



NREL Wind Energy Publications
Fiscal Year 2024



Notice

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Wind Energy Technologies Office. The views expressed herein do not necessarily represent the views of the DOE or the U.S. Government. This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications. U.S. Department of Energy (DOE) reports produced after 1991 and a growing number of pre-1991 documents are available free via www.OSTI.gov.

Journal Articles

Beckham, Gregg, Chen Wang, Avantika Singh, Erik G. Rognerud, Robynne Murray, Grant M. Musgrave, Morgan Skala, Paul Murdy, Jason S. DesVeaux, Scott R. Nicholson, Kylee Harris, Richard Canty, Fabian Mohr, Alison J. Shapiro, David Barnes, Ryan Beach, Robert D. Allen, Gregg T. Beckham, and Nicholas A. Rorrer, 2023. "Synthesis, Characterization, and Recycling of Bio-Derivable Polyester Covalently Adaptable Networks for Industrial Composite Applications." *Matter* 7 (2): 550–568.

<https://dx.doi.org/10.1016/j.matt.2023.10.033>.

Beiter, Philipp, Jerome Guillet, Malte Jansen, Elizabeth Wilson, and Lena Kitzing. 2023. "The Enduring Role of Contracts for Difference in Risk Management and Market Creation for Renewables." *Nature Energy* 9: 20–26.

<https://dx.doi.org/10.1038/s41560-023-01401-w>.

Beiter, Philipp, Trieu Mai, Matthew Mowers, and John Bistline. 2023. "Expanded Modelling Scenarios To Understand the Role of Offshore Wind in Decarbonizing the United States." *Nature Energy* 8: 1240–1249. <https://dx.doi.org/10.1038/s41560-023-01364-y>.

Beiter, Philipp, Tyler A. Hansen, Elizabeth J. Wilson, Jeffrey P. Fitts, Malte Jansen, Bjarne Steffen, Bolun Xu, Jerome Guillet, Marie Munster, and Lena Kitzing. 2023. "Five Grand Challenges of Offshore Wind Financing in the United States." *Energy Research & Social Science* 107: 103329. <https://dx.doi.org/10.1016/j.erss.2023.103329>.

Bergua, Roger, Stefano Cioni, Francesco Papi, Leonardo Pagamonci, Alessandro Bianchini, Nestor Ramos-Garcia, Georg Pirrung, Remi Corniglion, Anais Lovera, Josean Galvan, Ronan Boisard, Alessandro Fontanella, Paolo Schito, Alberto Zasso, Marco Belloli, Andrea Sanvito, Giacomo Persico, Lijun Zhang, Ye Li, Yarong Zhou, Simone Mancini, Koen Boorsma, Ricardo Amaral, Axelle Vire, Christian W. Schulz, Stefan Netzband, Rodrigo Soto-Valle, David Marten, Raquel Martin-San-Roman, Pau Trubat, Climent Molins, Emmanuel Branlard, Jason Jonkman, and Amy Robertson. 2023. "On the Characteristics of the Wake of a Wind Turbine Undergoing Large Motions Caused by a Floating Structure: An Insight Based on Experiments and Multi-Fidelity Simulations From the OC6 Phase III Project." *Wind Energy Science* 8 (11): 1659–1691. <https://dx.doi.org/10.5194/wes-8-1659-2023>.

Blair, Nate, Susan Babinec, Ian Baring-Gould, Amy N. Bender, Xiangkun Li, Ralph T. Muehleisen, Dan Olis, and Silvana Ovatt. 2024. "Techno-Economic Analysis of Renewable Energy Generation at the South Pole." *Renewable & Sustainable Energy Reviews* 193: 114274. <https://dx.doi.org/10.1016/j.rser.2023.114274>.

Bodini, Nicola, Mike Optis, Stephanie Redfern, David Rosencrans, Alex Rybchuk, Julie K. Lundquist, Vincent Pronk, Simon Castagneri, Avi Purkayastha, Caroline Draxl, Raghavendra Krishnamurthy, Ethan Young, Billy Roberts, Evan Rosenlieb, and Walter Musial. 2023. "The 2023 National Offshore Wind Data Set (NOW-23)." *Earth System Science Data* 16 (4): 1965–2006. <https://doi.org/10.5194/essd-2023-490>.

