



# CReW

*Center for Research in Wind*

TAKING THE LEAD IN **WIND POWER**  
RESEARCH, EDUCATION AND POLICY



THE FUTURE OF  
**SUSTAINABLE  
ENERGY**  
HAS ARRIVED

Wind power is a rapidly-growing and evolving field that is quickly becoming integral to our way of life. In 2018, wind energy generated 6.5% of the nation's electricity, enough to power 26 million homes. By the year 2050, wind power is expected to contribute 35% of the nation's energy, thanks in part to offshore wind power. Our shores possess a power potential that's nearly double the nation's current electricity use.

The Center for Research in Wind (CRoW) at the University of Delaware (UD) stands at the forefront of the wind power revolution. With experts and scientists in appointments across four of UD's seven colleges, CRoW aims to broadly expand knowledge in offshore and coastal wind power, transmission planning, and storage to support large-scale, carbon-free power systems. We also strive to educate the next generation of students and actively engage industry, policy makers and the public in discussions on offshore wind power, vehicle-to-grid (V2G) electric storage, and renewable energy.





# PUSHING THE BOUNDARIES OF RESEARCH

CRew is dedicated to mitigating the adverse effects of human-produced CO<sub>2</sub>, the greatest greenhouse gas contributor toward climate change. Our primary focus is centered on electricity and transportation: offshore wind power as a means of electricity generation and grid-integrated vehicle (GIV) technology as a means of electricity storage using vehicle-to-grid power (V2G).



## WIND

With an emphasis on coastal and offshore wind, CRew's wind power program is cross-cutting, integrated, and interdisciplinary. The program emphasizes social science perspectives, (e.g., public perceptions); environmental risks and benefits through geophysics, remote sensing, marine spatial planning and siting; wind resource measurement and modeling; and other engineering and economic challenges and opportunities, including tourism and job creation. Through our research and engagement with communities and decision makers, we also focus on other potential benefits of offshore wind power, including reduction in health impacts. Focal points also include the local need for wind energy to reduce air and water pollution and growing urgencies to respond to climate change impacts in a cost-effective manner that considers energy independence. Founded in 2008, the Center was the first interdisciplinary offshore wind energy center in the country.



## V2G

UD is the pioneer of V2G technology, which utilizes both software and hardware to allow electric vehicle batteries to help balance the power grid as clean energy sources—such as wind and solar—become more readily available. The University launched the world's first revenue-generating V2G project at its main campus in 2013.

The flow of power in and out of an electric-drive vehicle can be valuable to the electric grid, but only if it is provided precisely when needed. Through partnerships with institutions both academic and industrial, CRew's research is helping to perfect and disseminate a set of interacting V2G technologies, policies, and market strategies to achieve this value, while meeting the driving requirements of vehicle owners.



# PREPARING THE NEXT GENERATION

The students of today are the experts of tomorrow. CReW is committed to educating the next generation of wind power scientists, academics, professionals and policymakers through courses, specialized hands-on academies, and comprehensive certificate programs.



## GRADUATE EDUCATION AND PROGRAMS

Hands-on education is particularly important to graduate education. To this end, CReW works closely with graduate student research assistants and undergraduate researchers on innovative and impactful projects and partnerships. Our students study theory and methods, work with industry and other interested parties, analyze policies, and give demonstrations and lectures about new clean technologies.

Offering a Graduate Certificate in Wind Power Science Engineering and Policy, CReW helps degree and non-degree students gain a broad understanding of the wind energy industry from multiple disciplinary perspectives.



## BRIDGING THE GAP

Education doesn't end with a degree. In partnership with the Energy and Climate Academy of Denmark and UD's College of Earth, Ocean, and Environment, CReW is bridging the workforce gap with the Offshore Wind Skills Academy (OWSA), the first training program in the United States to focus on professionals and managers seeking to enter the industry or enhance their position within it.

The OWSA draws its instructors from experienced wind industry professionals who provide instruction in both introductory and advanced courses, from fundamentals to advanced thinking on developing offshore wind projects.







**Fig. 1 (left)** U.S. Rep. Lisa Blunt Rochester touring the 2-megawatt turbine on the Hugh R. Sharp campus in Lewes.

**Fig. 3 (below)** Lars Høst Johansen, Senior WTG Development Specialist at Ørsted, speaks to participants at the Offshore Wind Skills Academy.



**Fig. 2 (above)** A UD student tours the Block Island wind project as part of CReW's course on Offshore Wind Power Science, Engineering and Policy. The wind project is the U.S.' first offshore wind installation and is located off the coast of Rhode Island



## WORKING TOGETHER TO ADVANCE ENERGY SOLUTIONS

CReW is dedicated to engagement with the wider world, nurturing partnerships with industry, academia, communities, and government. From working with the Department of Energy's National Renewable Energy Laboratory (NREL) to collaborating with Siemens Gamesa on our 2 MW wind turbine to engaging in instructional partnerships and student exchanges with the Technical University of Denmark (DTU), CReW is an active collaborator with national laboratories, cutting-edge energy companies, academic institutions, citizen groups, and important policymakers to help make cleaner, more sustainable energy a reality.

# TOWER OF POWER

The University of Delaware is committed to being a leader in generating carbon-free energy. This commitment was jumpstarted in 2010, when a Gamesa G90-2.0 MW model wind turbine was erected adjacent to UD's Hugh R. Sharp Campus in Lewes, DE. The wind turbine is a collaboration between the University and Siemens Gamesa.

The 2-megawatt turbine provides energy to power university laboratories and buildings, with excess generation provided to the Lewes community—a total of more

than 45 million kilowatt hours in its first nine years of operation. The wind turbine also supports research and development, teaching opportunities and partnerships. Proceeds from the energy sales beyond those dedicated to ongoing turbine operation and maintenance are used to fund wind energy research and development projects. UD also partners with the Delaware Municipal Electric Corporation (DEMEC) through the sale of renewable energy credits (RECs) to fund graduate scholarships. The turbine has been a popular destination for federal institutions, communities and developers eager to expand their wind power knowledge.

**45**  
**MILLION**  
**KILOWATT**  
**HOURS**

Electricity generated by the turbine in its first nine years

**34.5K**  
**METRIC**  
**TONS**

Amount of carbon dioxide displaced from the atmosphere

**110 HOMES**  
**POWERED FOR**  
**5 YEARS**

Powered by the turbine's surplus electricity

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