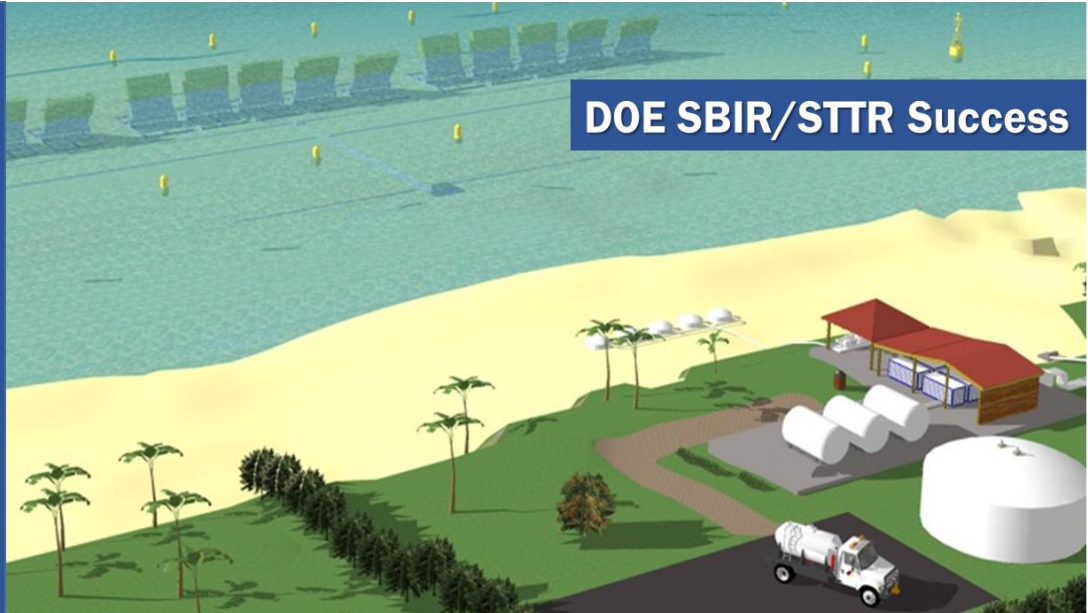


RME's wave-powered desalination system, known as Wave₂O™, will provide regions and communities in developing countries and islands with clean fresh water at a competitive cost



DOE SBIR/STTR Success

RESOLUTE MARINE ENERGY

When we think of hydropower and the harnessing of energy carried by ocean waves, we might picture devices engineered to transform wave energy in electricity to be pumped into the National electric grid. However, the economic developments associated with hydropower go far beyond the production of electricity. In fact, as stated in a recent report issued by the Wind and Water Power Technologies Office of the U.S. Department of Energy (DOE), in addition to producing electricity, many of today's hydropower facilities provide flood control, irrigation, and water supply, delivering public health and environmental benefits, in addition to electricity.

FACTS

PHASE III SUCCESS

RME is nearing completion of a \$9.0M private investment which will be used to test a pilot-scale Wave₂O™ system for a launch customer in Cape Verde.

IMPACT

A 500 m³/day Wave₂O™ unit can produce enough fresh water for 6,000 people, and a 4,000 m³/day plant will supply the needs of up to 50,000 people. The price/m³ is between \$1.00 and \$2.00/m³, while off-grid communities pay 3 times more for desalination plants using diesel-electric generators.

DOE OFFICE/PROGRAM

Energy Efficiency and Renewable Energy (EERE), Wind and Water Power

Resolute Marine Energy (RME) was founded in 2007 and its first R&D project was the production of electric power from wave energy for off-shore fish farming. Fish farms raise large quantities of fish in confinement, causing many environmental problems associated with pollution and disease due to their proximity to the shore. Moving the farms far offshore alleviates these problems and has been an ongoing trend in the sector. However, when farms are many miles away from the shore, providing the electric power they need for operating feeding, oxygen bubbling, and harvesting mechanisms becomes very challenging. RME obtained its first SBIR grant in 2008 from the National Oceanic and Atmospheric Administration (NOAA) to develop a wave energy converter system to power off-shore fish farms. RME's technology proposed a clean and cost-effective alternative to diesel generators and a dramatic reductions in logistics costs and pollution risks. Nevertheless, RME co-founder and CEO Bill Staby quickly recognized the lack of near-term commercial sales opportunities for off-shore fish farms due to a variety of factors inhibiting near-term industry growth. With the agreement of the project's industry partner, Mr. Staby decided to redirect RME's efforts towards a different commercial strategy, which is today looking much more promising. For the last eight years, RME has been working on adapting its wave energy converter technology to produce fresh water for human consumption and irrigation in developing countries and islands.

In RME's case, producing power from wave motion involves a bottom-mounted hinged flap that extends to a point just below the ocean surface. The flap swings back and forth when excited by waves and this motion is transferred to hydraulic pumps that feed high pressure seawater to a turbine for electricity production and to a reverse osmosis desalination system for fresh water production. RME's focus on water production has the benefit of virtually eliminating the technical challenges and costs associated with electricity storage because the Wave₂O™ energy storage "battery" is a water tank. RME's innovative Wave₂O™ technology is designed to address water shortages in "off-grid" areas of the world and initially in Africa and on Caribbean and Pacific Islands where RME has had success attracting several launch customers. Other promising market opportunities RME plans to address in the future include intensive agriculture, real estate development (including resorts), disaster relief and a variety of military and industrial applications.

According to Mr. Staby, the development of Wave₂O™ advanced significantly thanks to the DOE SBIR Phase I and Phase II grants that RME received starting in 2009. The impact of the DOE Phase II SBIR project that RME completed in 2013 has been significant. It enabled RME to complete a \$475,000 seed capital round and led to the completion of a subsequent \$2.5 million Convertible Notes round led by a Boston-based impact investment fund. Impact investors differ from venture capitalists in that the formers are typically willing to accept slightly lower financial returns if their investments create tangible proof of social, economic or environmental benefit. RME has deliberately positioned itself to receive impact investments because its goal is to provide fresh water to developing countries and islands where the lack of a robust electrical grid creates a reliance upon diesel-electric desalination systems to provide critical fresh water needs. In countries like Cape Verde, where the cost of water is almost three times higher than water produced by one of RME's Wave₂O™ systems, it is easy to see why the company's prospects for commercial success are very high. Presently, RME is marketing its \$9.0M series A preferred stock round and several institutional impact investors have showed strong interest.

With the completion of its Phase II SBIR project in 2013, RME concluded two important stages of its technical development program: (i) computer modeling; and (ii) the series of experiments necessary to

verify the computer models which has led to the creation of an innovative and cost-effective technology that will help solve one of the most serious problems facing mankind today; water security. RME is now ready and actively working on next steps which involve testing of a full-scale, fully-integrated Wave₂O™ system in Oregon prior to its deployment for a customer in Cape Verde.



An RME reduced-scale prototype Wave Energy Converter (WEC) being installed at Jennette's Pier in Nags Head, NC.

Written by Claudia Cantoni, Commercialization Program Manager, DOE SBIR/STTR programs, July 2017.