CONSTRUCTION

UMaine-Led Offshore Wind Project Receives Additional $3.7 Million from DOE

The University of Maine-led New England Aqua Ventus I offshore wind project will be awarded an additional $3.7 million from the U.S. Department of Energy (DOE) (subject to appropriations) to complete engineering and planning work and approach financial close.

In a joint statement, Sen. Susan Collins and Sen. Angus King announced that the funding is in addition to $3 million awarded by DOE in September 2014 to advance the design to deployment readiness.

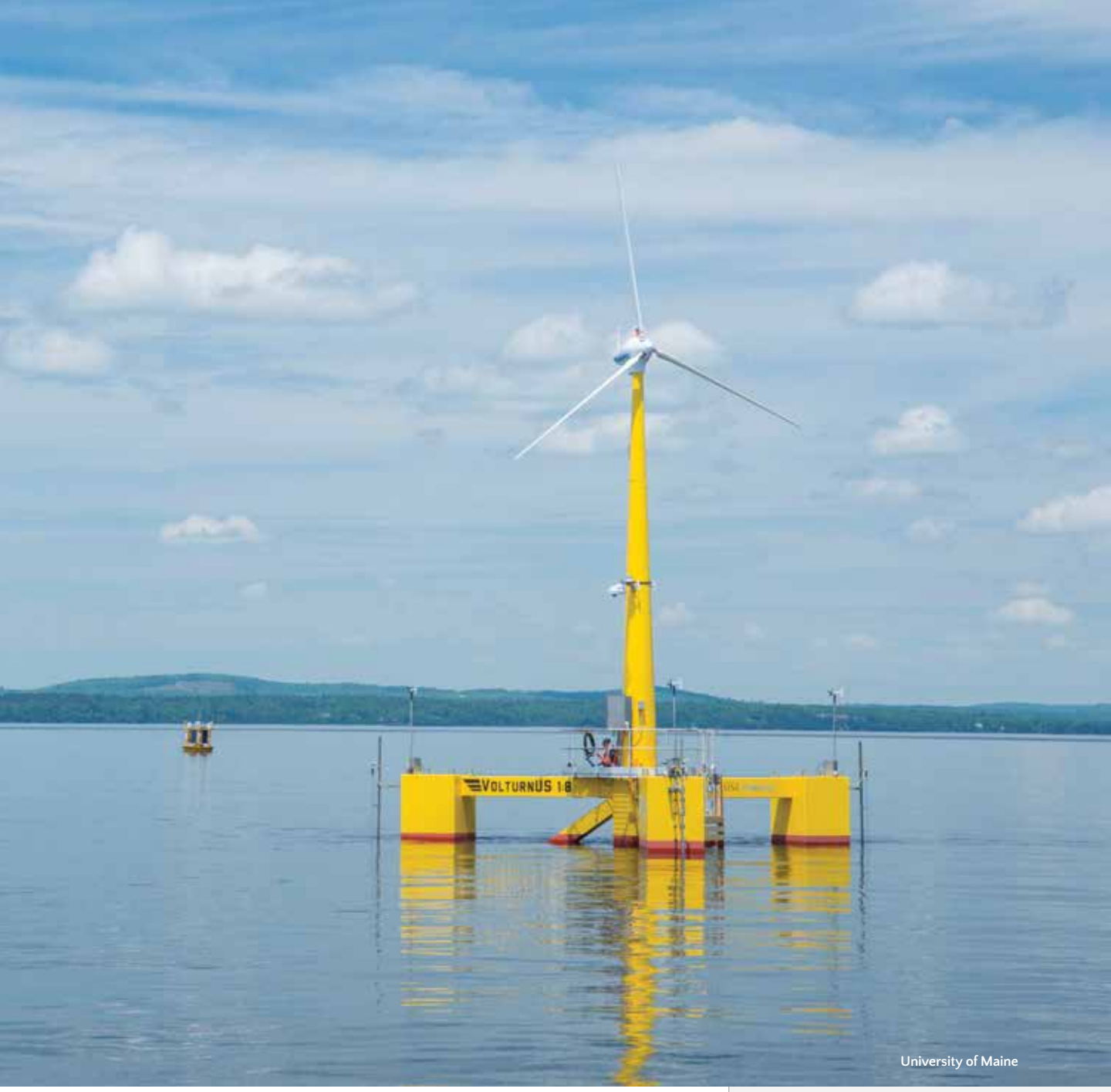
"The continued confidence of the Department of Energy in the University of Maine's Offshore Wind Demonstration Project speaks to the value of our research and development efforts and the great potential to make a difference in this state and beyond," said UMaine President Susan J. Hunter. "This additional funding recognizes the significant technology advancements UMaine and its partners have made on this project in the past year, and it makes possible even greater progress. We appreciate the leadership and vision of Maine's Congressional Delegation that have helped make this, and other federal funding, a reality for Maine."

