U.S. DEPARTMENT OF ENERGY

Office of
ENERGY EFFICIENCY & RENEWABLE ENERGY

2018 Wind Industry Partnership Summit

JANUARY 24–25, 2018
HOTEL PALOMAR
WASHINGTON, D.C.

LETTER FROM THE DIRECTOR

Welcome to the Wind Industry Partnership Summit presented by the U.S. Department of Energy's (DOE's) Wind Energy Technologies Office (WETO). Our goal for this summit is to help you gather information that directly addresses wind energy technology research and development (R&D) activities that enable innovations needed to advance U.S. wind systems. We also hope that throughout the summit you will gain a better understanding of the DOE and national laboratory resources available to you.

By bringing together wind industry executives and representatives from DOE and the national laboratories, this summit offers everyone the unique opportunity to network and engage in substantive discussions about how federally funded research can addresses the industry's R&D needs and challenges. We encourage you to share your expertise and insights during three distinct panel sessions: ***Turbine Technology Innovation and Extreme-Scale Turbines, The Wind Plant of the Future,*** and ***Grid-Enhancing Wind Power Plants***. Each session focuses on the intersection between wind industry R&D needs and the capabilities of DOE's national laboratories and other R&D participants.

This summit will reveal how you can to take advantage of new partnership opportunities between industry and the DOE national laboratories—collaborations that successfully address critical technology challenges, improve the competitiveness of American wind businesses, accelerate innovation, and achieve bottom-line results.

Ultimately, our goal is to work together to generate reliable and economical electricity from America's wind resources. By attending this summit, you are expressing your commitment to shaping the future of the wind industry. Thank you for your dedication.

Sincerely,

Valerie Reed
Acting Director, Wind Energy Technologies Office

ABOUT US

The U.S. Department of Energy's Wind Energy Technologies Office invests in energy science R&D activities that enable the innovations needed to advance U.S. wind systems. WETO is dedicated to driving down the cost of wind energy with more efficient, reliable, and predictable wind energy systems.

WHAT WE DO

WETO's research and development activities are aimed at improving performance, lowering costs, and reducing market barriers for U.S. wind energy. The office works with national laboratories, industry, universities, and other agencies to conduct R&D activities through competitively selected, directly funded, and cost-shared projects. Our efforts target both land-based and offshore wind power at the utility scale as well as systems on the distribution side and focus on novel research not being undertaken by the U.S. wind industry due to perceived cost, risk, or focus on near-term investment returns.

WHY IT MATTERS

Using the nation's abundant wind resources for electric power generation helps the nation increase its competitiveness, diversify its energy supply, increase energy security and independence, and provide affordable electricity across the country. In addition, wind energy deployment helps stimulate the revitalization of key sectors of the economy by investing in infrastructure and creating long-term skilled jobs.

ENABLING U.S. INDUSTRY GROWTH AND U.S. COMPETITIVENESS

WETO is committed to helping the nation secure affordable, unsubsidized wind energy and enhance U.S. competitiveness in the global wind market through energy science R&D activities that enable technology innovation. WETO invests in improvements to wind power plant design and technology development and operation, as well as helps develop tools to identify the highest quality wind resources. The United States can remain a leading global market for wind energy due to its vast domestic resources, low cost, and highly skilled workforce.

ADVANCING THE GROWTH OF THE U.S. WIND INDUSTRY: FEDERAL INCENTIVES, FUNDING, AND PARTNERSHIP OPPORTUNITIES

WETO provides information for researchers, developers, businesses, manufacturers, communities, and others seeking various types of federal assistance available for advancing wind energy.

