

National Wind Workforce Assessment: Educators to Students

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Acknowledgments

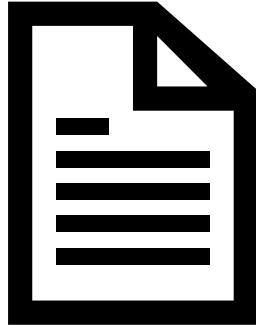
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We would also like to thank Laura Hastings, Maya Whalen-Kipp, and Patrick Gilman (U.S. Department of Energy [DOE] Office of Energy Efficiency and Renewable Energy Wind Energy Technologies Office [WETO]) for supporting this research and providing valuable insight and feedback. We also appreciate Sheri Anstedt (NREL) for her editorial and technical review, John Frenzl and Jen Grieco for their graphics support, and Bobby Jeffers, Andre Fernandes Tomon Avelino, and Rebecca Hanes for their counsel on the development of the system dynamics model.

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How To Use

- 1 Read the presentation like a report



OR

- 2 Use the “Overview: Quick Click” slide to navigate through the presentation

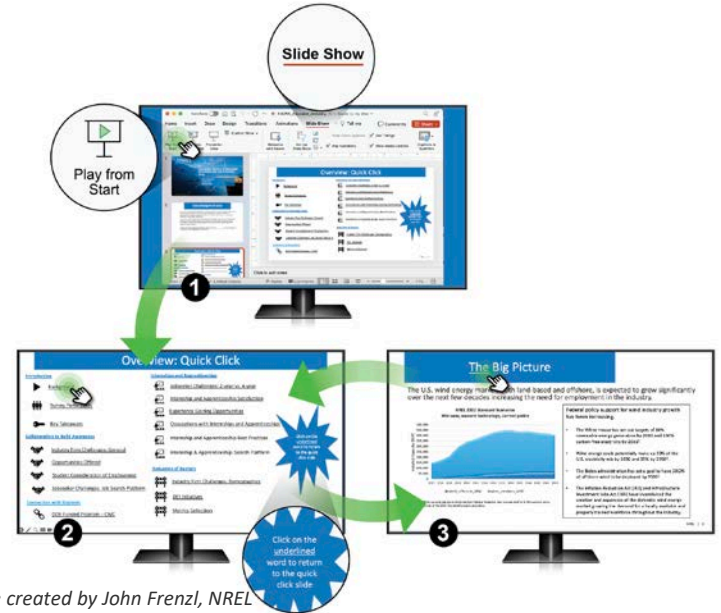


Image created by John Frenzi, NREL

Overview: Quick Click


Introduction

 Background

 Survey Participants


 Key Takeaways

Education Challenges: Potential Students

 Applicants and Acceptance Rates

 Influences for Applicant Numbers

 Influences for Acceptance Rates

 Challenges: Applications

Student Perception of Education and Training

 Degree Types

 Wind Employment Consideration and Interest

 Degree by Employment

 Connection Between Education and Industry

 Professional Experience and Career Services

 Professional Experience by Education Level

Connective Actions

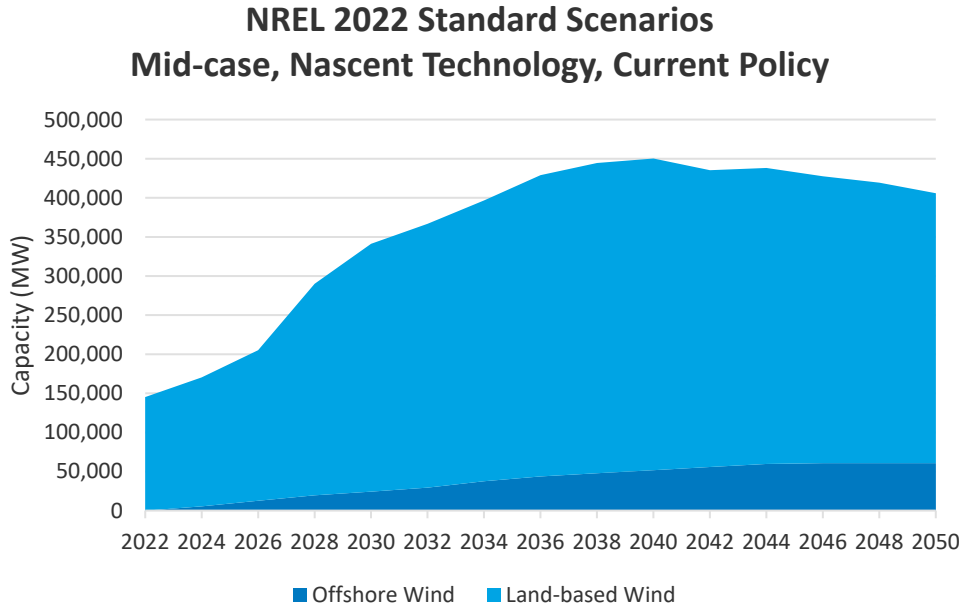
 Actionable Steps

Click on the underlined word throughout presentation to return to the quick click slide.

Introduction

The Big Picture

The U.S. wind energy market, both land-based and offshore, is expected to grow significantly over the next few decades, increasing the need for employment in the industry.



Graph from Gagnon et al. (2022)

The capacity additions driven by the Inflation Reduction Act are accounted for in the current policy scenarios of the 2022 Standard Scenarios projection.

Federal policy support for wind industry growth has been increasing.

- The White House has set targets of 80% renewable energy generation by 2030 and 100% carbon-free electricity by 2035 (White House 2021a).
- Wind energy could potentially make up 20% of the U.S. electricity mix by 2030 and 35% by 2050 (DOE-WETO 2017).
- The Biden administration has set a goal to have 30 GW of offshore wind be deployed by 2030 (White House 2021b).
- The Inflation Reduction Act and Infrastructure Investment Jobs Act have incentivized the creation and expansion of the domestic wind energy market, growing the demand for a locally available and properly trained workforce throughout the industry.

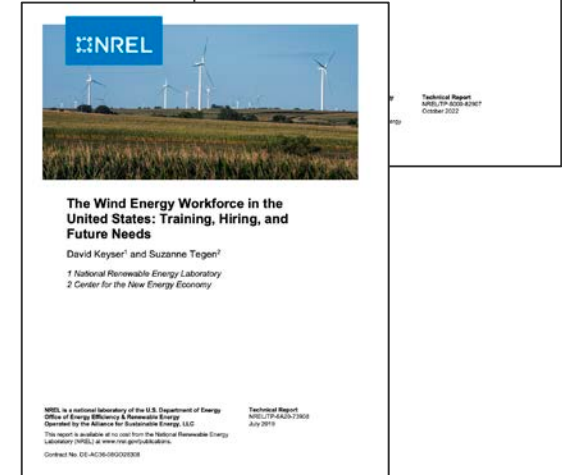
National Wind Workforce Assessment in Context

An **available** and **properly trained** workforce is needed for the success of the wind industry. However, past research has indicated that there is a **disconnect** between wind industry employers, the workforce, and educational institutions, which has been referred to as **the wind workforce gap**.

Wind workforce gap: Wind energy employers report having difficulty finding qualified candidates, while the potential wind energy workforce (e.g., students and recent graduates who are not yet working in the wind energy industry) report difficulty finding jobs, and educational institutions report having difficulty placing students in jobs (Stefek 2022).

Narrowing the gap could simultaneously (Keyser & Tegen 2019).

- Reduce recruitment costs for employers
- Help educational institutions fill classrooms
- Grow the domestic wind workforce by properly communicating wind industry careers to the potential workforce.



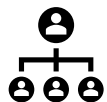
Previous Findings

Defining the Wind Energy Workforce Gap (Stefek 2022) indicated that the top three reasons for the workforce gap include experience, education and training qualifications, and geographic locations of jobs. This report expands on these findings.



Experience

Experience was noted as a challenge for more than one-quarter of all wind industry firms looking for entry- (27.6%) and non-entry-level (33%) job applicants.



Industry



Education and Training

More than one-quarter of responding firms indicated that “there are enough applicants, but too many applicants do not have the training or education needed for the job” (29.7%).



Geographic Location of Jobs

The third highest reason among wind firms searching for both entry- and non-entry-level applicants was that there are not enough applicants for available positions in areas where wind is being developed.



Employee

Members of the total workforce (68%) responded that gaining applicable work experience is somewhat of a challenge or a considerable challenge when trying to find work opportunities in the wind industry.

Current and potential workers identified getting hands-on training (62%) or technical training (61%) to develop skills and expertise as a challenge or obstacle when searching for relevant opportunities in the wind industry.

Finding employment opportunities where one lives or is willing to live was ranked the second highest challenge for the total and potential workforce (67%) and the top challenge for the current workforce (64%).

Intended Audience + Contents

This report presentation is intended for use by students looking to gain insight into educational institutions and actionable steps that can be taken to help narrow the workforce gap. More information can be found in complementary resources.