Bodini, Nicola, Stephanie Redfern, Alex Rybchuk, Vincent Pronk, Simon Castagneri, Avi Purkayastha, Caroline Draxl, Ethan Young, Billy Roberts, Evan Rosenlieb, Walter Musial, Sheng-Lun Tai, Larry Berg, David Rosencrans, and Julie K. Lundquist, and Mike Optis. 2023. "NOW-23: The 2023 National Offshore Wind Data Set." *Open Energy Data Initiative*. <https://dx.doi.org/10.25984/1821404>.

Bodini, Nicola, Ye Liu, Brian Gaudet, Raghavendra Krishnamurthy, Sheng-Lun Tai, Larry K. Berg, Alex Rybchuk, and Andrew Kumler. 2024. "Identifying Meteorological Drivers for Errors in Modeled Winds Along the Northern California Coast." *Monthly Weather Review* 152 (2): 455–469. <https://dx.doi.org/10.1175/MWR-D-23-0030.1>.

Bortolotti, Pietro, Daniel Ribnitzky, Emmanuel Branlard, and Martin Kuhn. 2023. "Rotor and Wake Aerodynamic Analysis of the Hybrid-Lambda Concept - An Offshore Low-Specific-Rating Rotor Concept." *Journal of Physics: Conference Series*. <https://dx.doi.org/10.1088/1742-6596/2626/1/012008>.

Branlard, Emmanuel, Jason Jonkman, Cameron Brown, and Jiatian Zhang. 2024. "A Digital Twin Solution for Floating Offshore Wind Turbines Validated Using a Full-Scale Prototype." *Wind Energy Science* 9 (1): 1–24. <https://wes.copernicus.org/articles/9/1/2024/>.

Clerc, Jeff, Theodore J. Weller, Matthew J. Lau, and Nels G. Johnson. 2023. "Rates of Seasonal Fuel Loading Do Not Differ by Sex or Overwintering Strategy in Three Species of Bats." *Journal of Mammalogy* 104 (6): 1246–1256. <https://dx.doi.org/10.1093/jmammal/gyad088>.

Cooperman, Aubryn, Omer Khalid, Guangbo Hao, Hamish Macdonald, Fiona Devoy McAuliffe, and Cian Desmond. 2023. "Cost-Benefit Assessment Framework for Robotics-Driven Inspection of Floating Offshore Wind Farms." *Wind Energy* 27 (2): 152–164. <https://dx.doi.org/10.1002/we.2881>.

De Jong, Emily, Eliot Quon, and Shashank Yellapantula. 2023. "Mechanisms of Low-Level Jet Formation in the U.S. Mid-Atlantic Offshore." *Journal of the Atmospheric Sciences* 81 (1): 31–52. <https://dx.doi.org/10.1175/JAS-D-23-0079.1>.

Hein, Cris, Sarah Rebecah Fritts, Emma Elizabeth Guest, Sara Patricia Weaver, Amanda Marie Hale, and Brogan Page Morton. 2024. "Experimental Trials of Species-Specific Bat Flight Responses to an Ultrasonic Deterrent." *PeerJ*. <https://dx.doi.org/10.7717/peerj.16718>.

Egerer, Ulrike, Scott Dana, David Jager, Geng Xia, Brooke J. Stanislawski, and Shashank Yellapantula. 2024. "Wind and Structural Loads Data Measured on Parabolic Trough Solar Collectors at an Operational Power Plant." *Scientific Data* 11 (98). <https://doi.org/10.1038/s41597-023-02896-4>.

Keller, Jonathan, Jarred Kenworthy, Edward Hart, James Stirling, Adam Stock, Yi Guo, James Brasseur, and Rhys Evans. 2023. "Wind Turbine Main Bearing Rating Lives as Determined by IEC 61400-1 and ISO 281: A Critical Review and Exploratory Case Study." *Wind Energy* 27 (2): 197–197. <https://dx.doi.org/10.1002/we.2883>.

[Letizia, Stefano, Peter Brugger, Nicola Bodini, Raghavendra](#) Krishnamurthy, Andrew Scholbrock, Eric Simley, Fernando Porte-Agel, Nicholas Hamilton, Paula Doubrawa, and Patrick Moriarty. 2023. "Characterization of Wind Turbine Flow Through Nacelle-Mounted Lidars: A Review." *Frontiers in Mechanical Engineering* 9 (2023). <https://dx.doi.org/10.3389/fmech.2023.1261017>.