In May 2014, New England/Maine Aqua Ventus I was selected as an alternate by the DOE for the next phase of its Advanced Technology Demonstration Program, which started out with nearly 70 projects. At that time, the DOE provided UMaine with $3 million and noted that Maine's VolturnUS technology, which was successfully demonstrated on a pilot scale near Castine, Maine, was highly favorable and innovative and that "with additional engineering and design, will further enhance the properties of American offshore wind technology options."

Since then, the data collected from the single VolturnUS 1:8 scale turbine demonstrated the viability of the floating concrete and composites hull. VolturnUS 1:8 — the first grid-connected offshore wind turbine deployed off the coast of North America — was launched in Brewer, Maine, on May 31, 2013, by the University of Maine's Advanced Structures and Composites Center and its partners. The prototype, which was the first concrete-composite floating platform wind turbine deployed in the world, remained off the coast of Castine, Maine, for 1.5 years.

More than 50 onboard sensors measured waves, wind, current, motions, and stresses on the floating platform. Relative to its 1:8 scale, the Castine unit saw 37 storms with return periods from 50 to 500 years, including relative wave heights equivalent to 70 feet. The data collected was used to further optimize the full-scale 6-MW concrete hull design. Over the past year, cost studies were conducted with contractors from Maine and across the U.S. and the world to demonstrate the cost-reduction advantages of the VolturnUS floating concrete hull technology.

"This extraordinary investment is proof that the DOE recognizes what we have long known: that



University of Maine

the Gulf of Maine is a tremendous resource for wind energy that could provide an affordable source of renewable energy directly to the country's population centers on the East Coast, while creating thousands of new jobs in Maine and diversifying the state's electricity supply," Sens. Collins and King said in their joint announcement. "We will continue to support the University of Maine as it participates in this demonstration program and to help ensure that Maine remains at the forefront of deepwater offshore wind power development and innovation."

"We are pleased that the Department of Energy decided to award the University of Maine an additional $3.7 million to put the New England Aqua Ventus I Demonstration Project on financial par with the other DOE-fund-

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ed offshore wind demonstration projects," said Professor Habib Dagher, executive director of UMaine's Advanced Structures and Composites Center and principal investigator of the DeepCwind Consortium. "We continue to make significant progress by demonstrating the technical advantages and cost reductions of the VolturnUS floating concrete offshore wind technology. Our team is busy putting the final touches on the design of the 6-MW hulls for the two-turbine, 12-MW demonstration project. The additional funding will help us complete all aspects of the project planning, negotiate supply contracts with industrial partners, and approach financial close for the project. The UMaine VolturnUS technology has important national impact as it allows us to more cost effectively access over 50 percent of the U.S. offshore wind resource in deepwaters within 50 miles of the coast and creates local and regional jobs as the hulls can be produced near the project site."

New England/Maine Aqua Ventus is considered part of the DOE's offshore wind portfolio under the Offshore Wind Advanced Technology Demonstration Projects, along with projects in Virginia, New Jersey, Oregon, and Ohio.