This presentation includes:

- Modeled scenario of Wind Workforce through 2050 based on Business-as-Usual
- Challenges for student applicants to renewable energy educational institutions
- Scenario on how the workforce gap is affected by changes in application and acceptance rates
- Student perception of educational and training programs
- Connective actions for industry and educational/training programs.

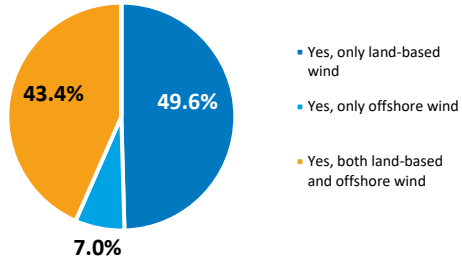
The information presented in the report originates from the 2022 survey effort conducted in partnership between NREL and BW Research Partnership, and various outside resources. To learn more about the methodology behind data collection and workforce modeling, please refer to the *National Wind Energy Workforce Assessment Methods Report: Surveys and System Dynamics Model* (McDowell and Stefek 2023).

Who Took the Survey?

Employer Survey (n=228)

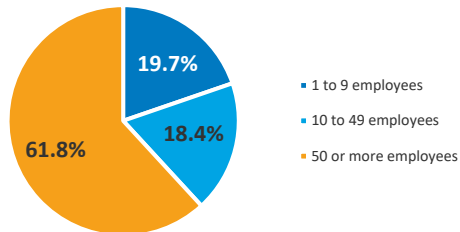
Involvement in Wind Energy Industry, 2022 (n=228)

Graph courtesy of BW Research Partnership



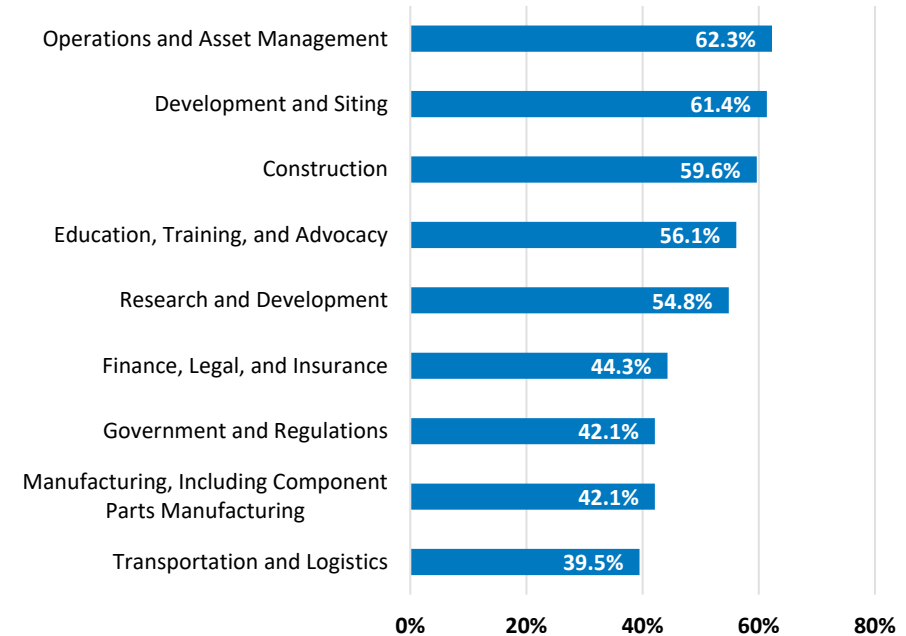
Number of Employees at Wind Energy Firms, 2022 (n=142)

Graph courtesy of BW Research Partnership



Involvement in Wind Industry Segments, 2022 (n=228)

Graph courtesy of BW Research Partnership

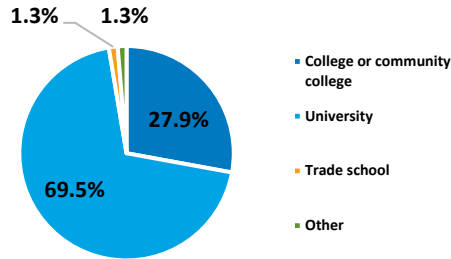


Who Took the Survey?

Student and Recent Graduate Survey (n=346)

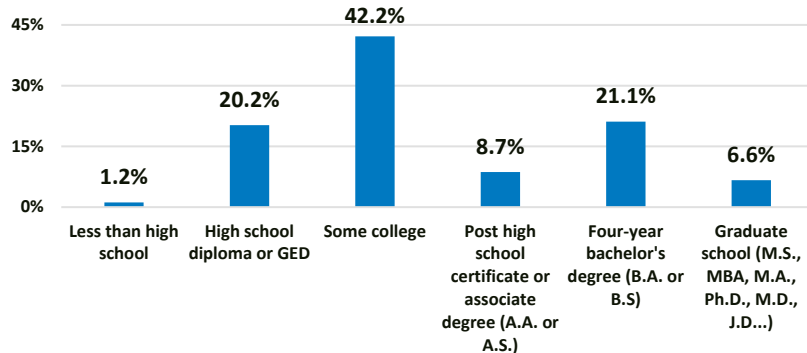
Type of School Attended, 2022 (n=226)

Graph courtesy of BW Research Partnership



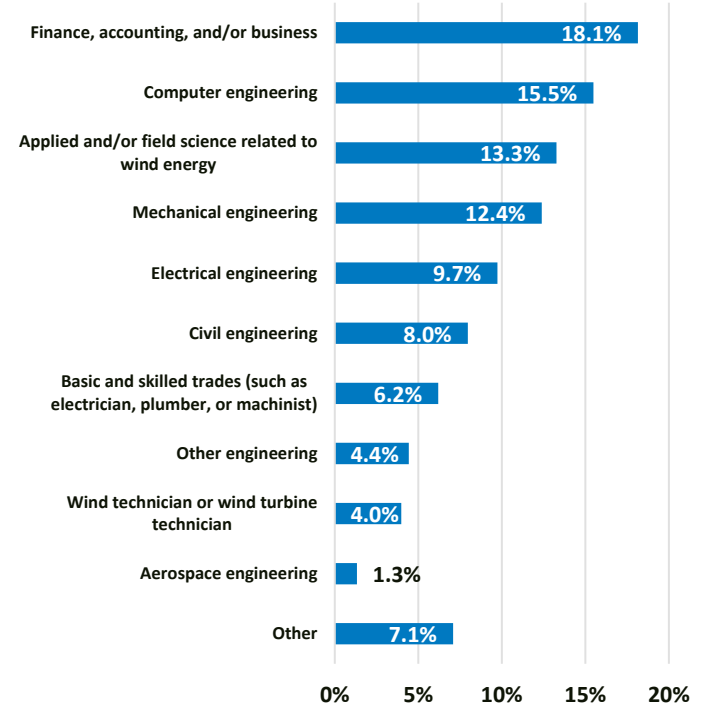
Last Educational Level Completed, 2022 (n=346)

Graph courtesy of BW Research Partnership



Degree Students and Recent Graduates were/are Working Toward, 2022 (n=226)

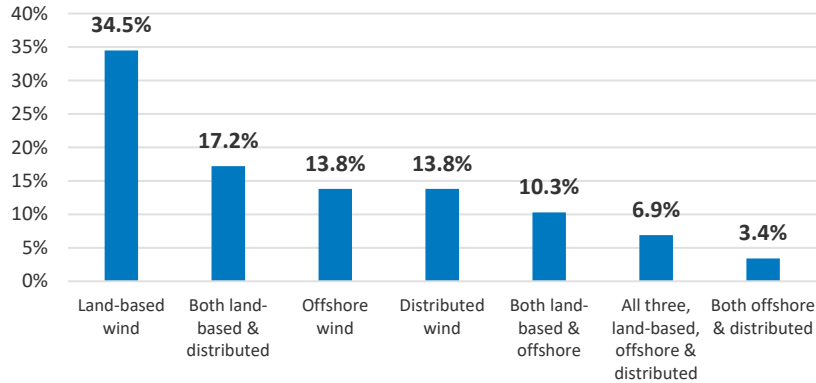
Graph courtesy of BW Research Partnership



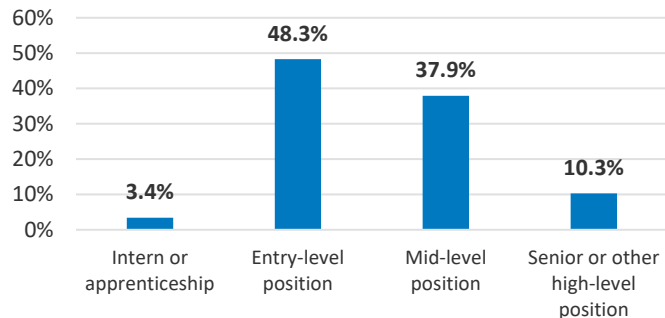
Who Took the Survey?