Wednesday, January 24, 2018	
8:00 a.m.–8:30 a.m.	**Networking Breakfast and Registration**
8:30 a.m.–8:40 a.m.	**Welcome to DOE's Wind Industry Partnership Summit** *Speaker:* Alexsandra Lemke, Senior Advisor, External Affairs, DOE and the National Renewable Energy Laboratory (NREL)
8:40 a.m.–8:50 a.m.	**Opening Remarks** *Speaker:* Valerie Reed, Acting Director, DOE, WETO
8:50 a.m.–9:00 a.m.	**DOE Wind Program Overview** *Speaker:* Mike Derby, Wind Program Manager, DOE, WETO Learn about the cutting-edge department activities that are leading research, development, and testing to commercialize innovative technologies that generate reliable and economical electricity from America's wind resources.
9:00 a.m.–10:00 a.m.	**Technology-to-Market Survey Validation and Q&A** *Speaker:* Brian Naughton, Sandia National Laboratories (Sandia) Validation of Industry Survey on Technology Needs and Priorities, Q&A
10:00 a.m.–10:15 a.m.	**Networking Break**
10:15 a.m.–10:30 a.m.	**Summit Facilitation Guidelines** *Speaker:* Bonnie Ram, Ram Power, LLC
10:30 a.m.–12:15 p.m.	**Turbine Technology Innovation and Extreme-Scale Turbines** *Speakers:* • Industry Needs Perspectives | Peter Fuglsang, Siemens, and Kristian Dixon, Envision • Laboratory Responses | Daniel Laird, NREL, and Joshua Paquette, Sandia • DOE Facilitator | Mike Derby, DOE, WETO • Facilitator | Bonnie Ram, Ram Power, LLC
12:15 p.m.–1:30 p.m.	**Networking Lunch, Urbana Restaurant**
1:30 p.m.–3:30 p.m.	**Wind Plant of the Future** *Speakers:* • Industry Needs Perspectives | Kiersten Ralston, GE, and Mark Alstrom, NextEra Energy Resources, WindLogics • Laboratory Response | Will Shaw, Pacific Northwest National Laboratory, and Paul Veers, NREL • DOE Facilitator | Mike Derby, DOE, WETO • Facilitator | Bonnie Ram, Ram Power, LLC
3:30 p.m.–4:00 p.m.	**Networking Break**
4:00 p.m.–5:00 p.m.	**Information Session: How to Collaborate with DOE and the National Laboratories** *Speaker:* Alexsandra Lemke, Senior Advisor, External Affairs, DOE and NREL
5:00 p.m.–6:00 p.m.	**No-Host Happy Hour, Urbana Restaurant**

Thursday, January 25, 2018	
8:15 a.m.–8:45 a.m.	**Networking Breakfast**
8:45 a.m.–9:00 a.m.	**Introduction/First Day Recap**
9:00 a.m.–11:00 a.m.	**Grid-Enhancing Wind Power Plants** *Speakers:* • Industry Needs Perspectives | Nick Miller, GE, and Randy Oye, Xcel Energy • Laboratory Responses | Jake Gentle, Idaho National Laboratory, and Greg Brinkman, NREL • DOE Facilitator | Charlton Clark, DOE, WETO • Facilitator | Bonnie Ram, Ram Power, LLC
11:00 a.m.–12:00 p.m.	**Closing Session** *Speakers:* • Summary of Issues and Follow-Up Actions | Mike Derby, DOE, WETO • Closing Comments | Valerie Reed, DOE, WETO

WORKING TOGETHER TO MOVE THE WIND ENERGY INDUSTRY FORWARD

The Wind Energy Technologies Office provides information for researchers, developers, businesses, manufacturers, communities, and others seeking various types of federal assistance available for advancing wind energy projects. This section provides information on the primary federal incentives for developing and investing in wind energy, resources for funding wind energy, and opportunities to partner with DOE and other federal agencies on efforts to move the U.S. wind energy industry forward.

DOE OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY (EERE)

Through funding opportunities offered by various office programs (including WETO), EERE offers financial assistance to businesses, industry, universities, and other organizations to encourage the development and demonstration of renewable energy and energy efficiency technologies with the goal of increasing their adoption. *https://eere-exchange.energy.gov/Default.aspx*

DOE ADVANCED RESEARCH PROJECTS AGENCY-ENERGY (ARPA-E)

ARPA-E funds short-term, technology-focused, applied R&D aimed at creating real-world solutions to important problems in energy creation, distribution, and use. The agency's focus is advancing high-impact energy technologies that are too early for private-sector investment but have the potential to radically improve U.S. economic security, national security, and environmental well-being. *https://arpa-e.energy.gov/?q=programs/apply-for-funding*

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

The Small Business Administration's SBIR program encourages U.S. small businesses to engage in federal R&D that has potential for commercialization. Its mission is to support scientific excellence and technological innovation through the investment of federal research funds in critical American priorities to build a strong national economy. Eleven federal agencies, including DOE, participate in the program, soliciting grant proposals from small businesses and making awards on a competitive basis. *https://science.energy.gov/sbir/funding-opportunities/*