Decisions on which of the five projects advance and receive an additional $40 million will be made by DOE by May 31, 2016, according to DOE.

For more information, go to www.umaine.edu.

— Source: University of Maine

SIEMENS REDUCES TRANSPORT COSTS FOR OFFSHORE WIND TURBINES BY UP TO 20 PERCENT

New transport vessel for Siemens offshore wind turbines. Starting in 2017, Siemens will have a shipping link between its new plant in Cuxhaven and international installation ports on the North Sea.

At EWEA 2015 in Paris, Siemens presented the company's new offshore logistics concept. A key element of this is an improved transport solution. Siemens has signed a long-term framework contract with transport service provider deugro Danmark A/S, an international transport company, utilizing two purpose-built transport vessels to efficiently link Siemens' existing production locations in Denmark with the new production facilities in Cuxhaven in Germany and Hull in the United Kingdom. Instead of loading the up-to-75-meter-long rotor blades and nacelles weighing approximately 360 metric tons by crane, the large and heavy components will be rolled on and off of these vessels. This "Roll-on/Roll-off" process is known as "Ro/Ro." Siemens has utilized this method for many years. Based on this experience, the company's experts have further developed the concept, and Deugro will provide tailor-made transport vehicles. Siemens estimates cost savings of 15 to 20 percent compared to current transport procedures, depending on the location of the offshore wind power plant.

"With our new logistics concept for D7 offshore wind turbines, we continue to leverage innovation and industrialization on our journey to lower the LCoE of offshore wind energy to below 10 cents per kilowatt hour,"" said Michael Hannibal, CEO of Offshore at Siemens Wind Power and Renewables Division. "Our new production facilities are located directly at harbors to allow advanced Ro/Ro handling and cost efficient shipping of heavy components. This solution will enable us to save up to one-fifth of the costs in the transportation chain, depending on the location of the specific offshore wind project."

Deugro Danmark A/S will assist with shipping of the large Siemens components. Two special transport vessels will be constructed, each with a length of approximately 140 meters. One of the purpose-built vessels can transport eight nacelles of the current Siemens D7 wind turbine platform at a time. It will be launched as early as fall 2016. The second vessel will accommodate up to 12 rotor blades and transport them from the production facility in Hull,

UK, or from Aalborg, Denmark, to the respective installation port. Both vessels can also be unloaded by crane when required. This enhances the flexibility of the installation ports, which are selected according to project-specific requirements.

In addition to the innovative cost-reducing transport concept, Siemens also presented optimization measures for installation and commissioning of offshore wind turbines. The D7 nacelle can be fully tested on the mainland. At the press conference, Michael Hannibal illustrated that comprehensive tests are planned directly in the future Cuxhaven production facility. Further improvements aim to shorten installation and commissioning times and to reduce weather-related project delays. All of these measures will be implemented in the next months and contribute to the industrialization of the entire value chain in an effort to make offshore wind energy increasingly affordable.

For more information, go to www.siemens.com/wind.

— Source: Siemens

IOWA STATE ENGINEERS TEST TALLER WIND TURBINE TOWERS MADE FROM PRECAST CONCRETE

Hydraulic equipment in two civil engineering labs recently pushed and pulled at test sections of a new kind of wind turbine tower, simulating the heavy, twisting loads that towers have to withstand.

In Iowa State University's Structural Engineering Research Laboratory, an actuator rocked a 12-foot-high and 6.5-foot-wide test section with 100,000 pounds of force every 1.25 seconds. The test section's two panels and two columns only moved a tenth of an inch, but the movement was visible, especially the swaying of the long wires attached to 65 strain and displacement sensors.

Those sensors collected data 50 times every second over weeks of fatigue testing. Meanwhile, Hartanto Wibowo, an Iowa State postdoctoral research associate, was on the lookout for tiny cracks or any other signs of wear in the test section, particularly around the prestressing cables connecting the panels and columns.