Martinez-Tossas, Luis, Masoumeh Gharaati, Nathaniel J. Wei, John O. Dabiri, Luis A. Martinez-Tossas, and Di Yang. 2023. "Large-Eddy Simulations of Turbulent Flows in Arrays of Helical- and Straight-Bladed Vertical-Axis Wind Turbines." *Journal of Renewable and Sustainable Energy* 15 (6): 063309. <https://dx.doi.org/10.1063/5.0172007>.

Martinez-Tossas, Luis, Philip Sakievich, Matthew J. Churchfield, and Charles Meneveau. 2023. "Generalized Filtered Lifting Line Theory for Arbitrary Chord Lengths and Application to Wind Turbine Blades." *Wind Energy* 27 (1): 101–106. <https://dx.doi.org/10.1002/we.2872>.

Moriarty, Patrick, Coleman Moss, Romit Maulik, and Giacomo Valerio Iungo. 2023. "Predicting Wind Farm Operations with Machine Learning and the P2D-RANS Model: A Case Study for an AWAKEN Site." *Wind Energy*. <https://dx.doi.org/10.1002/we.2874>.

Moriarty, Patrick, Vijay Matheswaran. 2024. "Wind Turbine Performance Enhancement with Minimal Structural Load Penalty: A Design Philosophy." *Wind Engineering*. <https://dx.doi.org/10.1177/0309524X231212565>.

Reynolds, Matthew, Sujal Bhavsar, Ranga Pitchumani, Jon Maack, Ignas Satkauskas, and Wesley Jones. 2024. "Stochastic Economic Dispatch of Wind Power under Uncertainty Using Clustering-Based Extreme Scenarios." *Electric Power Systems Research* 229: 110158. <https://dx.doi.org/10.1016/j.epsr.2024.110158>.

Rybchuk, Alex, Malik Hassanaly, Nicholas Hamilton, Paula Doubrawa, Mitchell J. Fulton, and Luis A. Martinez Tossas. 2023. "Ensemble Flow Reconstruction in the Atmospheric Boundary Layer From Spatially Limited Measurements Through Latent Diffusion Models." *Physics of Fluids* 35: 126604. <https://dx.doi.org/10.1063/5.0172559>.

Sharma, Ashesh, Michael J. Brazell, Ganesh Vijayakumar, Shreyas Ananthan, Lawrence Cheung, Nathaniel deVelder, Marc T. Henry de Frahan, Neil Matula, Paul Mullaney, Jon Rood, Philip Sakievich, Ann Almgren, Paul S. Crozier, and Michael Sprague. 2024. "ExaWind: Open-Source CFD for Hybrid-RANS/LES Geometry-Resolved Wind Turbine Simulations in Atmospheric Flows." *Wind Energy* 27 (3): 225–257. <https://dx.doi.org/10.1002/we.2886>.

Sheng, Shawn, Walid Touti, Mohamed Salah, and Khmais Bacha. 2024. "An Envelope Time Synchronous Averaging for Wind Turbine Gearbox Fault Diagnosis." *Journal of Vibration Engineering and Technologies* 12: 6513–6525. <https://dx.doi.org/10.1007/s42417-023-01267-y>.

Simley, Eric, Dev Millstein, Seongeun Jeong, and Paul Fleming. 2024. "The Value of Wake Steering Wind Farm Flow Control in US Energy Markets." *Wind Energy Science* 9 (1): 219–234. <https://dx.doi.org/10.5194/wes-9-219-2024>.

Sinner, Michael, Balthazar Arnoldus Maria Sengers, Andreas Rott, Eric Simley, Michael Sinner, Gerald Steinfeld, and Martin Kuhn. 2023. "Increased Power Gains from Wake Steering Control Using Preview Wind Direction Information" *Wind Energy Science* 8 (11): 1693–1710. <https://dx.doi.org/10.5194/wes-8-1693-2023>.

