MENV CAPSTONE 2022

NREL PROJECT BRIEF

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INTRODUCTION

To achieve a sustainable transition away from fossil fuels and to meet current federal targets, the U.S. must quadruple its land-based wind capacity by 2030 (1). To make that growth possible, our teams at NREL have been developing and refining projects focused on mitigating societal barriers to wind energy deployment. However, the U.S. does not currently have a sufficient workforce to meet its energy and equity targets. Wind energy employers report difficulty finding qualified job candidates, while educational institutions report difficulty placing students in jobs--this disconnect is the wind energy workforce gap. Gaining insight into this gap is essential to make sure the workforce is capable of achieving deployment goals, and is the core mission of the **Wind Energy Workforce Development (WEWD)** portion of our capstone.

With the anticipated speed of U.S. wind energy development, it is also vital to consider and center equity. Often, rural and under-resourced communities bear the burdens of wind farm development, without access to a fair share of the benefits that developers gain from their community and land. Collaboration, trust, and community pride are critical to the successful expansion of wind energy, as skepticism and misinformation are currently among the greatest barriers that wind energy development faces. Through methods including social science research, stakeholder engagement, and economic analysis, the **Wind Energy Community Planning and Engagement (WECPE)** portion of our capstone aims to define our understanding of wind energy equity. Together, WEWD and WECPE will help decision makers ensure that our transition away from fossil fuels is also equitable and beneficial to Americans.

PURPOSE

WECPE

Despite the importance of wind in the energy transition, little research at the federal level has been dedicated to understanding concerns and priorities surrounding equity in wind energy development. Key legislation, including the recent Inflation Reduction Act, has allocated major funding to the wind energy industry, meaning that development will likely continue accelerating; unfortunately, rapid expansions have the potential to introduce further inequities, as less time is often dedicated to community engagement when timelines are shortened.

Due to these concerns, NREL has been tasked by the Department of Energy (DOE) with conducting research to create a cohesive definition of “wind energy equity” that may be sent back to the Department of Energy and other federal actors. This process requires holistic engagement conducted over several project phases; therefore our capstone work will serve as a baseline for future iterations.

WEWD

Workforce development forecasting is difficult due to the many factors that impact the evolution of industries. Understanding how the supply and demand needs of a workforce change over time is valuable information that policy makers and industry stakeholders need to ensure sustainable development of an industry.

Some stakeholders are concerned about the wind energy workforce's ability to meet deployment demands; as a result, NREL has been tasked to develop a new methodology for the wind industry’s workforce forecasting and sensitivity analysis models by including new factors not previously applied-- for example, qualitative factors like industry attractiveness, job awareness, and transitional equity, and quantitative factors like automation and labor rates. Additionally, NREL seeks to gain more insight into the reasonings behind the workforce gap and collect data that can be used in the newly constructed model and future analysis.

METHODS

WECPE

- **Literature Review:** equity work in wind and other renewable energy
- **Survey of Experts & Stakeholders:** academics, wind developers, community decision makers
- **Subject Matter Expert Interview Series:** primarily academics, with some developers and decision makers
- **Virtual Workshop:** convening all stakeholders

WEWD

- **Literature Review:** wind workforce development, forecasting methodologies
- **Informational Interviews & Peer Reviews:** system dynamics professionals
- **Surveys of Key Stakeholders:** educators, industry employers, industry employees, and students
- **System Dynamics Modeling:** supply and demand of wind industry)

OUTCOMES

WECPE

This project delivers a comprehensive, co-developed understanding of wind energy equity. We will present our findings in several different formats, for internal use by NREL and DOE, and for dissemination to wind energy stakeholders more broadly. These deliverables include: 1) a memo and draft technical resource summarizing our findings across all phases of engagement; 2) a virtual Wind Energy Equity Workshop, during which key topics from our surveys and interviews will be further developed with diverse stakeholders; 3) updates to existing public-facing wind energy development guides for communities; and 4) a guide for equitable community engagement, created in collaboration with an equity consultant, to be used by NREL in future projects.

Due to NREL and DOE publication timelines, some of these may be incomplete or unavailable by the end of the Capstone project period; however, the work that we have completed has laid the foundations of what is now planned to be an extended effort on investigating wind energy equity at NREL and will inform the development of future projects at NREL, and therefore we already consider this preliminary work to be a success.

WEWD

This project provides analysis into the gap between education institutions/training programs and key industry players as it relates to the wind industry workforce. Additionally, the WEWD project will help to produce a potential new way to forecast the supply and demand of the wind workforce. The deliverables are four surveys and a preliminary systems dynamics forecasting model comparing the wind workforce potential supply and demand needed to meet 2030, 2035, and 2050 deployment goals. These preliminary results will be presented to WETO along with insights and current trends of the wind industry from the current surveys. The deliverables will be of continued use through FY 23 wind workforce analysis efforts.

BY THE NUMBERS

12 INTERVIEWS

WITH SUBJECT MATTER EXPERTS

5 SURVEYS

ASSESSING COMMUNITY AND WORKFORCE WIND NEEDS

4 PUBLICATIONS

ANTICIPATED IN FY23

CONCLUSION

WECPE

As an essential part of a clean energy future, wind energy offers enormous global benefits, from grid decarbonization to improved air quality, that are shared far beyond the communities where the turbines and transmission lines are located. However, constructing and operating wind infrastructure also comes with more localized negative impacts, including changes in views, land uses, and soundscapes. Wind energy equity requires that the communities most negatively affected by wind energy deployment also receive the most benefit. Making sure that all community members, not just landowners and local officials, have power in determining development processes, decisions, and compensation will help ensure that wind energy is a source of pride and resilience for frontline communities.

WEWD

Making sure the wind workforce is developed in a way that is not only equitable, but adequate in numbers and skills is essential to meeting wind energy deployment goals and reaching a clean energy future. Workforce development is driven by many non-linear relations and applying systems dynamics modeling is an important step in being able to map the important economic and policy levers that can be adjusted to help close the wind workforce gaps. Identifying the root causes of the gap can help to ensure sustainable development of the wind industry as a whole.

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REFERENCES

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