An experiment at the University of Minnesota's MAST Laboratory tested operational and extreme wind turbine tower loads on a full-scale cross section of a tower — an assembly that was 16 feet and 7 inches high, 8 feet in diameter, and included six panels and six columns tied together with prestressing cables. Engineers took data to see if the assembled tower pieces would hold up under the loads and whether they'd transfer the load from piece to piece and act as a single unit.

Sri Sritharan, Iowa State University's Wilson Engineering Professor in civil, construction and environmental engineering and a member of the College of Engineering's Wind Energy Initiative, said the tower cross section had no trouble resisting the loads, and preliminary data analysis confirms that observation.

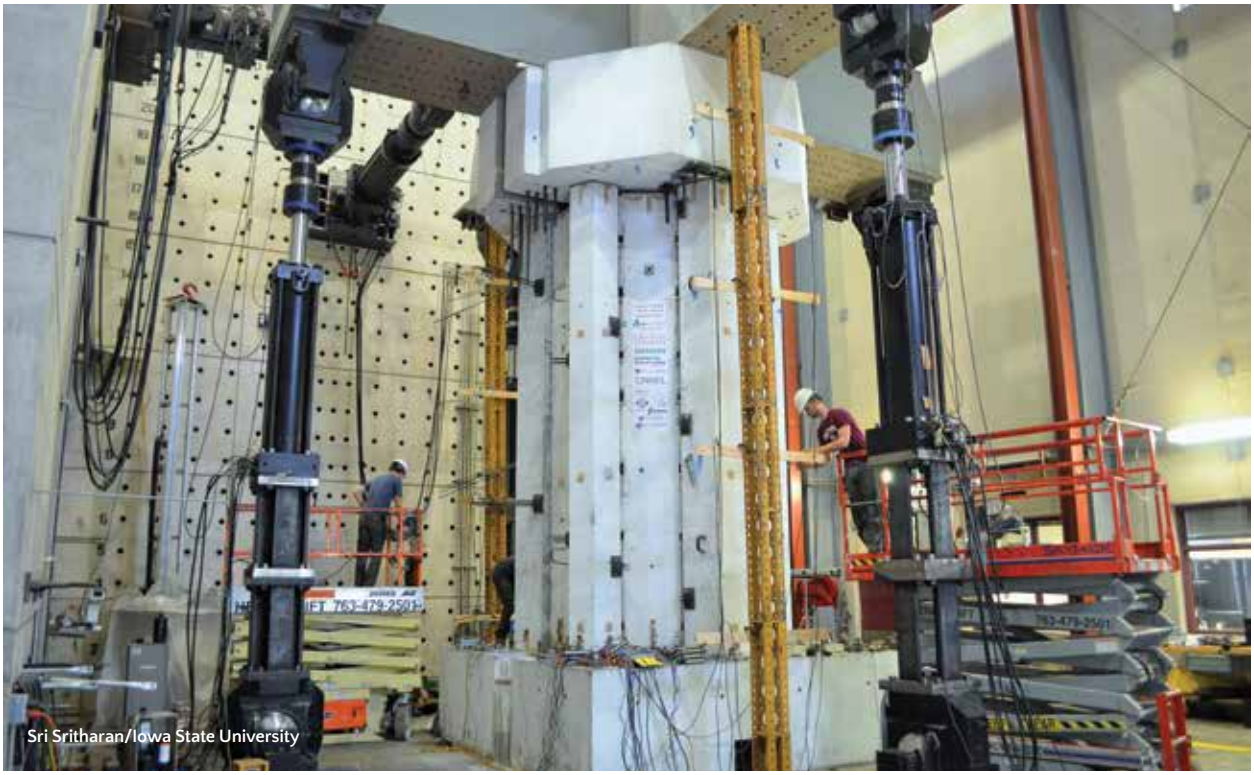
The fatigue test is ongoing with no damage detected after nearly 200,000 load cycles.

"It's fair to say these tests were a success," Sritharan said. "I think we've made great progress in validating a new concept of using prefabricated concrete for taller wind turbine towers."

