

VoltturnUS Hull

Patented | Demonstrated | Ready

A Concrete Semi-Submersible Floating Wind Platform Produced with Proven Industrialized Concrete Construction Methods

DEVELOPMENT

- \$40M Investment from the Department of Energy for technology demonstration
- \$100M Investment from Diamond Offshore Wind, a subsidiary of the Mitsubishi Corporation, and RWE Renewables
- Gulf of Maine Research Array
- Development and deployment of ten 15MW turbines in the Gulf of Maine, the nation's first floating offshore wind research array



U.S. DEPARTMENT OF
ENERGY

INNOVATION

Concrete construction gives benefits over steel

- Industrialized pre-cast bridge construction techniques; can be made anywhere in the world using locally sourced material and labor
- Lower cost per ton; lower overall LCOE
- Higher corrosion resistance than steel; lower O&M costs and long design life
- Heavier than an equivalent steel system; low center of gravity and high center of buoyancy yield excellent wave motion resistance

Optimized & Simple Design

- No complex features like active ballast systems, heave plates, or hanging masses
- Rectangular bottom beam sections are easier to construct and add more wave motion resistance than cylindrical sections

Mobility & Ease of Deployment

- Low tow-out draft allows for deployment in shallow water harbors around the globe. VoltturnUS can be disconnected and returned to port for maintenance or turbine upgrades

Over 70
US & international
patents

ABS
approved

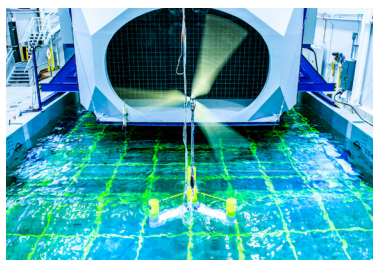


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VOLTURNUS TECHNOLOGY TIMELINE

2011	2013-2014	2015	2016
<p>1:50 Scale Testing</p> <ul style="list-style-type: none"> • Tested 1 TLP, 1 spar, 1 semi-submersible • Conditions mimicked Gulf of Maine conditions • Largest public data set for floating offshore wind 	<p>1:8 Scale VoltturnUS Testing</p> <ul style="list-style-type: none"> • 1st grid-connected offshore wind turbine in the Americas • Scaled 6-MW design • 50 onboard sensors • 18-month deployment • Over 40 extreme events, including 500-year events • Less than 0.17g of acceleration in all cases • Validated numerical tools 	<p>Alfond W2 Ocean Engineering Lab Opens</p> <ul style="list-style-type: none"> • \$13.8 M offshore model testing facility at UMaine with a wind machine over a wave basin capable of producing scaled wind and wave conditions that represent some of the worst storms possible on Earth. • Allows rapid innovation of floating offshore wind technology 	<p>US DOE Offshore Wind Advanced Technology Demonstration Program</p> <ul style="list-style-type: none"> • Top tier status from the US Department of Energy Advanced Technology Demonstration Program for offshore wind • Pilot project Aqua Ventus I to support up to 12MW turbine • More than \$50 Million invested
2017	2020	2024	2030s
<p>VoltturnUS FEED Meets ABS Requirements</p> <ul style="list-style-type: none"> • 100% FEED approval obtained from the American Bureau of Shipping 	<p>Global Investment</p> <ul style="list-style-type: none"> • Diamond Offshore Wind, a subsidiary of the Mitsubishi Corp., and RWE Renewables, the second-largest company in offshore wind globally invest \$100m into the demonstration and will lead the construction, deployment, and operations of the turbine. • New England Aqua Ventus LLC forms. 	<p>New England Aqua Ventus I Launch</p> <ul style="list-style-type: none"> • Full-scale demonstration of 11MW VoltturnUS to be deployed at the state-designated research site • Expected to be the first industrial-scale floating wind installation in the US 	<p>Commercial Offshore Wind Farms</p> <ul style="list-style-type: none"> • Build on experience from Aqua Ventus I for commercial-scale projects using VoltturnUS technology • Further design improvement and testing through investment from industrial and government sponsors



Model Testing in Alfond W2 Ocean Engineering Lab



VoltturnUS 1:8 scaled 500-year storm conditions, 2013



New England Aqua Ventus I Demonstration Site

FUTURE GROWTH

New England Aqua Ventus I

NEAV I is an approximately 11 MW floating offshore wind demonstration project to develop a clean, renewable energy source in the Gulf of Maine.

The VoltturnUS hull and turbine are held in position by three marine mooring lines securely anchored to the seabed and connected by subsea cable to the Maine power grid. The project goals are to demonstrate the innovative design of the VoltturnUS with a full-size offshore wind turbine, work with local contractors and manufacturers to generate local economic benefit, create and keep Maine jobs, and provide renewable energy now and in the future.

State of Maine Floating Offshore Wind Research Array

Development and deployment of ten 15MW turbines in the Gulf of Maine, the nation's first floating offshore wind research array.

