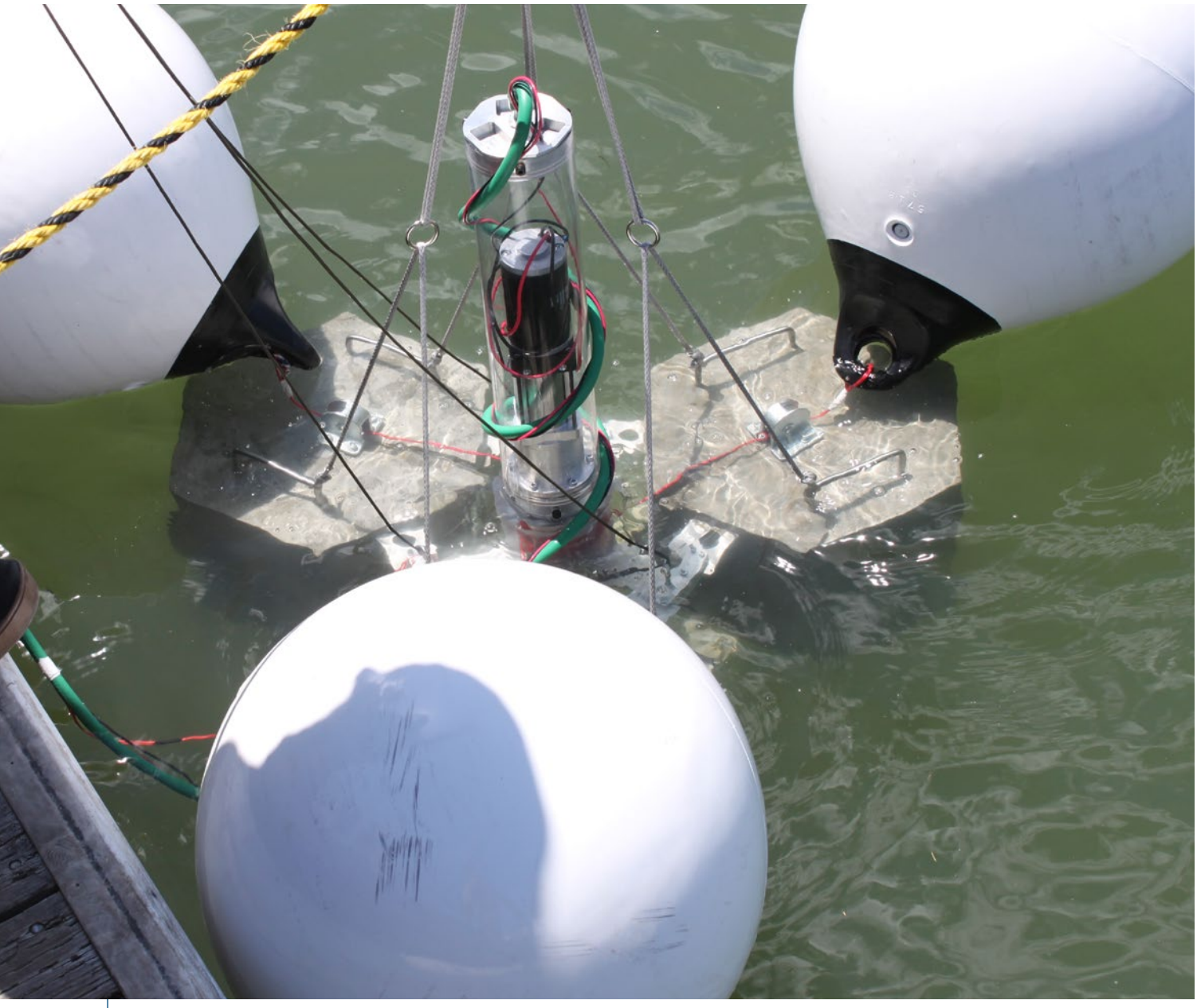
DASSAULT SYSTEMES

SOLIDWORKS

WHIRL ENERGY, INC.

CREATING A MECHANICAL POWER STORAGE SYSTEM WITH SOLIDWORKS SOLUTIONS



Whirl Energy relies on SOLIDWORKS design, structural analysis, computational fluid dynamics (CFD) analysis, and product data management (PDM) solutions to develop an innovative, mechanical, submerged-buoy approach to storing excess electrical power generated from renewable sources.

whirl ENERGY, INC.

Challenge:
Develop an efficient mechanical system for storing surplus power in order to maximize the generation of electricity from clean, renewable sources.

Solution:
Implement SOLIDWORKS product development solutions, including SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Flow Simulation computational fluid dynamics (CFD) analysis, and SOLIDWORKS Enterprise PDM product data management software.

Benefits:
- Developed patent-pending submerged buoy power storage system
- Supported fast, cost-effective iterations on design concepts
- Improved concept visualization with photorealistic renderings
- Resolved torque issues through advanced simulation studies

As clean, renewable energy production grows, so does the development of innovative storage systems for capturing the excess electricity generated by wind farms and solar arrays. Renewable energy sources must currently curtail generation whenever the amount of electricity that they produce exceeds user demand. With an efficient means for storing surplus power, wind and solar energy producers would not have to shut down during low-demand periods but could continue operating at full capacity, maximizing power generation and lowering the cost of clean electricity.

Because the amount of electricity involved makes battery technology costly, companies are developing mechanical systems for storing excess renewable power, including Whirl Energy, Inc. The California start-up has produced a patent-pending, 1/10-scale prototype of a submerged buoy system, which uses surplus power to crank buoys underwater to a depth of roughly 100 meters. Whenever power is needed, the buoys are slowly released and their buoyancy force supplies stored electricity as they rise to the surface.