Stanislawski, Brooke, Todd Harman, Raul Bayoan Cal, and Marc Calaf. 2024. "Barriers and Variable Spacing Enhance Convective Cooling and Increase Power Output in Solar PV Plants." *Journal of Renewable and Sustainable Energy* 16: 013501. <https://dx.doi.org/10.1063/5.0177420>.

Starke, Genevieve, Charles Meneveau, Jennifer R. King, and Dennice F Gayme. 2023. "A Dynamic Model of Wind Turbine Yaw for Active Farm Control." *Wind Energy*. <https://dx.doi.org/10.1002/we.2884>.

Wang, Lu, Roger Bergua, Amy Robertson, Alan Wright, Daniel Zalkind, Matthew Fowler, Eben Lenfest, Anthony Viselli, Andrew Goupee, and Richard Kimball. 2023. "Experimental Investigation of Advanced Turbine Control Strategies and Load-Mitigation Measures with a Model-Scale Floating Offshore Wind Turbine System." *Applied Energy* 335: 122343. <https://dx.doi.org/10.1016/j.apenergy.2023.122343>.

Wang, Lu, Roger Bergua, Amy Robertson, Jason Jonkman, Tri Ngo, Tuhin Das, Doyal Sarker, Francesc Fabregas Flavia, Robert Harries, Matthew Fowler, Eben Lenfest, Juan Lopez Muro, Laurent Burlion, and Onur Bilgen. 2023. "Experimental Validation of Models of a Hull-Based Tuned Mass Damper System for a Semisubmersible Floating Offshore Wind Turbine Platform." *Journal of Physics: Conference Series* 2626:012067. <https://dx.doi.org/10.1088/1742-6596/2626/1/012067>.

Wiley, Will, Jason Jonkman, Amy Robertson, and Kelsey Shaler. 2023. "Sensitivity Analysis of Numerical Modeling Input Parameters on Floating Offshore Wind Turbine Loads." *Wind Energy Science* 8 (10): 1575–1595. <https://dx.doi.org/10.5194/wes-8-1575-2023>.

Xia, Geng, Donghai Wu, Steven M. Grodsky, Wenfang Xu, Naijing Liu, Rafael M. Almeida, Liming Zhou, Lee M. Miller, Somnath Baidya Roy, Geng Xia, Anurag A. Agrawal, Benjamin Z. Houlton, Alexander S. Flecker, and Xiangtao Xu. 2023. "Observed Impacts of Large Wind Farms on Grassland Carbon Cycling." *Science Bulletin* 58 (23): 2889–2892. <https://dx.doi.org/10.1016/j.scib.2023.10.016>.

Zalkind, Daniel, Athul K. Sundarajan, Yong Hoon Lee, James T. Allison, and Daniel R. Herber. 2023. "Open-Loop Control Co-Design of Semisubmersible Floating Offshore Wind Turbines Using Linear Parameter-Varying Models." *Journal of Mechanical Design - Transactions of the ASME* 146 (4): 041704. <https://dx.doi.org/10.1115/1.4063969>.

Zalkind, Daniel, Nikhar J. Abbas, John Jasa, Alan Wright, and Lucy Pao. 2023. "Control Co-Design of a Floating Offshore Wind Turbine." *Applied Energy* 353 (B): 122036. <https://dx.doi.org/10.1016/j.apenergy.2023.122036>.

Technical Reports

Baranowski, Ruth, Paul Veers, Katherine Dykes, Christopher Bay, Pietro Bortolotti, Paula Doubrava, Suzanne MacDonald, Samantha Rooney, Carlo L. Bottasso, Paul Fleming, Sue Ellen Haupt, Amanda Hale, Cris Hein, and Amy Robertson. 2023. *Grand Challenges Revisited: Wind Energy Research Needs for a Global Energy Transition*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-86564. <https://www.nrel.gov/docs/fy24osti/86564.pdf>.

Bodini, Nicola, Mike Optis, Ye Liu, Brian Gaudet, Raghavendra Krishnamurthy, Andrew Kumler, David Rosencrans, Alex Rybchuk, Sheng-Lun Tai, Larry Berg, Walter Musial, Julie K. Lundquist, Avi Purkayastha, Ethan Young, Caroline Draxl. 2024. *Causes of and Solutions to Wind Speed Bias in NREL's 2020 Offshore Wind Resource Assessment for the California Pacific Outer Continental Shelf*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88215. <https://www.nrel.gov/docs/fy24osti/88215.pdf>.