DOE OFFICE OF TECHNOLOGY TRANSITIONS TECHNOLOGY COMMERCIALIZATION FUND (TCF)

The TCF leverages the R&D funding in DOE's applied energy programs to advance energy technologies with the potential for high impact. It uses 0.9% of the funding for DOE's applied energy research, development, demonstration, and commercial application budget for each fiscal year from the Office of Electricity, Office of Energy Efficiency and Renewable Energy, Office of Fossil Energy, and Office of Nuclear Energy. These funds are matched with funds from private partners to promote promising energy technologies with the goal of increasing the commercialization and economic impact of energy technologies developed at DOE's national labs. *https://energy.gov/technologytransitions/services/technology-commercialization-fund*

SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROGRAM

The Small Business Administration's STTR program funds collaborative efforts between small businesses and research institutions with the goal of transferring technologies and products from the laboratory to the marketplace. STTR's focus is on bridging the gap between the performance of basic science and the commercialization of resulting innovations. Five federal agencies, including DOE, participate in the program, soliciting grant proposals from small businesses and making awards on a competitive basis. *https://science.energy.gov/sbir/*

SMALL BUSINESS VOUCHERS (SBV)

DOE's SBV program provides clean-energy small businesses access to select national labs—making the contracting process simple, lab practices transparent, and access to the labs' unique facilities practical. Through SBV, selected small businesses receive access to the state-of-the-art facilities and experts at participating DOE national labs, while the labs expand their knowledge of and involvement with the private sector, helping small businesses with advanced technologies contribute to American competitiveness and economic growth. *https://www.sbv.org/*

There are a variety of ways to partner with the labs to access their unique capabilities and meet specific needs.

Agreement Type	Definition	Cost	Estimated Timeline*	Benefits
Cooperative Research and Development Agreement (CRADA)	Collaboration between a lab and one or more partners outside the federal government (usually from industry, nonprofit organizations, or academia, domestic or foreign) to collaborate and share the results of a jointly conducted R&D project.	Lab and participant may share costs or participant pays 100% funds-in.	One month	• Leverage and optimize resources • Share technical expertise in a protected environment • Option to obtain license to the lab CRADA-generated intellectual property (IP) on agreed-upon terms and conditions • Five-year data protection • Each partner may take title to its own CRADA-generated IP
Agreement for Commercializing Technology (ACT)	ACT is an agreement type allowed by DOE for its laboratory contractors to use third-party terms provisions for work performed with or for that third party. DOE IP provisions are required. ACT permits a more flexible cost structure to enable the laboratory contractor to cover certain costs, such as insurance, associated with risks of projects.	Varies, depending on circumstance. Participant pays 100% for laboratory contractor's cost of work. Example: lab and participant may share costs or participant pays 100% funds-in.	Two to four months to establish, depending on U.S. or foreign ownership and length of terms negotiations (about the same as other agreement types).	• Leverage and optimize existing capabilities at lab, freedom to negotiate as lab, releasing DOE from obligation • Option to work at the speed and style of industry partners: operating more like a business • Terms flexibility provides room to modularize each aspect of the agreement, to explore more thoroughly the risks (financial, performance, funding, resources/skills) • Allows lab to engage in more relevant, impactful work, such as accepting funds from foundations or nongovernmental organizations
Strategic Partnership Project *Formerly known as work-for-others*	Labs conduct work for non-DOE entities (such as industry, small businesses, or other federal agencies) and may utilize DOE facilities.	Participant pays full cost of the lab's effort.	One month	• Access to unique facilities, services, and/or technical expertise • Flexible terms for IP and licensing rights
User Facility Agreement	Users may access facilities, specialized equipment, instrumentation, and/or personnel, and so on, to conduct proprietary or nonproprietary research.	User pays approved user rate or each party covers its own cost.	Two weeks	• Generated data treated as proprietary (if proprietary user facility agreement) • Access to unique facilities and equipment to validate or improve user technology
Technical Service Agreement	Lab staff provide short-term technical assistance to organizations with technical problems requiring expertise that is not available commercially.	Participant pays full cost of the lab's effort.	Five–ten business days	• Access to lab scientists' and engineers' expertise
Licenses	Companies acquire IP rights (such as patents, copyrights, and trademarks) to commercialize technology developed by the lab.	Payment (in the form of issue fees, royalties on sales, equity in company, and so on) is nonrefundable and provided by the licensee.	One month or more depending on the license	• Leverage cutting-edge inventions to drive technology commercialization • Licenses may be nonexclusive or exclusive • Opportunity available to small and large businesses

Note that this table does not capture all partnering mechanisms, and there might be differences between each of the laboratories. Please contact the potential laboratory partner being considered for additional information.

