BEYOND THE TURBINE: A CEC SYSTEM TO OPTIMIZE LCOE

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In commercializing its Kinetic Hydropower System (KHPS) turbine-based Current Energy Convertor (CEC) systems, Verdant Power is engaged in a three-year project addressing the balance-of-system costs of a CEC project. Supported by the US DOE [1] and NYSERDA [2], the project has performed an Integrated Design process to design, build, install, and operate a TriFrame™ (TF) mounting structure with three Verdant Power Gen5 KHPS turbines.

The TF will be installed at Verdant's Federal Energy Regulatory Commission (FERC)-licensed Roosevelt Island Tidal Energy (RITE) Project in New York's East River. The project, which is aimed at scale-up to 10m diameter turbines and greater, will advance the TF from Technology Readiness Level (TRL) 3 to TRL 8, and reduce Capital Expense (CAPEX), Operational Expense (OPEX), and overall Levelized Cost of Energy (LCOE) system metrics. Specifically targeted are the time and cost of on-water work (OWW) for installation and O&M.

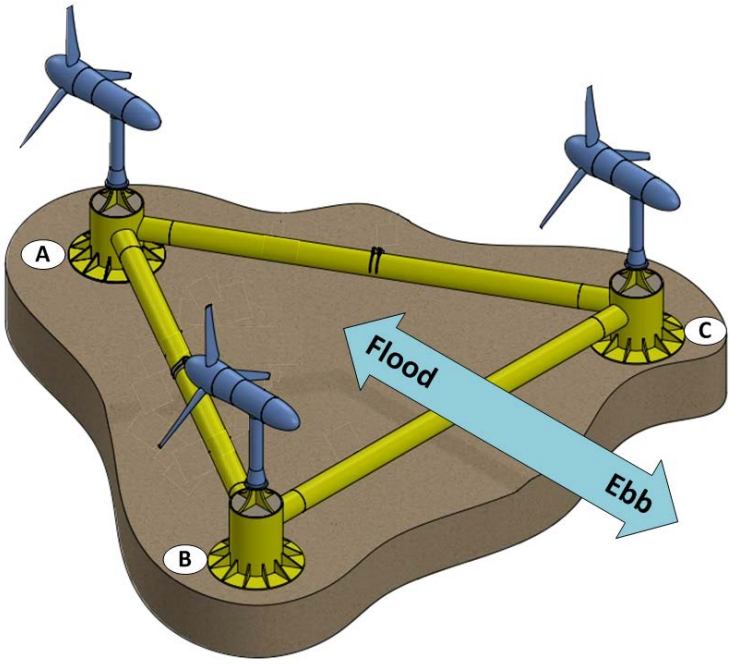

FIGURE 1. VERDANT POWER TRIFRAME™ HOLDING THREE KHPS TURBINES

The Integrated Design process closely combined capital and operational aspects of the system, reducing driving cost elements such as OWW as compared with installing individual turbines. In this work, Verdant has partnered with Ramboll [3] in the capital design and James Fisher Marine Services [4] in the installation design.

For both CAPEX and OPEX, the structural efficiencies from the three-turbine mount and Verdant's Precise Placement installation methodology allow for the elimination of several OWW steps and more rapid commissioning and maintenance operations. Divers and ROVs are not used, minimizing costs and risk.

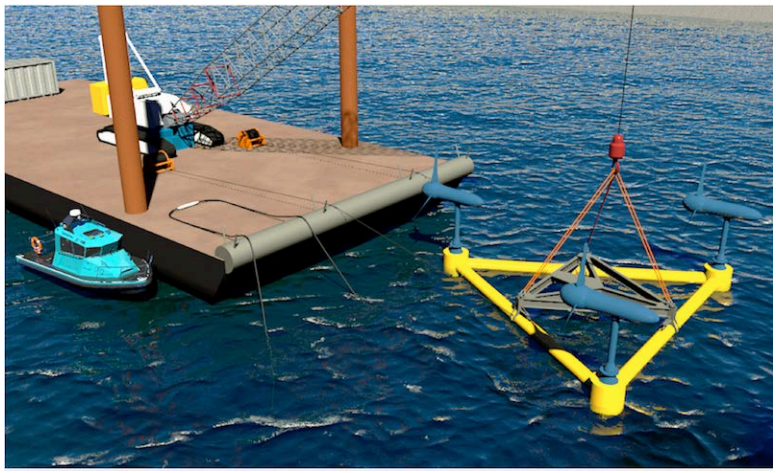

FIGURE 2. STORYBOARD OF ONE STEP OF TRIFRAME™ INSTALLATION

As appropriate to the TRL increase through the project, a detailed Risk Register has been used, augmented by a Failure Modes and Effects Analysis (FMEA). Storyboarding is used extensively for the design of deployment, installation, and O&M operations in order to reduce risk and minimize cost impacts of weather and other external circumstances. The project is planned for installation in 2020.

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REFERENCES

1. U.S. Department of Energy Office of Energy Efficiency and Renewable Energy (EERE), Water Power Technologies Office Award No. DE-EE0007349, "Integrated Development and Comprehensive IO&M Testing at RITE of a KHPS TriFrame Mount"
2. New York State Energy Research and Development Authority Agreement No. 18785, "The Roosevelt Island Tidal Energy (RITE) Demonstration Project"
3. https://ramboll.com
4. https://www.james-fisher.com/services/marine-services/