Bodini, Nicola, Stephanie Redfern, Alex Rybchuk, Vincent Pronk, Simon Castagneri, Avi Purkayastha, Caroline Draxl, Ethan Young, Billy Roberts, Evan Rosenlieb, Walter Musial, Sheng-Lun Tai, Larry Berg, David Rosencrans, Julie K. Lundquist, and Mike Optis. 2023.

NOW-23: *The 2023 National Offshore Wind Data Set*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87675. https://nationaloffshorewind.org/wp-content/uploads/147502_Final-Report.pdf.

Bortolotti, Pietro, Samuel Kainz, Julian Quick, Mauricio Souza de Alencar, Sebastian Sanchez Perez Moreno, Katherine Dykes, Christopher Bay, and Michiel B.Zaaijer. 2024. *IEA Wind TCP Task 55: The IEA Wind 740-10-MW Reference Offshore Wind Plants*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87923. <https://www.nrel.gov/docs/fy24osti/87923.pdf>.

Burton, Robin, Murali Baggu, Nate Blair, Manajit Sengupta, Tom Harris, Clayton Barrows, Haiku Sky, Vahan Gevorgian, Jeremy Keen, Elena Smith, Mike Campton, Sushmita Jena, Jaemo Yang, Travis Williams, Paritosh Das, James Elsworth, Prateek Joshi, Cameron Weiner, James Morris, Joseph McKinsey, Surya Chandan Dhulipala, Sam Molnar, Weihang Yan, Pranav Sharma, Wenbo Wang, Aadil Latif, Daniel Thom, Sourabh Dalvi, Ian Baring-Gould, Matthew Lave, Amanda Wachtel, C. Birk Jones, Emily Moog, Andrea Mammoli, Richard Garrett, Thad Haines, Will Vining, Cody Newlun, Olga Hart, Marcelo Elizondo, Xiaoyuan Fan, Patrick Maloney, Alok Bharati, Bharat Vyakaranam, Vishvas Chalise, Patrick Royer, Fernando Bereta dos Reis, Xue (Michelle) Li, Kaveri Mahapatra, Jeff Dagle, Xinda Ke, Meng Zhao, Orestis Vasios, Tycko Franklin, Michael Abdelmalak, Kishan Guddanti, Samrat Acharya, Marcos Cruz, Pavel Etingov, Chuan Qin, Juan Carlos Bedoya, Tony Nguyen, Sraddhanjali Bhadra, Ahmad Tbaileh, Laura Ward, Victoria Sinnott, Pablo Mendez-Curbelo, Peter Cappers, Jeff Deason, Margaret Pigman, Lawrence Paul Lewis, John T. Murphy,; Thomaz Kobayashi-Carvalhaes, Melanie Bennett, Yilu Liu, Harvey Cutler, Martin Shields, Hwayoung Jeon, and Michele Chait. 2024. *Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study (PR100): Summary Report*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88615. <https://www.nrel.gov/docs/fy24osti/88615.pdf>.

Burton, Robin, Murali Baggu, Robin Burton, Nate Blair, Manajit Sengupta, Tom Harris, Clayton Barrows, Haiku Sky, Vahan Gevorgian, Jeremy Keen, Elena Smith, Mike Campton, Sushmita Jena, Jaemo Yang, Travis Williams, Paritosh Das, James Elsworth, Prateek Joshi, Cameron Weiner, James Morris, Joseph McKinsey, Surya Chandan Dhulipala, Sam Molnar, Weihang Yan, Pranav Sharma, Wenbo Wang, Aadil Latif, Daniel Thom, Sourabh Dalvi, Ian Baring-Gould, Matthew Lave, Amanda Wachtel, C. Birk Jones, Emily Moog, Andrea Mammoli, Richard Garrett, Thad Haines, Will Vining, Cody Newlun, Olga Hart, Marcelo Elizondo, Xiaoyuan Fan, Patrick Maloney, Alok Bharati, Bharat Vyakaranam, Vishvas Chalise, Patrick Royer, Fernando Bereta dos Reis, Xue (Michelle) Li,; Kaveri Mahapatra, Jeff Dagle, Xinda Ke, Meng Zhao, Orestis Vasios, Tycko Franklin, Michael Abdelmalak, Kishan Guddanti, Samrat Acharya, Marcos Cruz, Pavel Etingov, Chuan Qin, Juan Carlos Bedoya, Tony Nguyen, Sraddhanjali Bhadra, Ahmad Tbaileh, Laura Ward, Victoria Sinnott,; Pablo Mendez-Curbelo, Peter Cappers, Jeff Deason, Margaret Pigman, Lawrence Paul Lewis, John T. Murphy, Thomaz Kobayashi-Carvalhaes, Melanie Bennett, Yilu Liu, Harvey Cutler, Martin Shields,; Hwayoung Jeon, and Michele Chait. 2024. *Estudio de Resiliencia de la Red Electrica de Puerto Rico y Transiciones a Energia 100% Renovable (PR100): Informe Resumido (Spanish Translation)*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88616. <https://www.nrel.gov/docs/fy24osti/88616.pdf>.