The test sections aren't anything like the 80-meter steel wind turbine towers seen all over the Iowa countryside. They're easily transportable precast columns and panels made from high-strength or ultra-high-performance concrete. Those columns and panels are tied together by cables to form hexagon-shaped cells that can be stacked vertically to form towers as tall as 140 meters.

Iowa State University engineers call this taller tower technology "Hexcrete" and believe it could revolutionize the production of wind energy. Sritharan said taller Hexcrete towers have many advantages over today's steel towers, including:

- The precast concrete pieces can be easily transported and assembled on-site.
- The technology engages precast concrete companies — an established American industry — in the wind energy business.
- Concrete towers can reach beyond 80 meters, providing energy companies with access to the faster and steadier winds at 100 meters and higher.
- Taller towers allow wind energy harvesting in regions of the country where energy demand is high and favorable winds are only above 100 meters.



Iowa State doctoral student Robert Peggar (right) helps prepare a Hexcrete cross section for load tests at the University of Minnesota's MAST Laboratory.

- Hexcrete helps reduce the cost of wind energy by cutting the production and transportation costs of towers.

Current research and development of the Hexcrete towers is supported by an 18-month, $1 million grant from the U.S. Department of Energy, a grant of $83,500 from the Iowa Energy Center, and $22,500 of in-kind contributions from Lafarge North America Inc. of Calgary, Alberta, Canada. The project's industry partners also include the Siemens Corp.'s Corporate Technology center in Princeton, New Jersey; Coreslab Structures (OMAHA) Inc. of Bellevue, Nebraska; and BergerABAM of Federal Way, Washington.

Sritharan's Iowa State research team also includes Julienne Krennrich, project manager and assistant director of the Engineering Research Institute; Shibin Lin, a postdoctoral research associate; and Bin Cai and Robert Peggar, doctoral students.

"Now our goal is to build a full tower in the field," Sritharan said. "Our intent is to identify partners who can work with us on a prototype tower. We'll also work to develop a commercialization plan."

To advance those efforts, Sritharan's research group will host technical and commercialization workshops next year. For more information about the workshops and the Hexcrete project, go to sri.cce.iastate.edu/hexcrete.

To watch a short video that shows how Hexcrete cells could be assembled into taller wind turbine towers, search for "120-m Tall Hexcrete Tower Assembly Options" on YouTube.

— Source: Iowa State University

CONSORTIUM PLANS TO BUILD FLOATING OFFSHORE WIND FARM IN PORTUGAL

EDP Renewables (EDPR), Mitsubishi Corporation (through its subsidiary Diamond Generating Europe), Chiyoda Corporation (through its subsidiary Chiyoda Generating Europe), Engie, and Repsol recently announced an agreement to implement a floating offshore wind farm off the coast of Northern Portugal known as the WindFloat Atlantic (WFA) project.

The project, located 20 km off the Portuguese coast at Viana do Castelo, is planned to be operational in 2018 and will consist of three or four wind turbines on floating foundations, accounting for a total capacity of 25 MW. WFA will benefit from the support of the European Commission through the NER 300 program and the Portuguese Government through the Portuguese Carbon Fund. It was also selected for the InnovFin program by the European Investment Bank.

The consortium will use the WindFloat technology, an innovative semi-submersible foundation developed by Principle Power, Inc. This technology was already implemented in a first-of-its-kind prototype called WindFloat 1 near Póvoa do Varzim. It is comprised of a 2-MW Vestas V80 commercial wind turbine mounted on a WindFloat floating offshore wind turbine foundation.

The prototype has already produced more than 16 GWh over almost four years of operation, performing excellently through extreme weather conditions. Its successful results have been key for the creation of this consortium and the launch of the WindFloat Atlantic project, the aim of which is to demonstrate the economic potential and reliability of this technology while advancing it further in the path toward commercialization.

This project represents a key step forward in establishing the WindFloat technology as a leader in deepwater offshore wind power generation.

For more information, go to www.edpr.com.

— Source: EDP Renewables