*The exact timeline for completing agreements is determined on a case-by-case basis (the estimated timelines above reflect time to complete agreements after the statement of work and funding have been agreed upon). Agreements with non-U.S. entities take longer.

NATIONAL LABORATORIES WITH WIND ENERGY EXPERTISE

Stemming from immense government investment in scientific research during World War II, DOE's national laboratories have served as the leading institutions for scientific innovation in the United States for more than 70 years. Today, 17 national laboratories address large-scale, complex research and development challenges with a multidisciplinary approach that translates basic science into innovation. WETO funds several national labs to conduct early-stage research to accelerate wind energy technologies. The national labs also work with industry, academia, and many other stakeholders to solve scientific challenges while providing test facilities, sophisticated instrumentation, and deep expertise. The following laboratories are working directly with DOE on specific activities concentrating on wind research and development.

ARGONNE NATIONAL LABORATORY

Lemont, Illinois

- **Advanced Photon Source User Facility**—Allows better understanding of the root causes of premature turbine component failures by using an intense beam of X-rays to locate defect and crack formations.
- **Atmospheric Observatory**—Features wind resource instrumentation facilities that include a meteorological tower, multiple sonic anemometers, temperature and surface energy budget measurement systems, custom sodar systems, the Radar Wind Profiler that records winds from 300 meters above the ground level, surface flux measurement systems, and stabilized platforms for offshore use.
- **Atmospheric Radiation Measurement at the Southern Great Plains Site**—Provides access to meteorological instrumentation, data sets for wind forecasting, and plant optimization.
- **Tribology Laboratory**—Offers accelerated testing and root-cause analysis of the materials in drivetrain components that experience surface damage, such as micropitting, fatigue pitting, scuffing, and wear.
- **Leadership Computing Facility**—Supports the advancement of wind predictions by increasing model resolution and improving physical representations of complex terrains using advanced modeling tools on high-performance computing platforms.
- **Electric Power Grid with Renewable Energy Sources**—Offers advanced grid modeling for grid operators to simulate and predict the reliability, economic and market effects, and policy implications of the increasing penetration of renewables on the power grid.

Contact: Ushma Kriplani, *ushma@anl.gov* | *www.anl.gov*

IDAHO NATIONAL LABORATORY

Idaho Falls, Idaho

- **Critical Infrastructure Test Range**—Features a 61-mile transmission loop, seven substations, and three commercial feeds that enable physical and cyber performance testing on industry-scale infrastructure systems.
- **Wireless National User Facility**—Enables researchers to address national challenges in infrastructure security, communications interoperability, spectrum utilization, and the reliability of wireless technologies.
- **Human System Simulation Laboratory**—Represents a reconfigurable virtual control center for integrating transmission line dynamic line rating tools and wind, solar, or temperature data visualization into electric utility control centers.
- **Power and Energy Real-Time Digital Simulation Laboratory**—Incorporates real-world data, hardware, and software into real-time simulations of electrical, thermal, and mechanical systems.
- **Microgrid Test Bed**—Incorporates wind and solar power, two flow batteries capable of storing 320 kilowatt-hours, advanced modeling, and load control capabilities.

Contact: Jake Gentle, *jake.gentle@inl.gov* | *www.inl.gov*

Argonne NATIONAL LABORATORY

INL Idaho National Laboratory

BERKELEY LAB

Lawrence Livermore National Laboratory

LAWRENCE BERKELEY NATIONAL LABORATORY

Berkeley, California

- **Electricity Markets Research**—Delivers research and analysis expertise, including wind energy cost and performance trends and drivers, system value, market potential, electric grid operations and infrastructure impacts, and public acceptance and deployment barriers.
- **Cyclotron Road**—Offers a home for top entrepreneurial researchers to advance technologies until they can succeed beyond the research lab by supporting critical technology development and helping identify the most suitable business models, partners, and financing mechanisms for long-term impact.