Burton, Robin, Murali Baggu, Robin Burton, Nate Blair, Manajit Sengupta, Tom Harris, Clayton Barrows, Haiku Sky, Vahan Gevorgian, Jeremy Keen, Elena Smith, Mike Campton, Sushmita Jena, Jaemo Yang, Travis Williams, Paritosh Das, James Elsworth, Prateek Joshi, Cameron Weiner, James Morris, Joseph McKinsey, Surya Chandan Dhulipala, Sam Molnar, Weihang Yan, Pranav Sharma, Wenbo Wang, Aadil Latif, Daniel Thom, Sourabh Dalvi, Ian Baring-Gould, Matthew Lave, Amanda Wachtel, C. Birk Jones, Emily Moog, Andrea Mammoli, Richard Garrett, Thad Haines, Will Vining, Cody Newlun, Olga Hart, Marcelo Elizondo, Xiaoyuan Fan, Patrick Maloney, Alok Bharati, Bharat Vyakaranam, Vishvas Chalise, Patrick Royer, Fernando Bereta dos Reis, Xue (Michelle) Li,; Kaveri Mahapatra, Jeff Dagle, Xinda Ke, Meng Zhao, Orestis Vasios, Tycko Franklin, Michael Abdelmalak, Kishan Guddanti, Samrat Acharya, Marcos Cruz, Pavel Etingov, Chuan Qin, Juan Carlos Bedoya, Tony Nguyen, Sraddhanjali Bhadra, Ahmad Tbaileh, Laura Ward, Victoria Sinnott,; Pablo Mendez-Curbelo, Peter Cappers, Jeff Deason, Margaret Pigman, Lawrence Paul Lewis, John T. Murphy, Thomaz Kobayashi-Carvalhaes, Melanie Bennett, Yilu Liu, Harvey Cutler, Martin Shields,; Hwayoung Jeon, and Michele Chait. 2024. *Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study (PR100): Final Report*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88384. <https://www.nrel.gov/docs/fy24osti/88384.pdf>.

Burton, Robin, Murali Baggu, Robin Burton, Nate Blair, Manajit Sengupta, Tom Harris, Clayton Barrows, Haiku Sky, Vahan Gevorgian, Jeremy Keen, Elena Smith, Mike Campton, Sushmita Jena, Jaemo Yang, Travis Williams, Paritosh Das, James Elsworth, Prateek Joshi, Cameron Weiner, James Morris, Joseph McKinsey, Surya Chandan Dhulipala, Sam Molnar, Weihang Yan, Pranav Sharma, Wenbo Wang, Aadil Latif, Daniel Thom, Sourabh Dalvi, Ian Baring-Gould, Matthew Lave, Amanda Wachtel, C. Birk Jones, Emily Moog, Andrea Mammoli, Richard Garrett, Thad Haines, Will Vining, Cody Newlun, Olga Hart, Marcelo Elizondo, Xiaoyuan