Current Worker Survey (n=29)

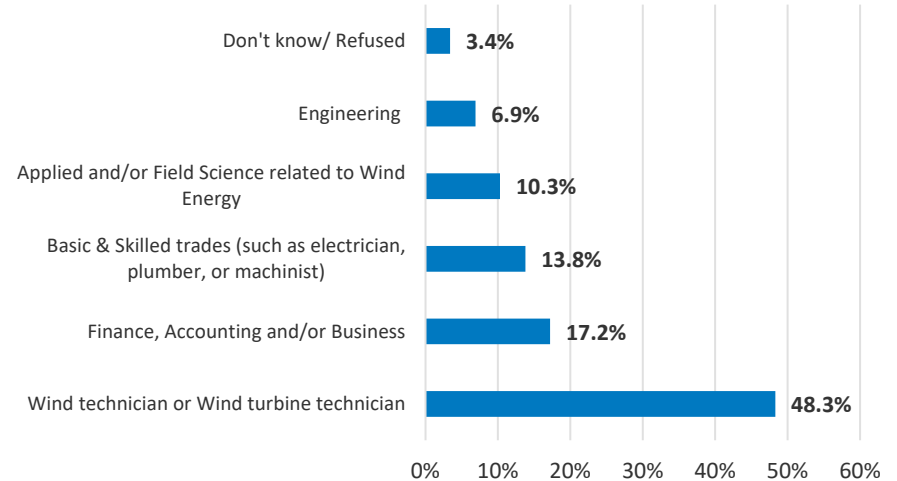
Primary Sector of Work in the Wind Industry (n=29)



Most Recent Employment Level in the Wind Industry (n=29)



Area of Study (n=29)

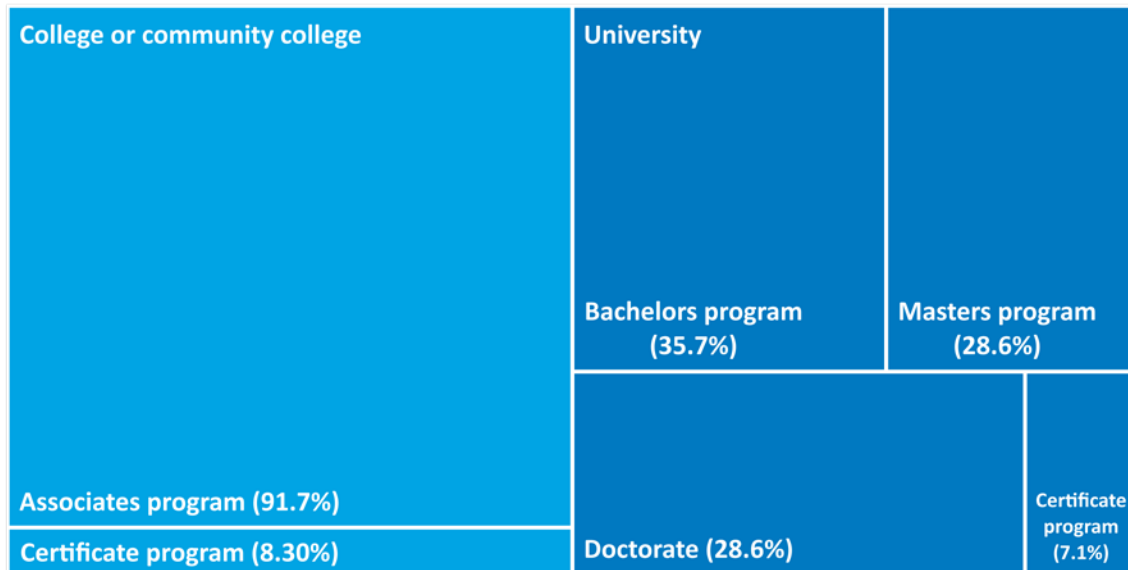


Who Took the Survey?

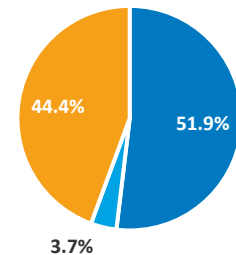
Educator Survey (n=27)

Type of Program in the School Employed (n=14, n=12)

■ University ■ College or community college

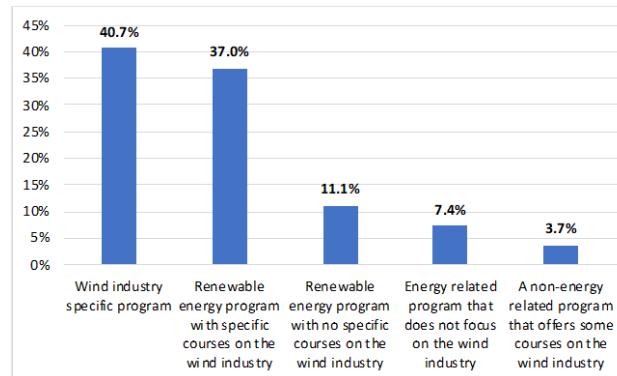


Type of School Currently Employed (n=27)



■ University ■ Trade school ■ College or community college

Program Involvement With the Wind Industry (n=27)



Key Takeaways

Workforce Estimation

According to model projections under a business-as-usual (BAU) scenario, if the wind energy industry is to progress in line with NREL 2022 Standards Scenario Mid-case with nascent technology and current policy—one potential path for expansion—a larger supply of qualified and adequately trained workers will be needed to support overall workforce demand.

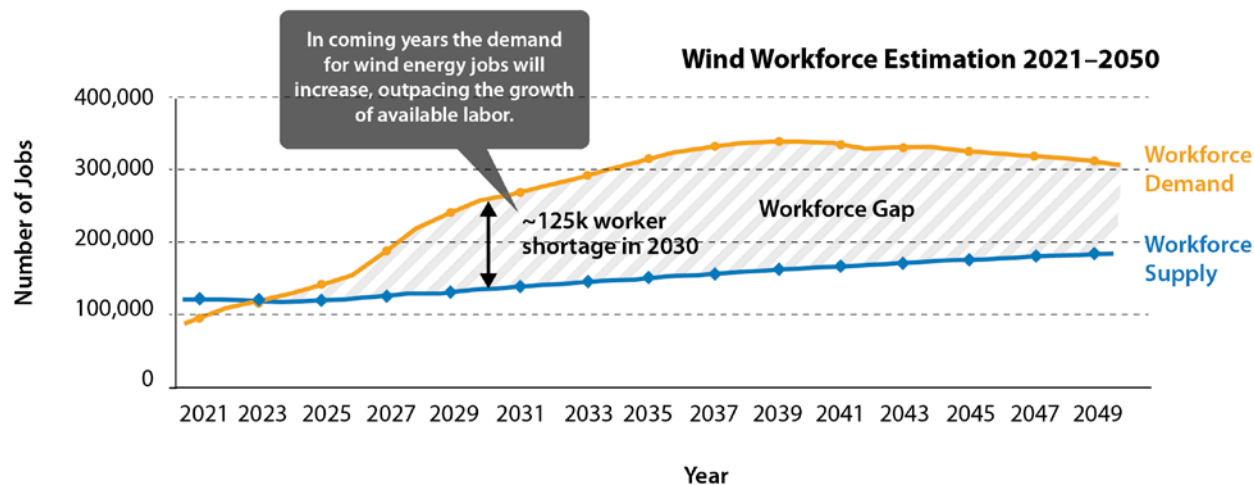


Image created by John Frenzl, NREL

2030: 134,364 FTE Supply

2030: 124,095 FTE Deficit

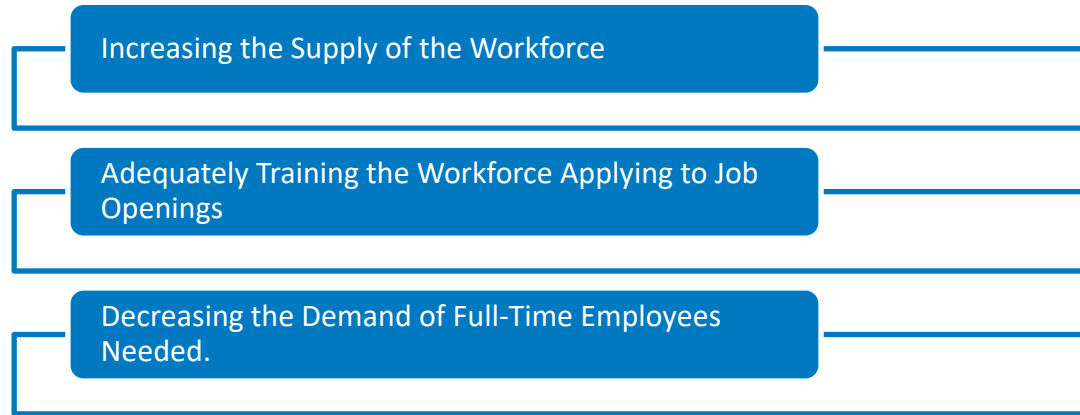
2030: 258,459 FTE Demand

Under current assumptions, the wind industry supply is expected to increase steadily through 2050; however, it is not predicted to be at the rate that is needed to meet 2030 or 2050 wind workforce demand. The workforce supply estimations are informed by current wind industry perceptions and baseline data collected through the 2022 survey effort, and results vary depending on the qualitative inputs.

