

# Pioneering a **Blue Energy** Future for Florida

Progress, Challenges and Opportunities

July 31, 2017

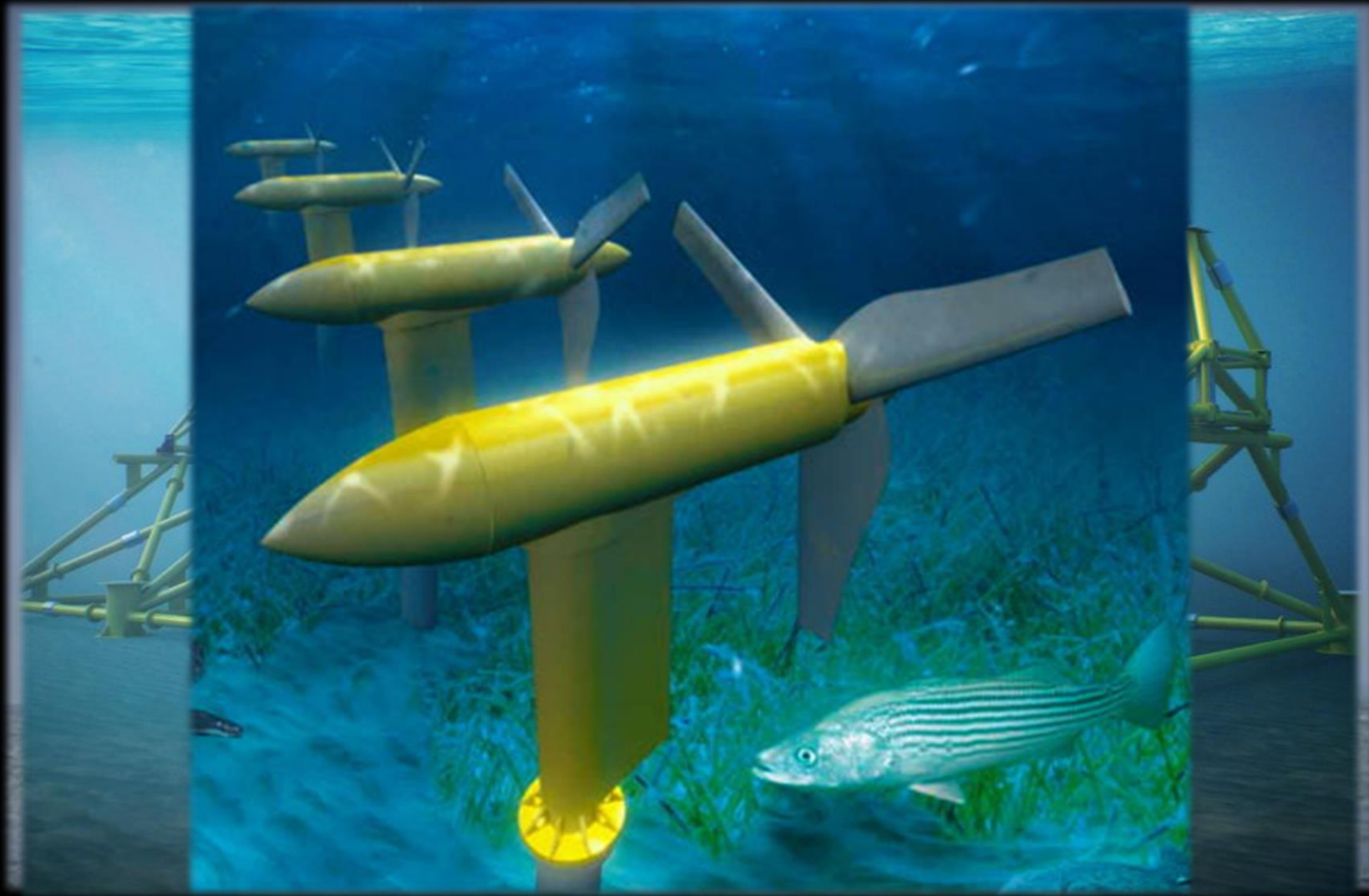