Fan, Patrick Maloney, Alok Bharati, Bharat Vyakaranam, Vishvas Chalise, Patrick Royer, Fernando Bereta dos Reis, Xue (Michelle) Li,; Kaveri Mahapatra, Jeff Dagle, Xinda Ke, Meng Zhao, Orestis Vasios, Tycko Franklin, Michael Abdelmalak, Kishan Guddanti, Samrat Acharya, Marcos Cruz, Pavel Etingov, Chuan Qin, Juan Carlos Bedoya, Tony Nguyen, Sraddhanjoli Bhadra, Ahmad Tbaileh, Laura Ward, Victoria Sinnott,; Pablo Mendez-Curbelo, Peter Cappere, Jeff Deason, Margaret Pigman, Lawrence Paul Lewis, John T. Murphy, Thomaz Kobayashi-Carvalhoes, Melanie Bennett, Yilu Liu, Harvey Cutler, Martin Shields,; Hwayoung Jeon, and Michele Chait. 2024. *El Estudio de Resiliencia de la Red Electrica de Puerto Rico y Transiciones a Energia 100% Renovable (PR100): Informe Final*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88614.

<https://www.nrel.gov/docs/fy24osti/88614.pdf>.

Cooperman, Aubryn, J. Zoellick, G. Adams, A. Mustafa, R. Anilkumar, P. Duffy, A. Sparks, S. Kramer, S. Trush, S. Bernstein, C. Butler, A. Porter, A. Herath, M. Cesario, E. Wallach, C. Ingvaldsen, D. Wakeman, C. Chamberlin, and A. Jacobson. 2023. *Northern California and Southern Oregon Offshore Wind Transmission Study*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87090. <https://schatzcenter.org/pubs/2023-OSW-R2.pdf>.

Corbus, Dave, Gregory Brinkman, Mike Bannister, Sophie Bredenkamp, Lanaia Carveth, Rebecca Green, Luke Lavin, Anthony Lopez, Melinda Marquis, Joseph Mowers, Matthew Mowers, Leonardo Rese, Billy Roberts, Amy Rose, Shahil Shah, Pranav Sharma, Hongfei Sun, Bin Wang, Bharat Vyakaranam, Zhenyu (Henry) Huang, Kevin Harris, Chuan Qin, Nader Samaan, Marcelo Elizondo,; Tony Nguyen, Quan Nguyen, Kishan P. Guddanti, Patrick Royer, Fernando Bereta dos Reis, Shahnawaz Siddiqui, Sameer Nekkallapu, and Michael Abdelmalak. 2024. *Atlantic Offshore Wind Transmission Study*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88003. <https://www.nrel.gov/docs/fy24osti/88003.pdf>.

Corbus, Dave, Gregory Brinkman, Mike Bannister, Sophie Bredenkamp, Lanaia Carveth, Rebecca Green, Luke Lavin, Anthony Lopez, Melinda Marquis, Joseph Mowers, Matthew Mowers, Leonardo Rese, Billy Roberts, Amy Rose, Shahil Shah, Pranav Sharma, Hongfei Sun, Bin Wang, Bharat Vyakaranam, Zhenyu (Henry) Huang, Kevin Harris, Chuan Qin, Nader Samaan, Marcelo Elizondo,; Tony Nguyen, Quan Nguyen, Kishan P. Guddanti, Patrick Royer, Fernando Bereta dos Reis, Shahnawaz Siddiqui, Sameer Nekkallapu, and Michael Abdelmalak. 2024. *Atlantic Offshore Wind Transmission Study: Executive Summary*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-89304. <https://www.nrel.gov/docs/fy24osti/89304.pdf>.

DeGeorge, Elise, Rebecca Meadows, Aubryn Cooperman, Mariya Koleva, Caroline Draxl, Levi Kilcher, Elena Baca, Kerry Strout Grantham, Walter Musial, Nathan Wiltse, and Omar Jose Guerra Fernandez. 2023. *Feasibility Study for Renewable Energy Technologies in Alaska Offshore Waters*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87903.

https://espis.boem.gov/final%20reports/BOEM_2023-076.pdf.

Eberle, Annika, Trieu Mai, Owen Roberts, Travis Williams, Pavlo Pinchuk, Anthony Lopez, Matthew Mowers, Joseph Mowers, Tyler Stehly, and Eric Lantz. 2024. *Incorporating Wind Turbine Choice in High-Resolution Geospatial Supply Curve and Capacity Expansion Models*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87161.

<https://www.nrel.gov/docs/fy24osti/87161.pdf>.