Note: Information about the assumptions and data used is in the Methodology report. These projections are highly dependent on the assumption of the model and data gathered through the 2022 survey effort and should be used as a high-level estimate of scale and trend as opposed to a point projection.

Key Takeaways

Closing the gap between the workforce that is needed to meet deployment goals and the supply of the workforce that is possible in the wind industry under current assumptions will require:



This presentation will address increasing the supply of the workforce by **assessing the perceptions students and educators have of the wind industry, and hiring difficulties faced by both students and wind energy firms.**

Key Takeaways

Reported challenges for student applicants to renewable energy educational institutions:

- **Number of applicants** and **acceptance rates** into renewable energy education and training programs have largely **stayed the same** over the past year and past three years.
- Over the past year and past three years, educators who reported an **increase in applicants** reported that **job market availability, marketing for the program, and economic drivers** were the most impactful reasons for the increases, indicating some of key levers for further growth.
- Additionally, educators reported that the **biggest obstacle** students face when applying to renewable energy education and training programs was a **lack of financial support (86%), followed by COVID-19 related changes (71%) and a lack of available staff resources to support more students (62%)**.

Reported student perceptions of education and training programs:

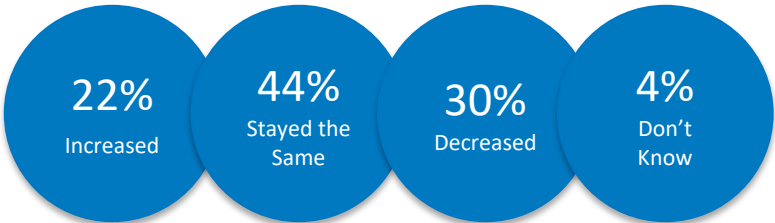
- Once in renewable energy education and training programs, students and recent graduates reported that **they were/are working toward a variety of degrees**.
- **Over one-third of students and recent graduates** were enrolled in programs that **did not mention the wind industry**.
- Generally, **interest for a career in wind is high**; however, those **who are not applying into the wind industry** reported that is due to **interest in other careers, a lack of awareness of wind industry opportunities, and limited exposure to wind curriculum in classes**.
- For entry-level employees, a **lack of relevant wind experience** remained the **top barrier for hiring**, as reported by wind industry employers.
- Students reported being **aware of experience gaining opportunities** offered through their educational institutions. Educators also reported that students do **utilize the career services department** if the school has one. Therefore, one way industry firms could help mitigate hiring challenges in the wind industry is by **connecting with educational institutions for partnership in experience gaining opportunities offered through their programs**. Creating ties between educational institutions and the wind industry can help build a sustainable pipeline for a utilized labor force.

Challenges Potential Students
Face When Entering
Renewable Energy Education

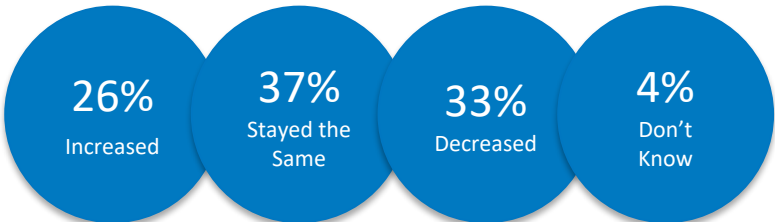
One way to increase the number of job seekers going into wind is to increase the quantity of students going through related education and training programs. Over the past year, educators have reported that applicants and acceptance rates of students to renewable energy degree programs have largely stayed the same. Similarly, this trend has stayed relatively constant over the past three years.

Trends in Number of Applicants

Over the past year (n=27)

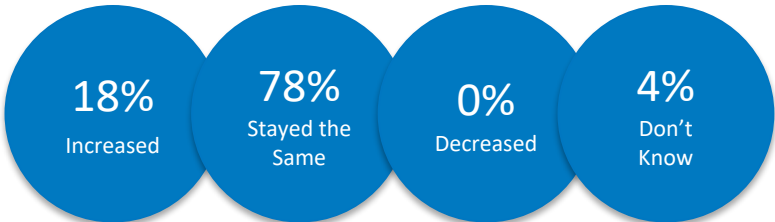


Over the past three years (n=27)

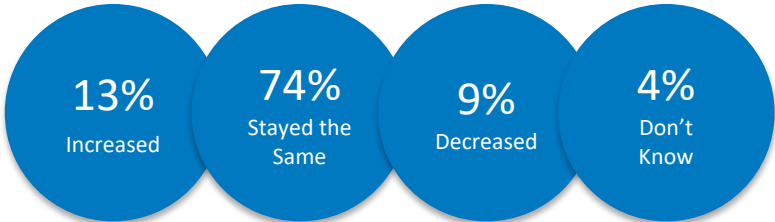


Trends in Acceptance Rates

Over the past year (n=23)



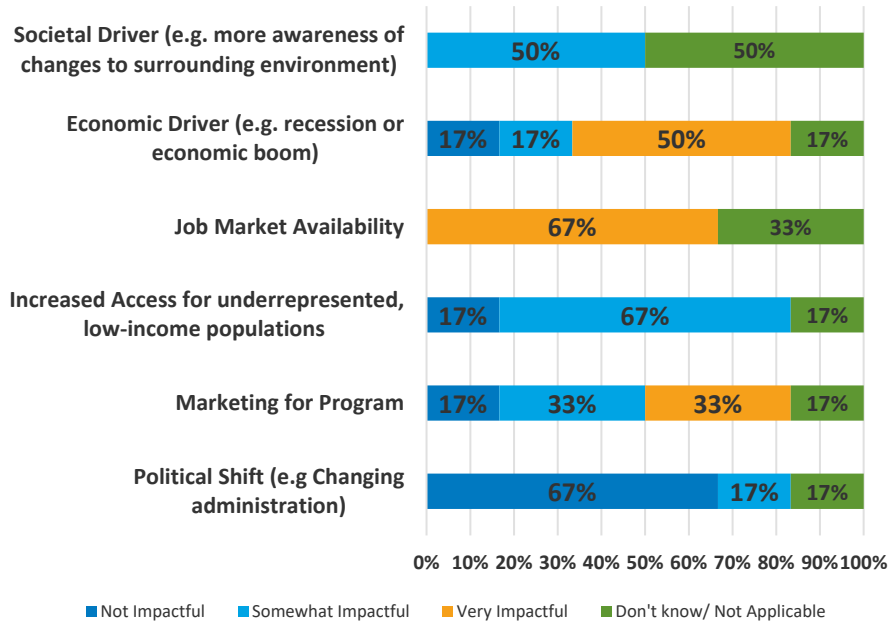
Over the past three years (n=23)



Over the past year and past three years, educators who reported an increase in applicants reported that job market availability, marketing for the program, and economic drivers were the most impactful reasons for the increases, indicating some of the key levers for further growth.

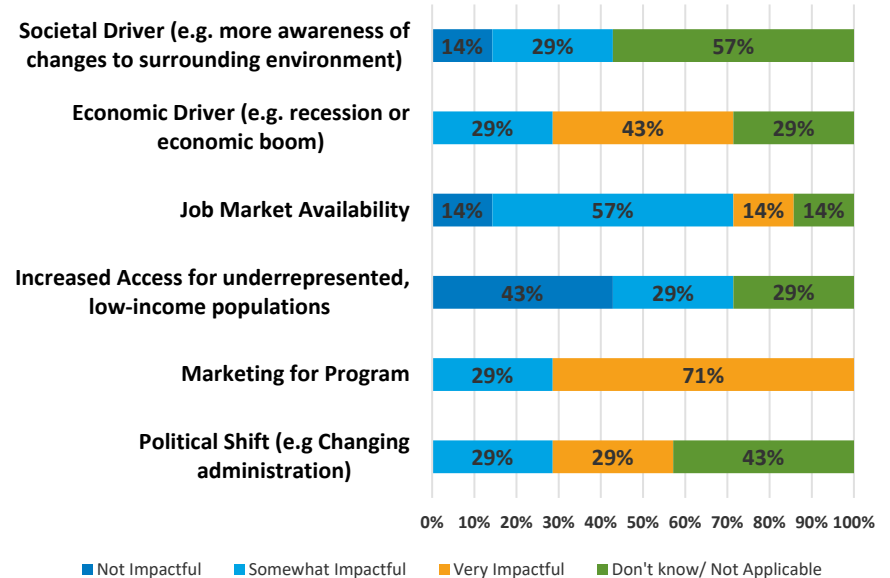
Over the past year

Reasons for **Increase in Applicants** Over the **Past Year** (n=6)



