional trainers and industry educators	3%	16%	7%	48%	7%	16%	3%
Accountants/bookkeepers/finance	1%	8%	10%	61%	12%	8%	0%
Paralegals	0%	14%	14%	56%	14%	0%	0%
Admin/clerical	17%	13%	27%	37%	4%	1%	1%
Wind technicians	27%	40%	20%	14%	0%	0%	0%
Trade workers (electricians, welders, etc.)	35%	48%	7%	11%	0%	0%	0%
Assembly workers	71%	18%	6%	0%	0%	0%	6%
Transportation/logistics workers	68%	5%	11%	16%	0%	0%	0%
Construction laborers (other than skilled trade workers)	100%	0%	0%	0%	0%	0%	0%

# Do They Need *Wind-Specific* Education and Training?

Overall, wind energy firms are more likely to want their employees to have education and/or professional certification related to their occupation (e.g., certified public accountants).

However, for:

- Professors,
  - Teachers,
  - Product designers,
  - Design engineers, and
  - Wind technicians,
- wind energy-specific professional certification is more important.



*Photo by Lee Jay Fingersh, NREL 14902*



# U.S. vs. International Applicants

At 25% of the firms we contacted, representatives searched outside the United States for candidates. Representatives at some wind energy firms view U.S. applicants as having less wind energy-specific education and training relative to international applicants.

Do U.S. applicants have more than, less than, or the same as their international counterparts?	More (or Stronger)	Same	Less (or Weaker)
<b>Problem solving and critical thinking skills</b>	13%	63%	23%
<b>Wind-related experience</b>	19%	54%	27%
<b>Wind energy-specific education and training</b>	17%	47%	36%
<b>Work ethic</b>	13%	75%	13%

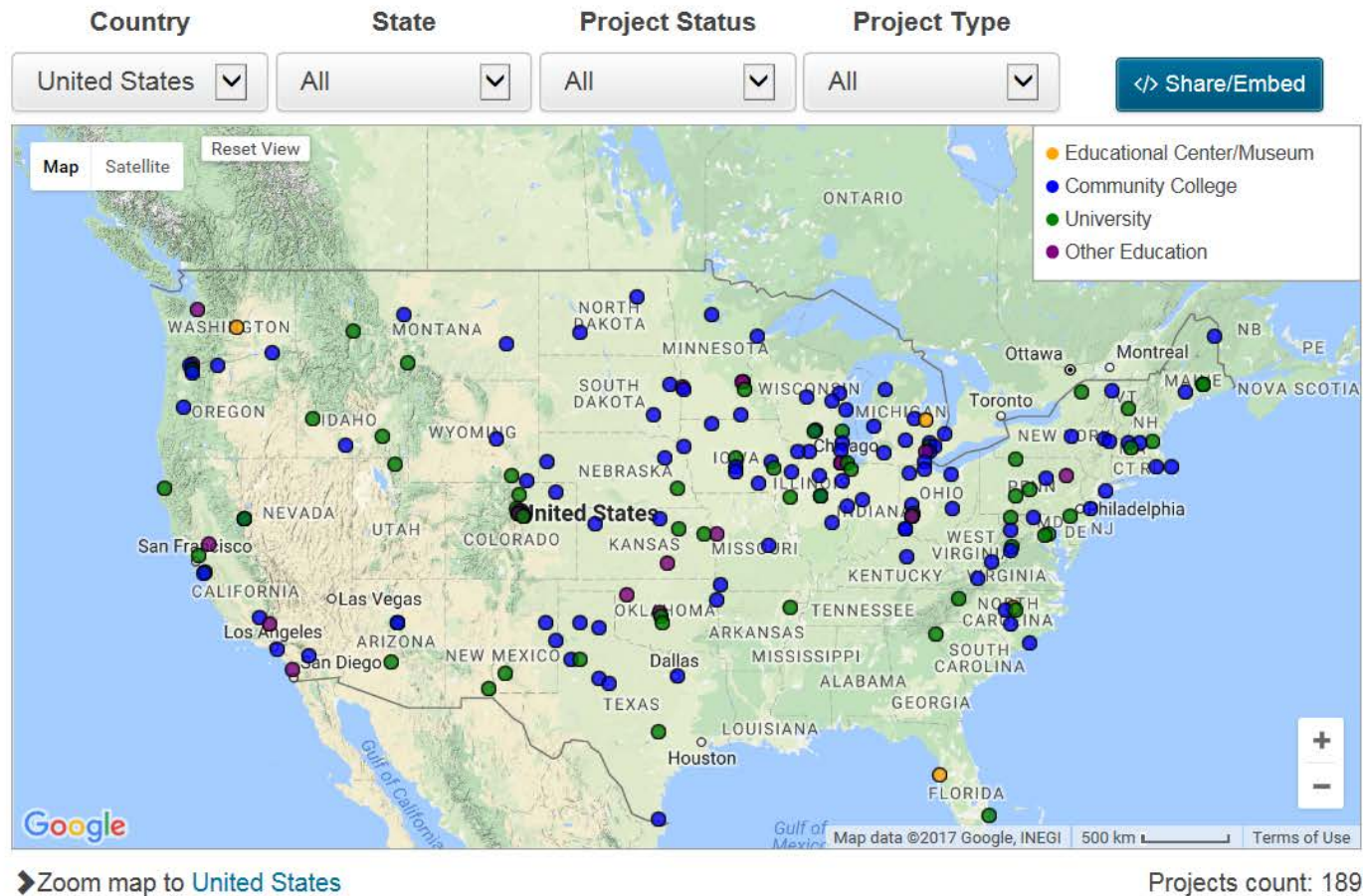
# Wind Energy Education and Training Programs