Fuchs, Rebecca, Walt Musial, Gabriel R. Zuckerman, Mayank Chetan, Melinda Marquis, Leonardo Rese, Aubryn Cooperman, Patrick Duffy, Rebecca Green, Philipp Beiter, Daniel Mulas Hernandez, James A. Morris Jr., Alyssa Randall, Jonathan A. Jossart, Lauren Mudd, and Peter Vickery. 2023. *Assessment of Offshore Wind Energy Opportunities and Challenges in the U.S. Gulf of Mexico*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88195. <https://www.nrel.gov/docs/fy24osti/88195.pdf>.

Houghteling, Clara, Anthony Teixeira, and Chloe Constant. 2024. *Expanding the Baseline: Community Perspectives on Equity in Land-Based Wind Energy Development and Operations*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88903. <https://www.nrel.gov/docs/fy24osti/88903.pdf>.

Jamison, Johanna, Simon Sandler, William Scott Carron, and Johanna Jamison. 2024. *Jackson County Community Solar Modeling Results*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88408.

<https://www.nrel.gov/docs/fy24osti/88408.pdf>.

Keller, Jon. 2024. *GRC1.5 Project: Joint Industry Megawatt Scale Gearbox Field Tests: Cooperative Research and Development Final Report*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88867. <https://www.nrel.gov/docs/fy24osti/88867.pdf>.

Kotarbinski, Matthew, Brinn McDowell, Jonty Katz, Genevieve Starke, and Nicholas Riccobono. 2024. *A 2023 Perspective: What Is the Value of Hybridization?*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87824. <https://www.nrel.gov/docs/fy24osti/87824.pdf>.

Lopez, Anthony, P. J Stanley, Owen Roberts, Trieu Mai, Travis Williams, Pavlo Pinchuk, Grant Buster, and Eric Lantz. 2023. *Estimating National-Scale Wind Potential Using Spatially Explicit Turbine Layout Optimization*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-85075. <https://www.nrel.gov/docs/fy24osti/85075.pdf>.

Lopez, Anthony, Pavlo Pinchuk, Michael Gleason, Wesley Cole, Trieu Mai, Travis Williams, Owen Roberts, Marie Rivers, Mike Bannister, Sophie-Min Thomson, Gabe Zuckerman, and Brian Sergi. 2024. *Solar Photovoltaics and Land-Based Wind Technical Potential and Supply Curves for the Contiguous United States: 2023 Edition*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87843. <https://www.nrel.gov/docs/fy24osti/87843.pdf>.

McDowell, Brinn, Jeremy Stefek, Elena Smith, Bailey Pons, and Quaran Ahmad. 2024. *National Wind Energy Workforce Assessment: Challenges, Opportunities, and Future Needs*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87670. <https://www.nrel.gov/docs/fy24osti/87670.pdf>.

McDowell, Brinn, Jeremy Stefek. 2024. *National Wind Workforce Assessment Methods Report: Surveys and System Dynamics Model*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87787. <https://www.nrel.gov/docs/fy24osti/87787.pdf>.

Mulas Hernando, Daniel, Walter Musial, Patrick Duffy, and Matt Shields. 2023. *Capacity Density Considerations for Offshore Wind Plants in the United States*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-86933. <https://www.nrel.gov/docs/fy24osti/86933.pdf>.

Perez, Paula, Owen Roberts, Aubryn Cooperman, and Matt Shields. 2024. *Potential Impacts of the Inflation Reduction Act on Domestic Manufacturing and Deployment for Land-Based Wind Turbines*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87300. <https://www.nrel.gov/docs/fy24osti/87300.pdf>.

Wiley, Will, Roger Bergua, Amy Robertson, Jason Jonkman, Lu Wang, Michael Borg, and Matthew Fowler. 2023. *Definition of the Stiesdal Offshore TetraSpar Floating Wind System for OC6 Phase IV*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-86442. <https://www.nrel.gov/docs/fy24osti/86442.pdf>.



National Renewable Energy Laboratory
15013 Denver West Parkway, Golden, CO 80401
303-275-3000 • www.nrel.gov

NREL prints on paper that contains recycled content.

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/MP-5000-90028 • May 2024

*Front cover photo by Josh Bauer and Brian Bechtold, NREL. Back
cover photo by Werner Slocum, NREL.*