Over the past three years

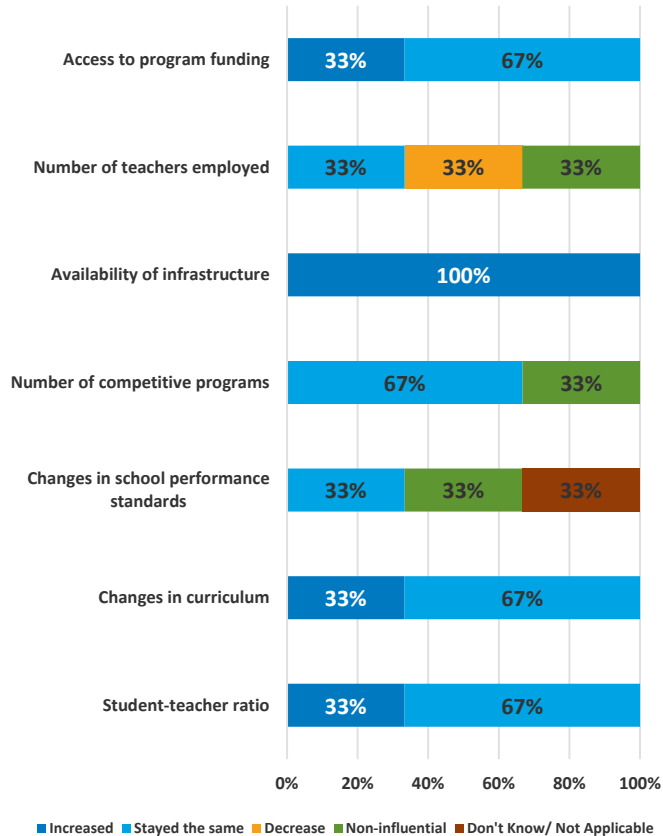
Reasons for **Increase in Applicants** Over the **Past Three Years** (n=7)



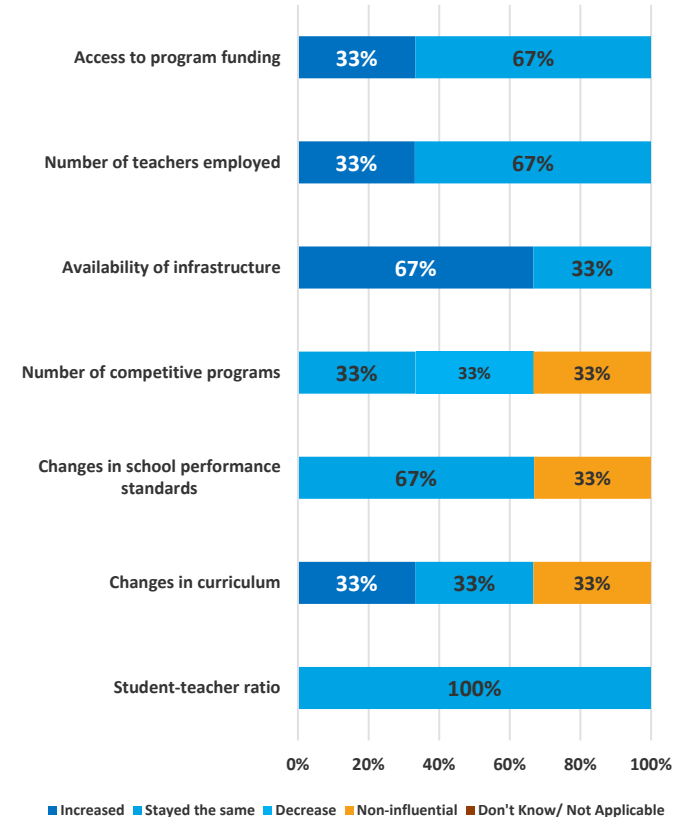
In the Past Year

Reported Influential Impacts on Acceptance Rates Between One and Three Years

In the Past Three Years

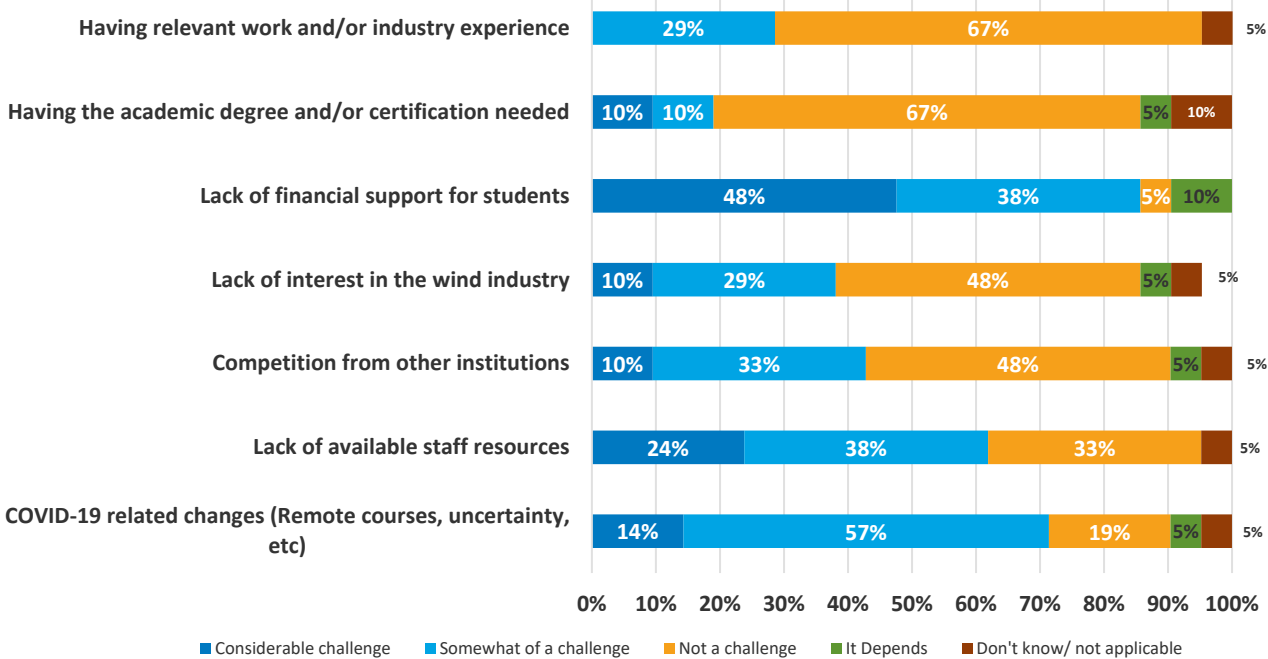


- Acceptance rates into renewable energy educational and training institutions have fluctuated due to various influential factors.
- Educators who reported an increase in their acceptance rate over the past year attributed it to an increase in availability of infrastructure, increased access to program funding, and an increased student-teacher ratio.
- Educators who had an increase in their acceptance rate over the past three years attributed it to availability of infrastructure, number of teachers employed, and access to program funding.



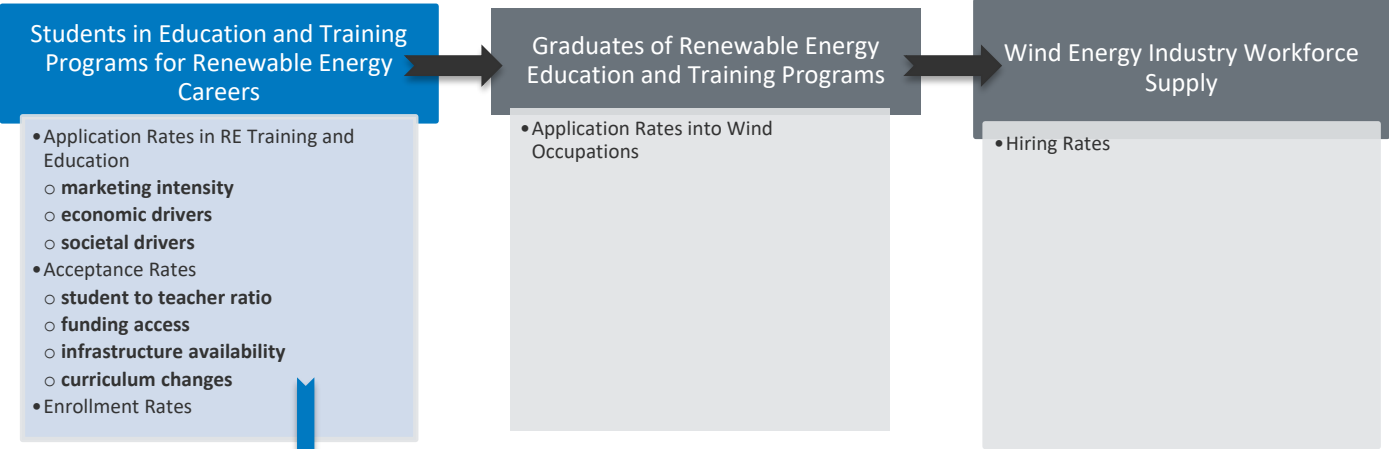
Additionally, educators reported challenges students commonly face when applying to educational and training programs. Obstacles such as a lack of financial support, COVID-19 related changes, and a lack of available staff resources to support more students ranked as the biggest challenges for students.