According to President Saben Murray, developing this innovative power storage system required a robust design and analysis platform. Although as a semifinalist at the 2010 Clean Tech Open the company was offered free licenses of Autodesk® Inventor® software, Whirl Energy ultimately chose to utilize SOLIDWORKS® product development solutions.

"SOLIDWORKS is intuitive and advanced, particularly with its FEA [finite element analysis] integration," Murray explains. "SOLIDWORKS provides the sophisticated features that allow us to simulate the unique mechanics involved with winching five-meter-diameter buoys 100 meters underwater."

Whirl Energy standardized on SOLIDWORKS product development solutions because they provide advanced simulation technology and visualization tools within a fully integrated, easy-to-use design package. The company implemented SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium finite element analysis, SOLIDWORKS Flow Simulation computational fluid dynamics (CFD) analysis, and SOLIDWORKS Enterprise PDM product data management software.

"With SOLIDWORKS, we have the capabilities that we need to quickly and cost-effectively shake out this innovative technology," Murray notes. "SOLIDWORKS solutions enable us to validate that these systems will work and continue to refine their commercial application beyond the functional half-meter-diameter buoy prototype system that we've developed."

ITERATING ON AN IDEA

Using SOLIDWORKS, Whirl Energy is accelerating development of the world's first commercial-scale buoyant mechanical batteries. The company initially investigated a flywheel-based energy storage system. However, when that approach proved to have fundamental limitations, the firm began looking at buoyancy force as a more practical alternative. Because conducting design and analysis iterations in SOLIDWORKS is fast and inexpensive, Whirl Energy has advanced its concept to a working prototype and patent submission, in preparation for a commercial pilot project.

"Power storage is a big issue for renewable energy achieving parity with conventional generation costs," Murray stresses. "With SOLIDWORKS, we can quickly iterate on design concepts, allowing us to rapidly go from an idea to a validated design. In our case, SOLIDWORKS helped us determine the theoretical limits on flywheel design and see how the submerged buoy system could sidestep them."

SIMULATION LEADS TO SOLUTIONS

Whirl Energy relies on SOLIDWORKS Simulation Premium analysis software to study and evaluate the extreme forces and stresses associated with winching buoys underwater. The company then uses this knowledge to optimize the system's design to withstand a challenging operating environment.

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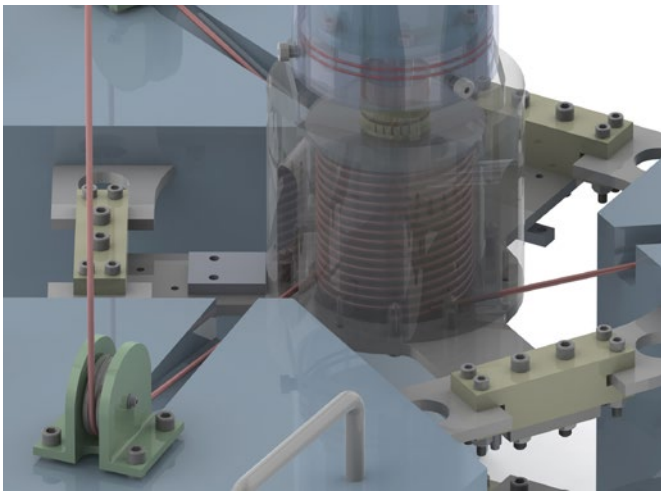
— Saben Murray, President

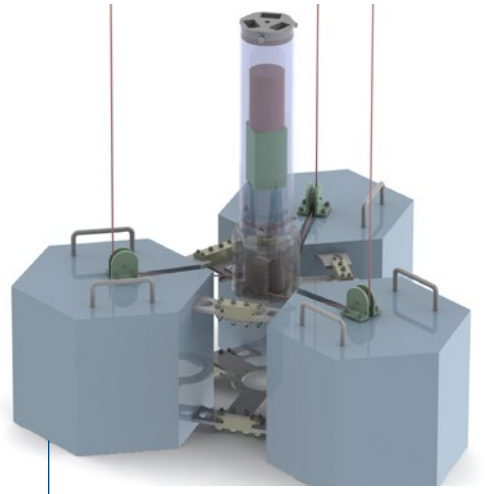
"The buoys and high-strength fiber tethers that connect to the underwater winches on the full-scale units will create millions of Newton-meters of torque, and the gearboxes required are among the largest planetary drives humanity produces," Murray says. "Using SOLIDWORKS Simulation tools, we've been able to minimize misalignment of forces and achieve a fundamental symmetry and balance in our designs that optimizes material use despite the enormous loads involved, which is absolutely the key to commercially viable grid energy storage."

VISUALIZING HOW SUBMERGED BUOYS STORE POWER

In addition to modeling the submerged buoy system, validating its performance, and building a functional prototype, Whirl Energy leverages SOLIDWORKS visualization tools to demonstrate how the system works. "Without SOLIDWORKS, we would have a much harder time communicating what the system is and how it operates," Murray points out.

"It's critical that investors and prospective customers understand what we're creating," he continues. "It's one thing to tell them about a power storage system that utilizes concrete anchors, underwater winches, tethers, pulleys, trusses, and buoys. However, showing them a photorealistic image of the complete system rendered with PhotoView 360 is much more effective for communicating how the system will actually work and for generating support for building a full-scale, commercial application."





Using SOLIDWORKS design, simulation, and PDM tools, Whirl Energy is accelerating development of the world's first commercial-scale buoyant mechanical batteries.

▶ View it in eDrawings.®

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