Go to WINDEXchange in your browser. Click on Education & Training Programs.

- Workforce Development
- Collegiate Wind Competition
- Wind for Schools Project
- School Project Locations
- Education & Training Programs**
- Curricula & Teaching Materials
- Resources

## Wind Energy Education and Training Programs

This map shows the location of wind energy education and training programs in the United States. Find programs at community colleges, universities, and other institutions.



# Wind Educational Institutions and Training Programs

	Wind-Specific Program	Renewables with Wind Program		Post-Secondary Certificate	Associate's Degree	Bachelor's Degree	Post-Bachelor's Certificate	Master's or Ph.D.
Number of certificate or degree programs	34	39		21	26	7	9	10
Programs with 2016 Graduates								
Number of certificate or degree programs	27	33		18	19	7	7	9
Average graduates per program 2016	9	14		14	7	28	11	7
Number of graduates 2016 total graduates = 712	243	469		248	135	194	75	60

This information is not comprehensive and does not capture all U.S. education and training programs in wind energy. Totals may not sum due to rounding.

An average of 40% of graduates from certificates and 1-2 year programs enter the wind industry. **Only ~31% of 4-year colleges and masters/Ph.D. programs enter the wind industry upon graduation.**

# We Need to Bridge the Gap

Wind industry recruiters



Motivated, well-qualified  
wind energy graduates

We need to increase our diversity.

# DOE/NREL Initiatives, Tools, Partners to Help Cross the Bridge



## Tools and Resources:

- Wind Career Map
- Jobs and Economic Development Impacts (JEDI) Models [www.nrel.gov/analysis/jedi](http://www.nrel.gov/analysis/jedi)
- WINDExchange – bi-weekly newsletter to ~16,000 subscribers

## Initiatives:

- Wind for Schools
- Collegiate Wind Competition
- North American Wind Energy Academy

**Partners:** Universities, community colleges, NGOs  
WRISE – Women in Renewable Industries and Sustainable Energy, AWEA Workforce Committee and many more.