Reported challenges or obstacles students face when applying to educational programs (n=21)



- Biggest challenges for students:
- 1) Lack of financial support (86%)
 - 2) COVID-19 related changes (71%)
 - 3) Lack of available staff resources to support more students (62%).

To better understand how influencing application and acceptance rates affects students entering renewable energy related education and training programs, and therefore the number of graduates potentially qualified for careers in wind, key levers discovered through the survey effort were implemented into the workforce estimation model. Some of the key levers identified are bulleted below (e.g., marketing intensity, student to teacher ratio).



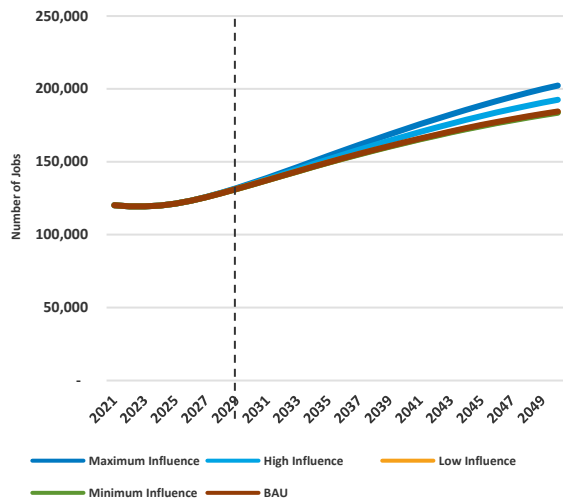
The model indicated that as the application levers **increase in positive influence** over the application rate, the **percent of students applying into renewable energy education and training programs also increases**. Furthermore, **increasing** the number of students applying, being accepted into, and therefore going through education and training programs allows for a **larger number** of qualified applicants to graduate, apply, and subsequently be hired into wind jobs.

A scenario was run to evaluate how increasing or decreasing key levers contributing to application and acceptance rates into renewable energy education and training programs can impact workforce projections. The effects of these changes on the workforce supply and workforce gap estimations can be found on **Slide 25**.

Workforce Estimation

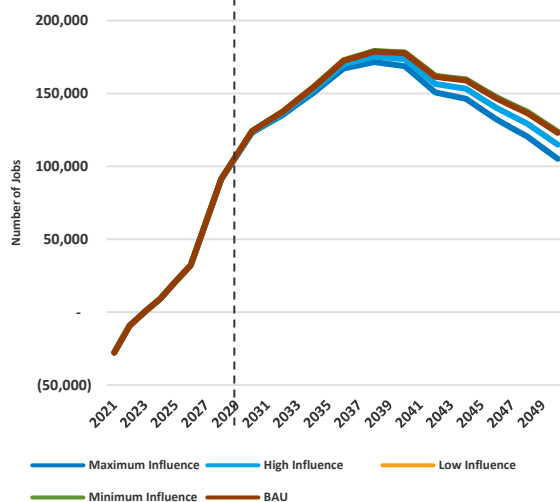
If the applicant pool increases, and hiring and attrition rates stay constant, the number of workers currently in the wind industry is projected to increase. Assuming demand of the wind workforce stays constant based on current deployment, increasing the number of wind industry employees can help to mitigate the gap between demand of workers needed to meet deployment projections and supply of workers available in the wind industry. What percent the workforce gap closes by will be correlated to how much the positive perception of the wind industry increases or decreases. Potential ranges are displayed below but are highly dependent on taking actions to make sure key application and acceptance rate levers are influenced in a positive way.

Workforce Supply Estimation: Education and Experience Scenario



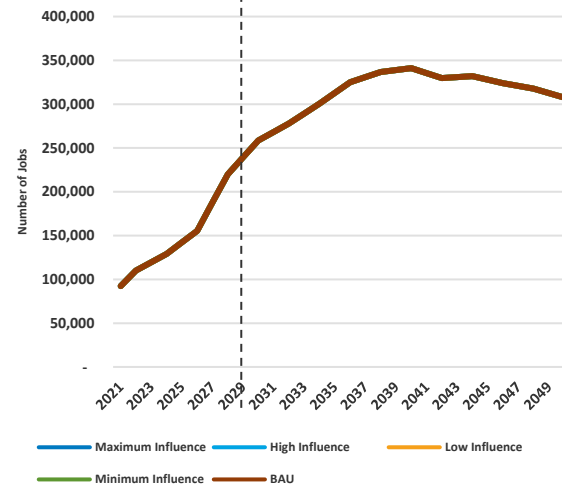
Maximum influence 2030: 135,415 Jobs
2030: Increase of 0.78% from BAU
2050: Increase of 9.62% from BAU

Workforce Gap Estimation: Education and Experience Scenario



Maximum influence 2030: deficit of 123,044 Jobs
2030: Decrease of 0.85% from BAU
2050: Decrease of 14.5% from BAU

Workforce Demand Estimation: Education and Experience Scenario



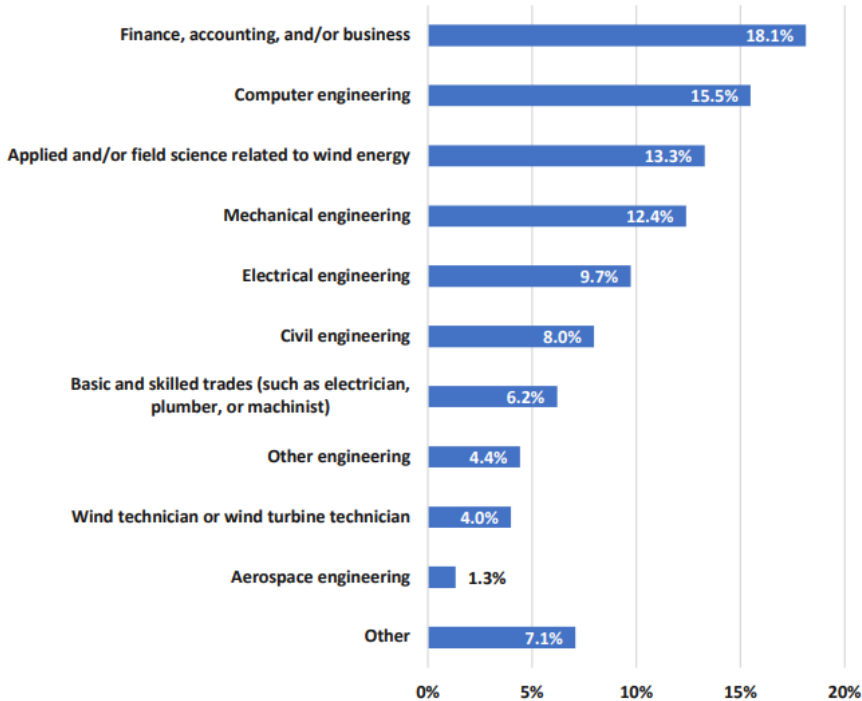
Demand stays consistent at 258,459 FTE

Student Perception of Education and Training Programs

Once in renewable energy education and training programs, students and recent graduates reported that they were/are working toward a variety of degrees. Additionally, 43% of educators reported that their program has between 25% and 50% of their student body undergoing a career pivot. However, of the student respondents, over one-third of students and recent graduates were enrolled in a program that did not mention the wind industry.

Degree Students and Recent Graduates were/are Working Toward, 2022 (n=226)

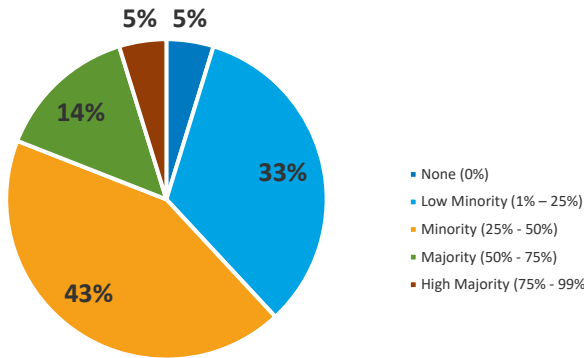
Graph courtesy of BW Research Partnership



Student-reported program involvement in the wind industry:

- 1) The program does not mention the wind industry during courses (33.5%)
- 2) Enrolled in renewable energy program with specific focus on the wind industry (17.6%)
- 3) Enrolled in energy related program with no specific courses on the wind industry (16.5%).

Percent of Student Body Undergoing a Career Pivot (n=21)



Educators reported that less than half of their students who have jobs after 6 months go into the wind industry. Additionally, 37.5% of students reported they have never considered working in the wind industry. Interest in other industries and lack of exposure to the wind industry were noted as the top reasons for why students do not consider working in wind.

Educators reported that 89.19% of students had jobs 6 months after graduation. 47.95% of students with jobs after 6 months had them within the wind industry.

