

# Southeast National Marine Renewable Energy Center (SNMREC)

## Florida Atlantic University

### Fact Sheet

The Southeast National Marine Renewable Energy Center (SNMREC) is a U.S. Department of Energy and State of Florida designated R&D center at Florida Atlantic University focused on enabling the safe and responsible commercialization of marine renewables in the U.S., Florida, and the world. The center's initial focus has been on open-ocean currents like the Gulf Stream, and how they might be harnessed for utility-scale power generation.

### Who We Are

Since 2006, SNMREC has attracted more than \$20M in state, federal, and private funding to help shape the U.S.' marine energy portfolio. Led by Director, Ms. Susan Skemp, SNMREC consists of a team of seven full-time staff boasting more than 50 years of government affairs, coastal management, and regulatory experience, more than 100 years of applied engineering (majority offshore), and more than 60 years with the private sector. As a result, SNMREC is uniquely positioned to meet the needs of the marine renewable energy industry of today and tomorrow.

The staff's regulatory, management, administrative, operations, and applied engineering expertise is complimented by the 25+ researchers at FAU and among SNMREC's strategic university partners who have conducted more than \$10M of marine renewable research projects since 2007. More than 70 graduate students have been supported by SNMREC, many of whom have moved on to positions in the marine renewable energy sector, including commercial developers, the U.S. Department of Energy's Wind and Water Power Program, and national energy laboratories. In addition, the team works with an average of 10 undergraduate interns and two graduate student research assistants at any given time to ensure research continuity and direct student involvement.

### Where We Are

Located in southeast Florida, SNMREC operates actively on three of FAU's campuses—main campus (Boca Raton, Florida), Harbor Branch Oceanographic Institute (Ft. Pierce, Florida), and the Institute for Ocean and Systems Engineering (Dania Beach, Florida). FAU's main campus serves as the primary location with access to FAU's administration and management, and cross-cutting, multi-disciplinary research faculty. Most of SNMREC's offshore infrastructure and projects are fabricated, tested, and launched from Harbor Branch, where the engineering team works alongside HBOI's specialized offshore fabrication, machining, and operations team. FAU's Dania Beach campus provides laboratory space where drivetrain testing equipment is installed and some oceanographic measurement instrumentation is prepared for at-sea use.

SNMREC's unique proximity to the Gulf Stream in the Florida Straits, arguably the most desirable open-ocean current location for energy production, positions the Center to lead global efforts to harness open-ocean surface current energy capture. Less than 20 miles from the "core" of the Gulf Stream, nestled among a major recreational boat building community, the world's most active cruise ship points of departure, Florida's primary gas ports of entry, a population of more than 5 million, and all associated marine supply chain industries, SNMREC has unprecedented access to the ingredients needed to help make marine renewable energy a major part of the U.S. and Florida's electricity generation portfolio.

## **What We Offer**

SNMREC understands that the commercial marine renewable energy industry, directly and indirectly, dictates the future of the sector. Therefore, a great emphasis is placed on engaging, understanding, and assisting the private sector with project development. Future projects will face technological, socio-economic, and environmental challenges before achieving commercial success. At the intersection of these factors, SNMREC offers a comprehensive suite of capabilities and services. Designated at FAU, SNMREC aims to leverage the University's resources where possible, or arrange with a comprehensive strategic partner network to align research, testing or workforce training needs.

Specifically, SNMREC has invested in a large suite of tools, data, and expertise via its research portfolio, which are available to the marine renewables sector. Much of the Center's recent efforts have been focused on navigating the U.S. regulatory framework, establishing a small-scale turbine offshore testing capability, measuring and characterizing the Gulf Stream, and providing platforms for open-ocean current research. Finally, SNMREC has dedicated resources to stakeholder outreach, public awareness, and workforce training. In addition to training, educating and mentoring close to 100 collegiate-level students in marine renewable topics, SNMREC has created a high school science curriculum that has been adopted by more than 200 teachers in seven South Florida counties from as far south as Monroe County to as far north as St. Lucie County.

## **Major Contributions**

- Negotiated the U.S.' first and only lease to conduct marine renewable activities on the outer continental shelf—the basis for presently established federal guidelines
- Leveraged state funds to become one of only three U.S. centers dedicated to marine renewables and the only center serving the eastern U.S.
- Facilitated organization of state-federal Florida task force for marine renewables
- Compiled more than two years of aerial marine animal surveys to understand risk of animal encounters with marine renewables offshore southeast Florida
- Constructed and tested a research turbine to accelerate component design and environmental analysis
- Collected more than six years of unprecedented Gulf Stream resource data essential to designs, regulation, and site selection
- Guided and sponsored novel R&D in more than 45 key areas to fill in early-stage knowledge gaps
- Trained more than 200 teachers in seven South Florida counties to introduce marine renewable energy into high school science classrooms
- Founding member of U.S. Marine Renewables Industry Trade Association and founding member of International Technical Standards Efforts for Marine Renewables