Contact: Ryan Wiser, *rhwiser@lbl.gov* | *www.lbl.gov*

LAWRENCE LIVERMORE NATIONAL LABORATORY

Livermore, California

- **Model and Site Validation**—Supplies a 7,000-acre rural facility used for model and observation site validation.
- **Mobile Observational Instruments**—Gives access to mobile observational instruments, including lidar, surface flux measurements, and sonic anemometry.
- **Multiscale Atmospheric Simulation**—Bridges the range of atmospheric scales of motion, from weather to turbulence, that impact wind plant operation and performance.

Contact: Jeff Mirocha, *mirocha2@llnl.gov* | *www.llnl.gov*

LOS ALAMOS NATIONAL LABORATORY

Los Alamos, New Mexico

- **Model Development**—Focuses on improved multiscale characterization of wind plant inflow conditions for use in wind turbine design and operation within a plant.
- **Grid Optimization and Controls**—Develop advanced methods for stochastic optimal power that integrate a high penetration of variable and intermittent wind resources into power systems while accounting for power system controls and nonlinear response and mitigating the risk of network and generator overloads and voltage violations.
- **Energy Management Systems**—Integrate advanced stochastic optimal power flow with methods for stochastic unit commitment to reduce the economic cost of wind integration.

Contact: Fawn Gore, *fawn@lanl.gov* | *www.lanl.gov*

NATIONAL RENEWABLE ENERGY LABORATORY

Golden, Colorado

- **National Wind Technology Center**—Gives industry partners the technical support needed to develop wind turbine components and improve existing technologies.
- **Dynamometer Research Facilities**—Allow engineers to conduct analyses on the mechanical and electrical systems of a wind turbine.
- **Field Test Sites**—Provide numerous test pads to field test prototypes of small and large wind turbines.
- **Regional Test Centers**—Offer access to technical assistance in support of the small wind turbine market.
- **Structural Testing Laboratory**—Provides laboratory facilities and resources for assembly, experimentation, structural and design validation, and certification of small- and large-scale components and turbine systems.
- **Controllable Grid Interface**—Reduces certification testing time and costs while providing system engineers with a better understanding of how wind turbines, photovoltaic inverters, and energy storage systems react to disturbances on the electric power system.

Contact: Brian Smith, *brian.smith@nrel.gov* | *www.nrel.gov/wind*

OAK RIDGE NATIONAL LABORATORY

Oak Ridge, Tennessee

- **Manufacturing Demonstration Facility**—Performs advanced manufacturing R&D and provides industry with the tools and expertise to produce cutting-edge wind turbine components and tooling, reduce prototyping and production times, increase product reliability, and focus on decreasing the cost of wind technologies.
- **Carbon Fiber Technology Facility**—Develops low-cost carbon fibers and provides the wind energy industry with a flexible, highly instrumented carbon fiber line that can be used to demonstrate advanced technology scalability and produce prototypical carbon fibers while serving as the last step before commercial production.
- **Composite Materials and Process Technology Facility**—Focuses on the development and characterization of energy-efficient, high-rate, and low-variability composites and their processing as part of the Institute for Advanced Composites Manufacturing Innovation.

Contact: Dominic Lee, *leedf@ornl.gov* | *www.ornl.gov/cleanenergy*

PACIFIC NORTHWEST NATIONAL LABORATORY

Richland, Washington

- **Atmospheric Radiation Measurement Climate Research Facilities**—Grant access to meteorological instrumentation for wind forecasting and plant optimization.
- **Systems Engineering Building**—Provides space and equipment that furthers basic and applied research in electricity markets, generation, transmission, distribution, and end use, including buildings-grid integration.
- **Lab Homes**—Provide custom side-by-side homes (i.e., baseline home and experimental home) to conduct energy research in a typical, occupied home environment.
- **Marine Sciences Lab**—Offers research capabilities in wetland and coastal ecology, environmental monitoring/measurement, remote sensing, water resources modeling, and national and homeland security.