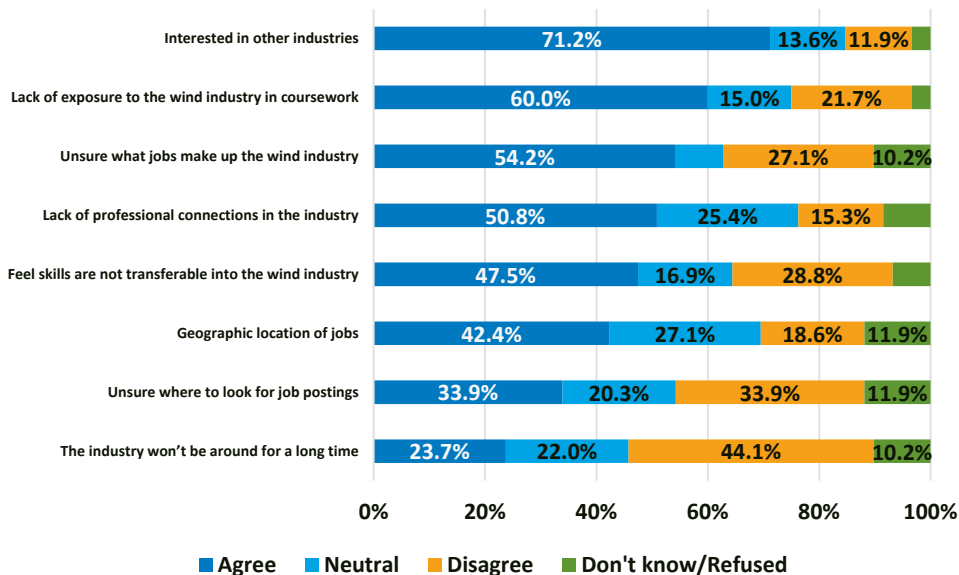
37.5% of students and recent graduate respondents have **not considered** working in the wind energy industry. 24.4% have **actively searched** for work opportunities, and 33.8% have **considered but not actively searched** for wind industry employment.

Top Three Reported Reasons for Lack of Consideration of Employment in Wind Energy

- 1) Interest in other industries (71.2%)
- 2) Lack of exposure to the wind industry in coursework (60.0%)
- 3) Unsure what jobs make up the wind industry (54.2%).

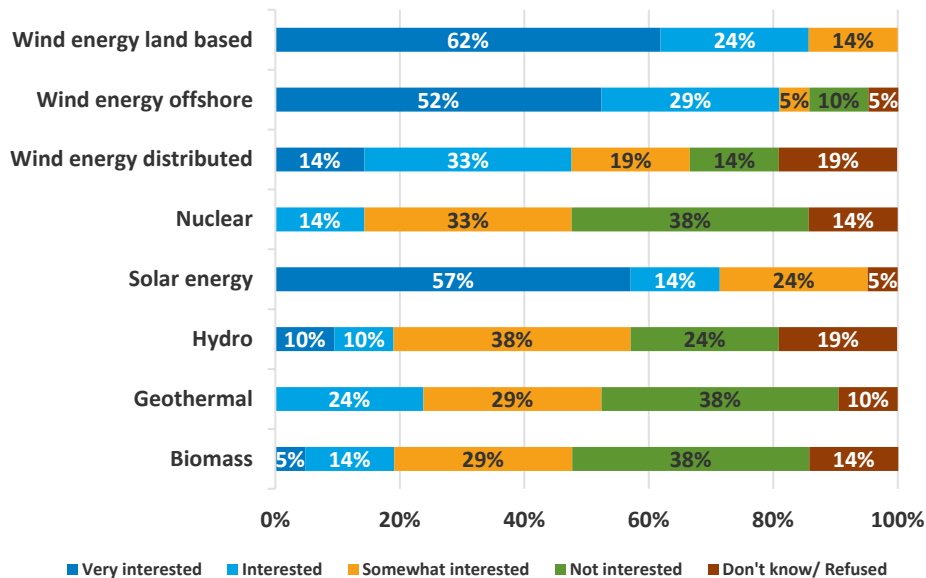
Reasons for Lack of Consideration of Employment in Wind Energy, 2022 (n=33-60)

Graph courtesy of BW Research Partnership



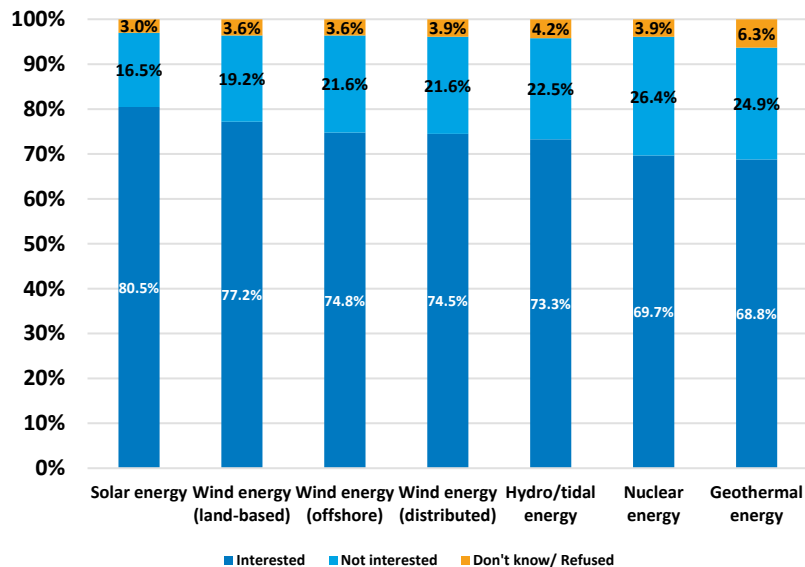
Despite a lack of exposure to wind specific content, the top three renewable industries that students are interested in pursuing post graduation, as reported by both students and educators, are land-based wind, offshore wind, and solar energy.

Student Interest in Clean Energy Industries as Reported by Educators, 2022 (n=21)



Interest in Energy Industry by Category as Reported by Educators, 2022 (n=333)

Graph courtesy of BW Research Partnership



Of the students working toward a career in wind, survey results indicated an increase in students working toward a degree in an applied or field science since 2020. Additionally, the largest share of respondents were pursuing a bachelor's degree or other 4-year degree.

Degree type by employment	High school diploma or GED	Some college, but no degree	Certificate or certification	Associate degree or 2-year degree	Bachelor's degree or 4-year degree (B.A., B.S., BBA)	Master's and/or MBA (M.A., M.S., MEng)	Professional degree (MD, DDS, JD)	Doctorate (Ph.D., Ed.D.)
Aerospace engineering	0%	0%	0%	0%	0%	100%	0%	0%
Mechanical engineering	4%	7%	4%	0%	50%	21%	0%	14%
Electrical Engineering	9%	0%	5%	18%	45%	9%	0%	9%
Civil Engineering	11%	6%	11%	11%	50%	0%	0%	11%
Computer Engineering	3%	14%	6%	11%	43%	20%	0%	3%
Other engineering	0%	0%	0%	10%	70%	20%	0%	0%
Finance, accounting, and/or business	0%	10%	2%	20%	54%	2%	7%	5%
Basic and skilled trades (such as electrician, plumber, or machinist)	7%	21%	7%	21%	29%	0%	14%	0%
Wind technician or wind turbine technician	22%	33%	0%	0%	33%	11%	0%	0%
Applied and/or field science related to wind energy	3%	21%	3%	14%	24%	21%	3%	10%
Other	0%	0%	6%	6%	50%	25%	0%	6%

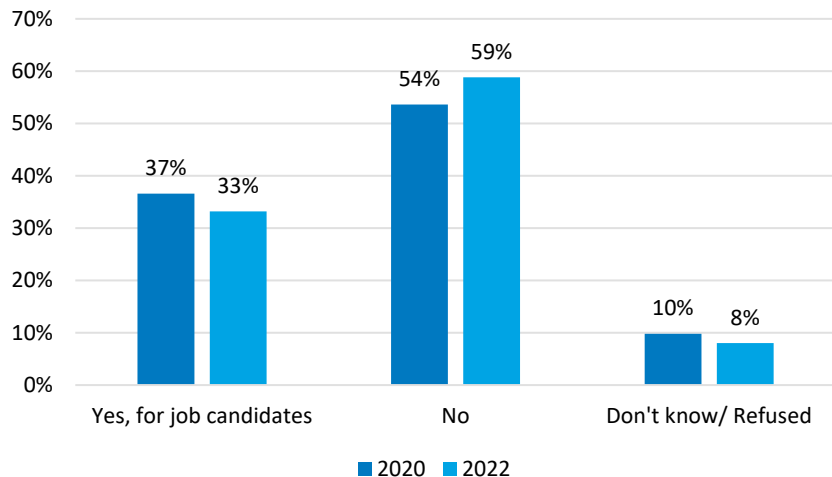
Overall, the proportion of students and recent graduates who indicated that their job and degree focus were within wind energy increased.