## Blue Energy Future

Despite many challenges, much progress has been made, and the U.S. is looking forward to a “blue” energy future. SNMREC is among leading industry, government, and academia groups attempting to identify and address barriers to commercial implementation of marine renewables. A 2011 marine renewable roadmap that was prepared by the Ocean Renewable Energy Coalition (a U.S. industry trade association) identified eight primary project factors that affect the success of commercial projects. Of those identified, half were not technology related, but rather socio-economic—policy issues, market development, economic and financial issues, and education and workforce training. SNMREC is already addressing policy issues and workforce training with ongoing initiatives, but soon plans to add solutions for market development and economic/financial issues targeted at both individual company assistance as well as broader market needs.

SNMREC anticipates continuing to lead the nation with regulatory support and workforce development contributions as we pioneer these areas. The Center also anticipates testing small-scale commercial energy capture equipment during 2016 and to eventually offer offshore test infrastructure for full-scale evaluation. As research and development needs continue to arise, SNMREC intends to shift primary focus towards interdisciplinary array-scale research topics and foster a national network of research institutions focused on marine renewables.

## Marine Energy and SNMREC Quick Facts

- Energy created from marine hydrokinetic resources works with the force of moving water. Whether it’s a current or the ocean’s surface moving up and down in waves, it can be used to drive machinery, which in turn, will generate electricity. The simplest way to understand this concept is to visualize a wind turbine, but underwater instead.
- Water is nearly a thousand times heavier than air—a current of 1 knot has the power of winds blowing at 10 mph or so. However, deeper water offshore southeast Florida, where the Florida Current is, prevents using “underwater wind turbines” like those found on land with masts. To address this issue, researchers at SNRMEC are working with companies to design, test, and build machines that have the potential to be anchored on the ocean floor and “fly” in the current, much the same way that a kite does in the wind.
- Power from ocean currents could supply 4 percent of annual U.S. energy demand or 27 percent of power consumed in coastal Southeast United States (during 2012). In addition, energy from ocean currents could power 15 million American homes or all of the households in Florida, South Carolina and North Carolina – up to a \$15B market opportunity.
- Because the marine and hydrokinetic sector is still young, it requires significant assistance in support of technology development and testing, environmental characterization and risk evaluation, regulatory and policy support, and workforce training. To accommodate these needs, SNMREC is preparing an open-ocean energy testing laboratory, which consists of an offshore turbine test berth (approximately 12 nautical miles offshore of Ft. Lauderdale, Fla.). This capability is under construction and will be installed to accommodate small-scale turbines (up to 100kW production and/or 7m rotor diameter).

- In 2010, SNRMEC submitted a marine hydrokinetic lease application to the U.S. Department of Interior's Bureau of Ocean Energy Management that will become the model for future commercial leases. As this is *the first U.S. application for marine hydrokinetic projects on the outer continental shelf*, an environmental assessment of SNRMEC activities by the Bureau of Ocean Energy Management is helping prepare the agency for future commercial lease applications. The environmental assessment was publicly released in August 2013, with a "Finding of No Significant Impact." On June 1, 2014, SNRMEC was granted the 1st national lease by the Bureau of Energy Ocean Management to conduct renewable energy activities in support of marine hydrokinetic energy. *These projects represent the first and only such capability globally.*
- SNRMEC has designed a small experimental turbine system, which is being fabricated at FAU's Harbor Branch Oceanographic Institute in Ft. Pierce, Fla. to allow researchers to test new innovations, companies to evaluate components, and to investigate marine animal interactions with equipment.
- SNRMEC plans to start testing small-scale versions of commercial turbines and eventually test full-scale systems for companies. Full-scale testing will likely include a wired connection to the grid onshore and the opportunity for turbines to be installed for longer periods of time to evaluate reliability and performance in a real-world environment.
- Small-scale testing industry partners of SNRMEC include Minesto, AB (Sweden), Aquantis, Inc. (California), IHI Corp (Japan), Safrema Energy (Florida), Ocean Current Energy, Inc. (Florida), Verdant Power (New York), Anadarko Petroleum Company (Texas), Crowd Energy (Florida) and InCurrent Turbines, Ltd. (Canada).
- SNRMEC is committed to preserving marine life and as such is conducting extensive research and evaluation of the potential effects of underwater turbines. It is important to note that the underwater turbines will move at a considerably slower pace than wind turbines (wind – 80 to 160 mph vs. water – 8-16 mph). Fish and most marine mammals swim much faster than the rotation of the underwater turbine's blades. Additional testing conducted by FAU's Southeast National Marine Renewable Energy Center includes research on sea-turtle distributions and behavior.