Contact: Will Shaw, *will.shaw@pnnl.gov* | *www.pnnl.gov*

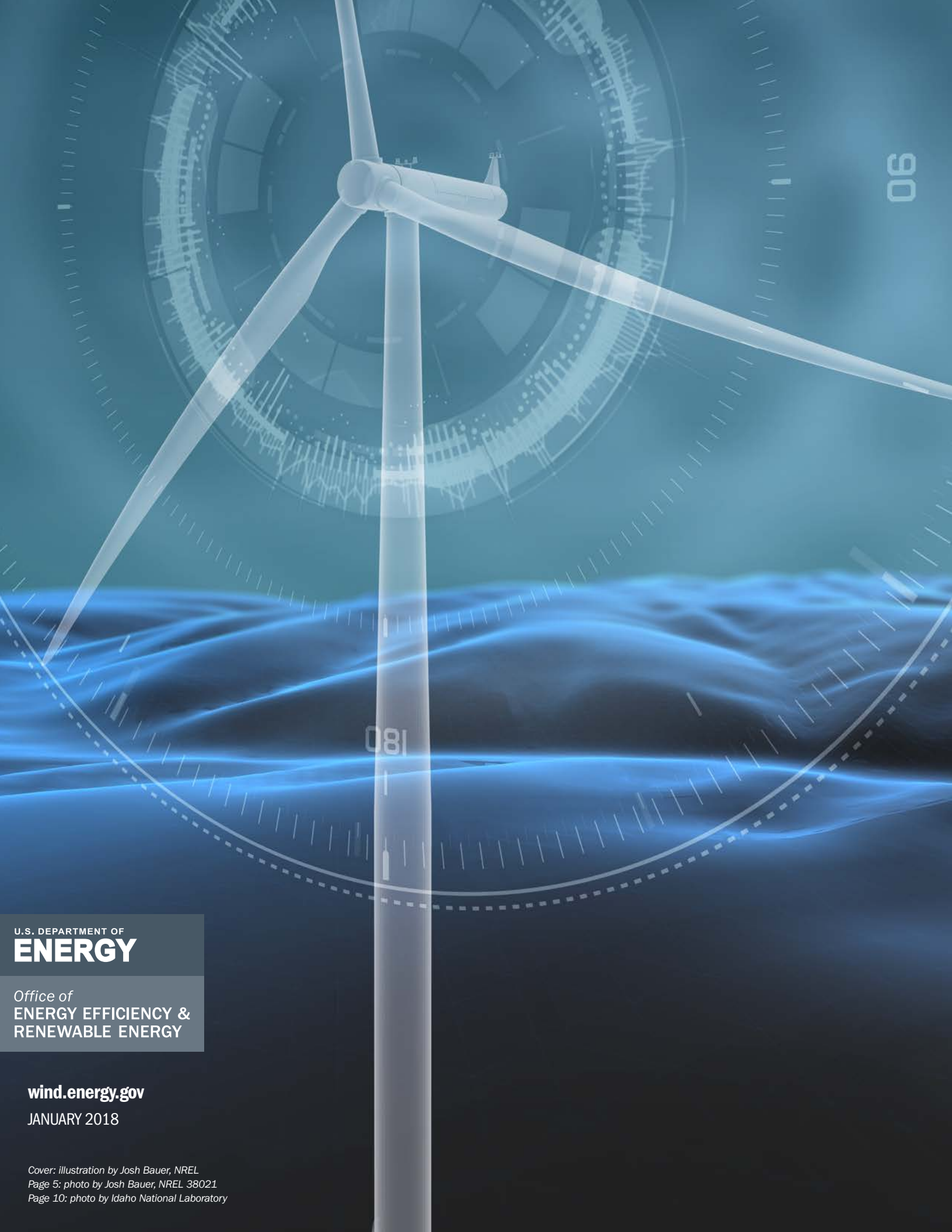
SANDIA NATIONAL LABORATORIES

Albuquerque, New Mexico

- **Scaled Wind Farm Technology Facility**—Enables rapid, cost-efficient testing and development of wind energy technologies.
- **Wake-Imaging System**—Improves the spatial- and temporal-resolution capabilities of velocity measurements within wind farms that are needed to provide the necessary data for validating high-fidelity simulations.
- **Synthetic Aperture Radar**—Provides high-resolution imagery for wind radar interference research by using long-range propagation characteristics of radar signals and complex information processing.
- **Infrastructure Assurance and Non-Destructive Inspection Facility**—Advances methods to reliably detect cracks, voids, weak bonds, and disbands in both metal and composite structures and associated damage tolerance and advanced materials studies.

Contact: Brian Naughton, *bnaught@sandia.gov* | *wind.sandia.gov*

NOTES



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