One way to help mitigate hiring challenges in the wind industry is by utilizing educational institutions for job recruitment opportunities offered through education. Creating connections between educational institutions and the wind industry can help build a sustainable pipeline for a utilized labor force.

In 2022, just under three in five (59%) employers reported that they did not work with U.S.- based educational institutions. Creating stronger networks with U.S.-based educational institutions for job candidates and increasing students' overall awareness and perception of wind careers could be an opportunity for wind industry firms looking to hire candidates with adequate training.

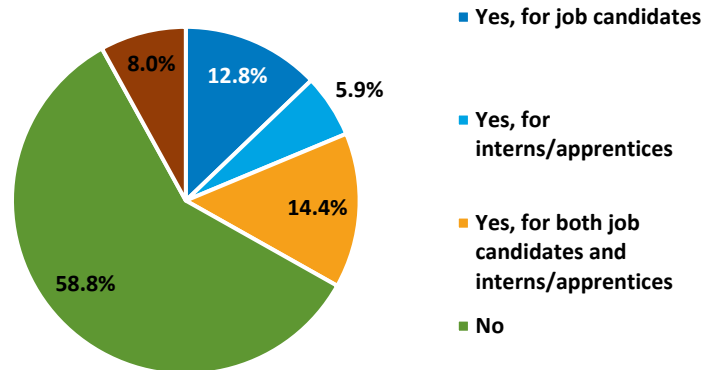
Utilization of U.S.-Based Educational institutions by Wind Employers, 2020, 2022

Graph courtesy of BW Research Partnership



Utilization of Educational Institutions by Wind Energy Firms, 2022 (n=187)

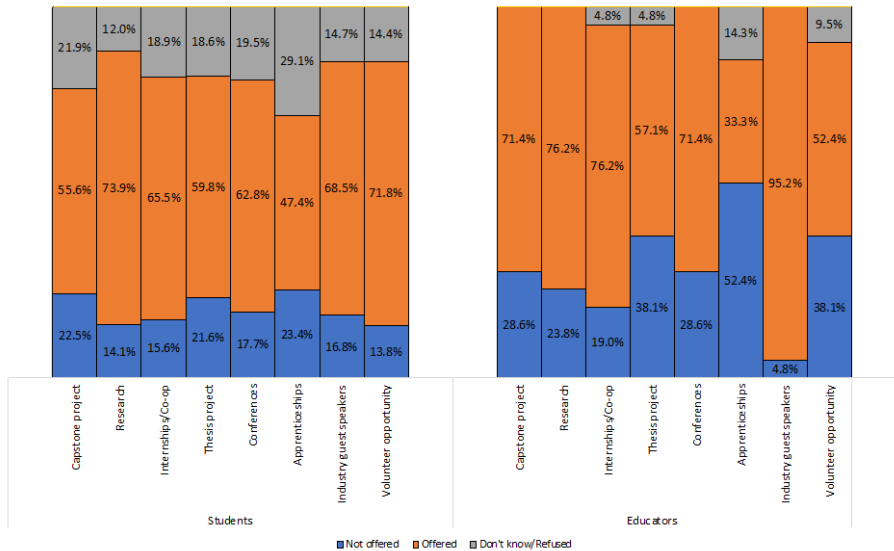
Graph courtesy of BW Research Partnership



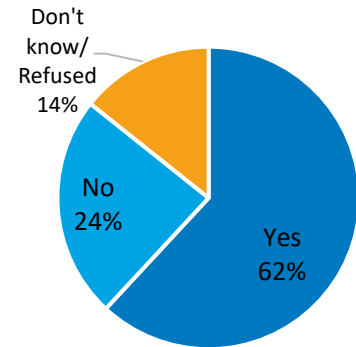
Students and wind industry firms have reported that gaining relevant experience has been a hiring challenge in the wind industry. However, students surveyed reported being aware that their educational institutions have opportunities for gaining experience alongside their degree track. Additionally, educators who reported having career service departments noted that 77% of students utilized these services. Therefore, wind industry firms could create **more partnerships** with educational/training institutions and career services to participate in experience gaining opportunities that these institutions already offer and build connections to career opportunities in the wind industry.

Industry guest speakers were the most prevalent experience gaining opportunity offered by educational institutions who took the survey (95.2%), followed by internships (76.2%) and research (76.2%). The majority of students, especially university students, reported being aware of these specific opportunities.

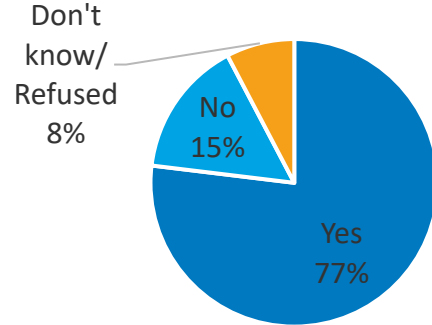
Awareness of Experience Opportunities Offered By Educators to Students



Educators With Career Service Departments (n=21)



Student Utilization of Career Service Departments (n=13)



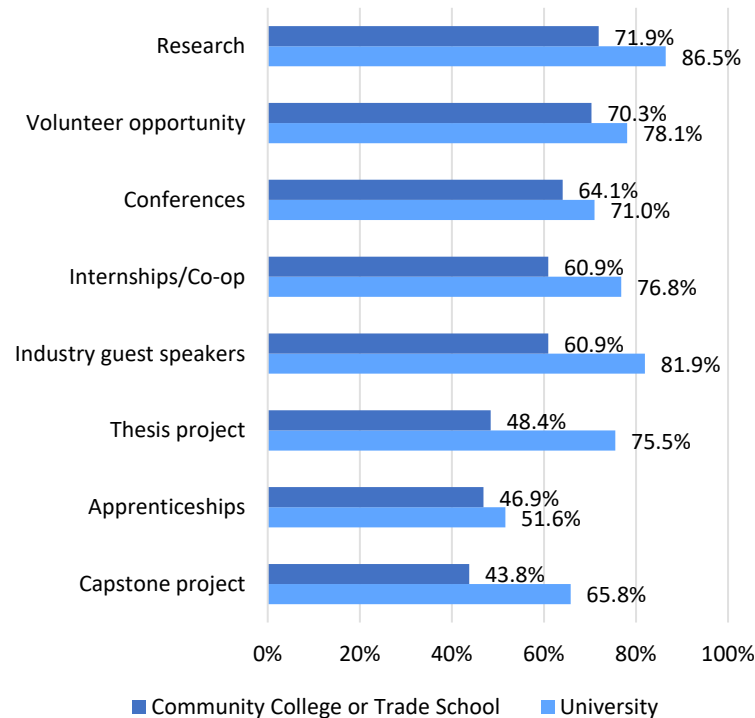
Making sure experience gaining opportunities reach all students will be important to successfully connecting job seekers to the wind industry. While students have been aware of and participating in wind energy related programs, those in 4-year degree programs saw the proportionally highest amount of participation within DOE programs or seminars related to wind energy as opposed to trade workers and apprenticeships.

Participation in DOE Programs and Wind Related Degree Programs by Education Level

	K-12 student at a Wind for Schools/ RePowering Schools event	Post-secondary level course, program, internship, or other activity that was part of the Wind Application Center	Degree program specific to wind energy	Degree or certificate for wind technician	Courses or seminars specific to wind energy
Associate degree or 2-year degree	19%	15%	20%	15%	13%
Bachelor's degree or 4-year degree (B.A., B.S., BBA)	41%	30%	34%	37%	45%
Master's and/or MBA (M.A., M.S., MEng)	6%	13%	14%	13%	19%
Professional degree (MD, DDS, JD)	4%	3%	3%	4%	2%
High school diploma or GED	6%	10%	2%	4%	3%
Some college but no degree	19%	20%	17%	15%	8%
Certificate or certification	4%	3%	3%	4%	2%
Doctorate (Ph.D., Ed.D.)	4%	8%	7%	7%	7%

Experiences Offered at Community Colleges, Trade Schools, or Universities, 2022 (n=220)

Graph courtesy of BW Research Partnership



Potential Actions for Industry and Education/Training Programs to Better Connect With Qualified Students

More information can be found in the *Connective Actions for Educator & Wind Industry* presentation.

Actionable Steps to Address Workforce Gap

Lack of Experience

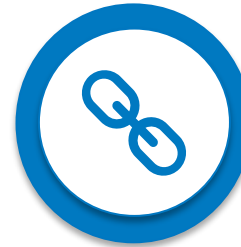


Collaborate with Educational Institutions to Build Awareness of Wind Industry Opportunities.

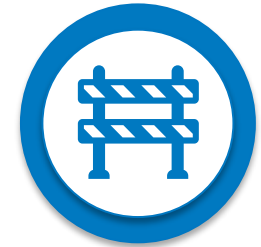


Establish Effective Internship and Apprenticeship Programs and Pipelines.

Lack of Applicants



Connect with Students Through Outreach and Programs such as CWC.



Reduce Barriers to Entrance for Historically Underrepresented Populations.

More information can be found in the *Connective Actions for Educator & Wind Industry* presentation.

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Thank You

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