**Engagement** with academia, communities, and industry through webinars, trainings, summits.

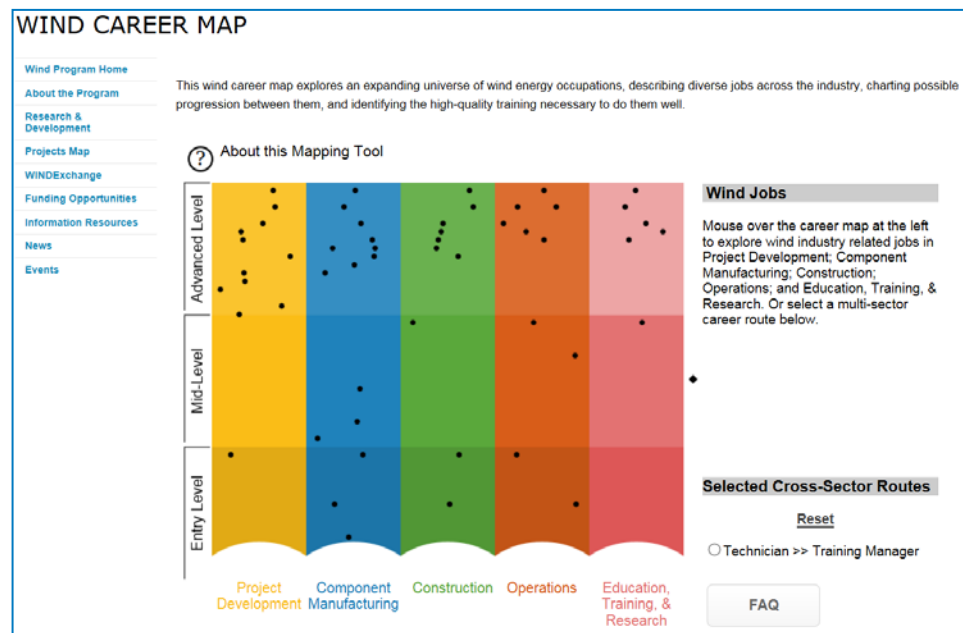


Photo from Cassandra Nguyen, Kansas State University, NREL 35630



We have work to do!  
Thank you.

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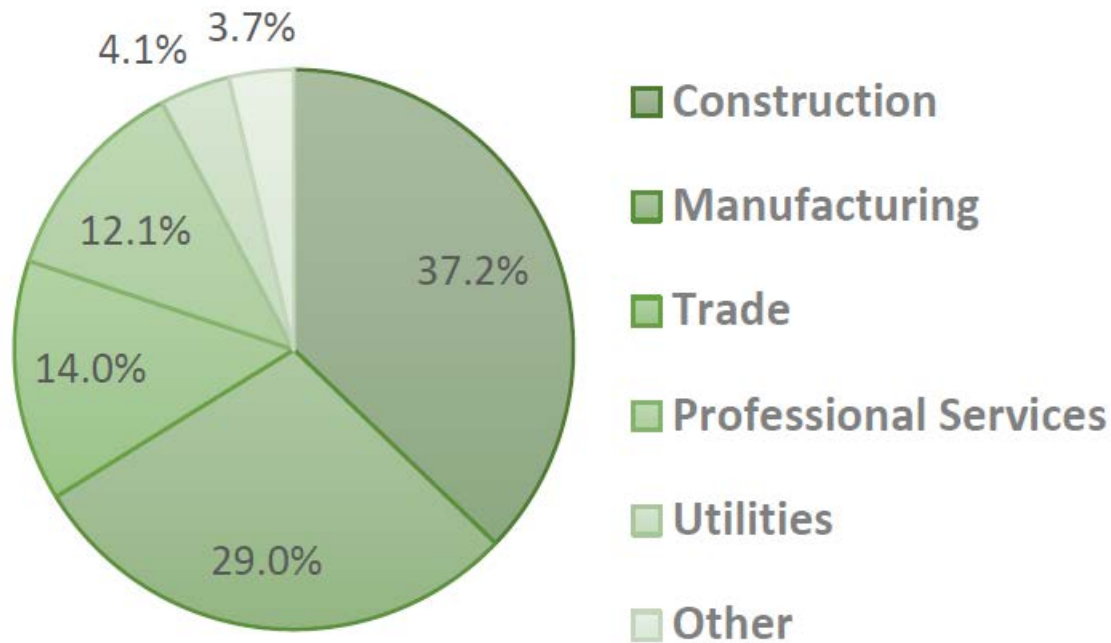
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[www.nrel.gov](http://www.nrel.gov)



# Today's U.S. Wind Energy Workforce by Industry

## Wind Employment by Industry



U.S. Department of Energy (2017) Search for "DOE Jobs Report"

[https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report\\_0.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf)