July 2024

## Analysis of wind energy's effect on local employment and income

Ben Gilbert, Colorado School of Mines; Ben Hoen, Lawrence Berkeley National Laboratory; Hannah Gagarin, Sandia National Laboratory

REPORT SUMMARY

In 2024, Berkeley Lab collaborated with the Colorado School of Mines, to compile a unique dataset that includes employment and earnings records from 96 percent of all workers, and all utility-scale wind projects, across 23 states occurring between 2000 and 2020. All previous analyses of wind energy impacts have relied on data summarized at the county level, which masks effects that might occur at close distances from the project. This new analysis uses worker-level data based on a worker's residence location. The analysis spans more than six years before each project operation begins to six years after and is focused on effects within 20 miles of turbines. This allows an unprecedented examination of impacts on local employment and income through the full wind project development cycle. For additional information, graphs and analysis, see the <u>report landing page</u>.

The construction of onshore wind energy projects can be linked to several local economic impacts, including job creation, tax revenue, local landowner income, and changes to home sale prices. Because of the difficulty of assembling high-resolution data to examine relatively small effects, employment and income economic impacts remain understudied. This study uses data from more than 100 million individuals held in the US Census Bureau's Federal Statistical Research Data Center program, 9 million of those who live within 20 miles of existing wind projects and investigates employment and earnings records in the periods before, during, and after wind project construction. Report highlights are as follows:

**Effects are evident within 20 miles of an operating wind project but not beyond that.** Income and employment changes outside of 20 miles are either too small or too sporadic to be identified statistically.



Figure 1a and 1b: Event study estimates using worker- and county-aggregated-level data for workers within 20 miles of a wind project with a capacity of at least 10 MW compared to all workers outside that distance. Points represent means, and error bars represent 95% confidence intervals. Figure (a) shows the percent changes in employment levels within 20 miles, and Figure (b) shows the percent changes in income for workers within 20 miles.

**Within 20 miles of operating wind projects, we see increases in employment of roughly 0.4**%. This equates to 230 jobs over the project's life. This is 2 to 4 times larger than those found in previous studies. These employment increases translate to one local FTE for each \$2 million invested in the wind project.

**We also see clear evidence of increases in worker income within 20 miles.** An average of 4% increase in income is estimated for employed workers, equating to \$1,270 annually. This translates into an increase of \$0.16 for each dollar invested in the wind project.

**Both employment and income increases remain six years after the wind project's construction begins, which implies effects are experienced well after construction ends.** We hypothesize these are spillover (or secondary) effects derived from increased tax and lease revenue accrued locally and wind project-related employment, all of which exist for many years, if not the project's full life.

**Segments of the population experience outsized effects compared to others.** For example, black workers enjoy larger employment and income effects than white and Hispanic workers. Similarly, individuals without a high school diploma or those with a college degree see larger benefits than those who only completed high school. Finally, male workers are associated with considerably larger benefits from wind development than female workers.

Across all measures, the worker-level estimates used for this study are larger than county-level estimates, which are classically relied upon. This implies that the many studies that have relied on county-level estimates could be underestimating the size of the effects.

## Acknowledgements

This research was conducted with support from the U.S. Department of Energy Wind Energy Technologies Office (DOE WETO) under Contract No. DE-AC02-05CH11231. This research uses data from the Census Bureau's Longitudinal Employer Household Dynamics Program, which was partially supported by the following National Science Foundation Grants SES-9978093, SES-0339191 and ITR-0427889; National Institute on Aging Grant AG018854; and grants from the Alfred P. Sloan Foundation. We also thank the Rocky Mountain Research Data Center staff and in particular Philip Pendergast, Kas McLean, and Carlos Becerra for their support. We are grateful for the detailed and helpful comments from Johannes Schmieder and all of the participants at the NBER Conference and Pre-Conference Workshop on Distributional Impacts of New Energy Policies, which benefited from funding from the Alfred P. Sloan Foundation. We could not have performed this work without the support of the DOE WETO, specifically Patrick Gilman, Rin Ball, and Maggie Yancey.

## **Disclaimer and Copyright Notice**

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the United States Government or any agency thereof, or The Regents of the University of California. Ernest Orlando Lawrence Berkeley National Laboratory is an equal opportunity employer. The U.S. Government retains a non-exclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes.

For more information, visit us at <u>https://emp.lbl.gov/</u> For all of our downloadable publications, visit <u>https://emp.lbl.gov/publications</u>