# Ocean Thermal Energy Conversion



Oscillating Point Absorbers

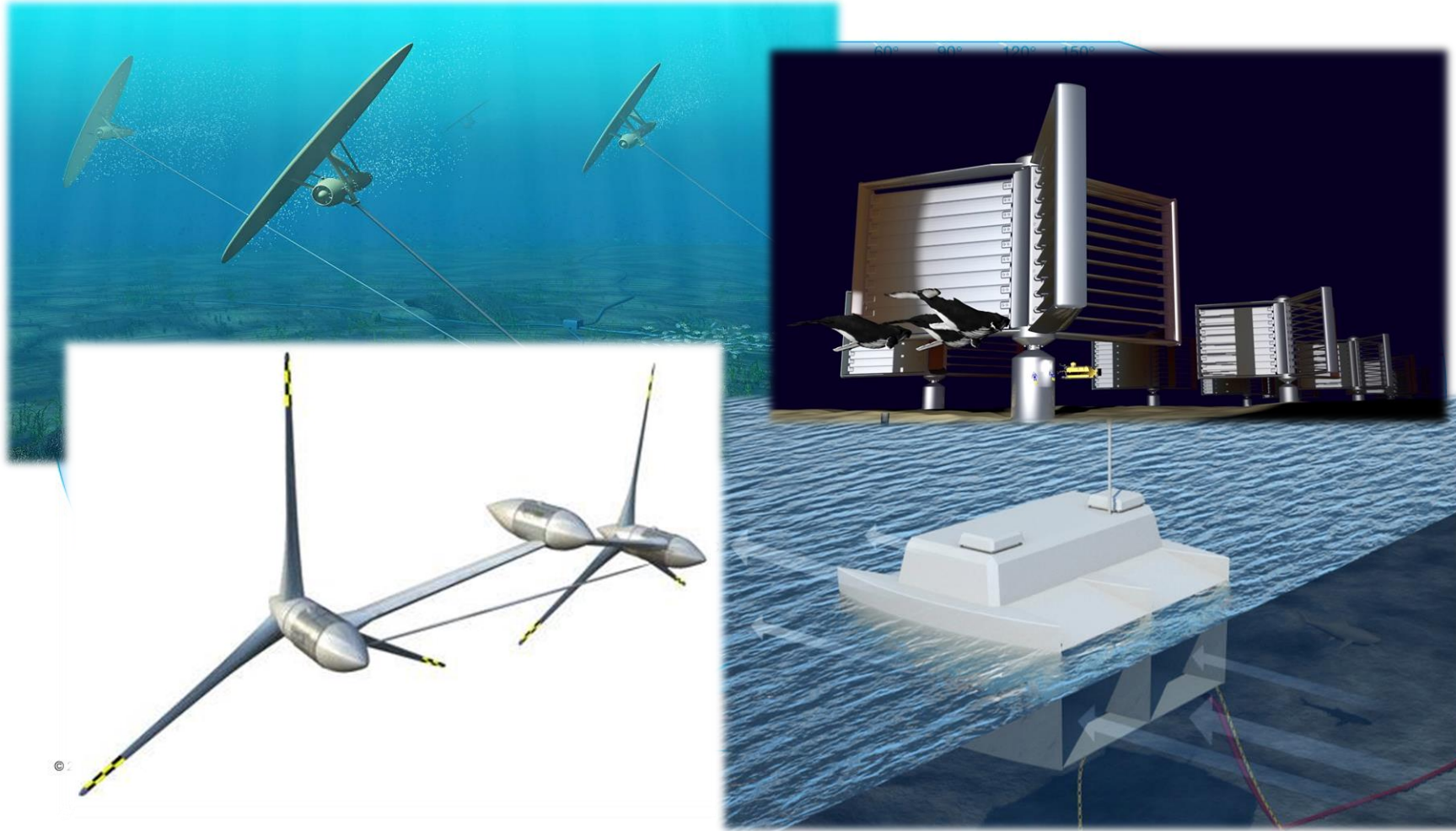




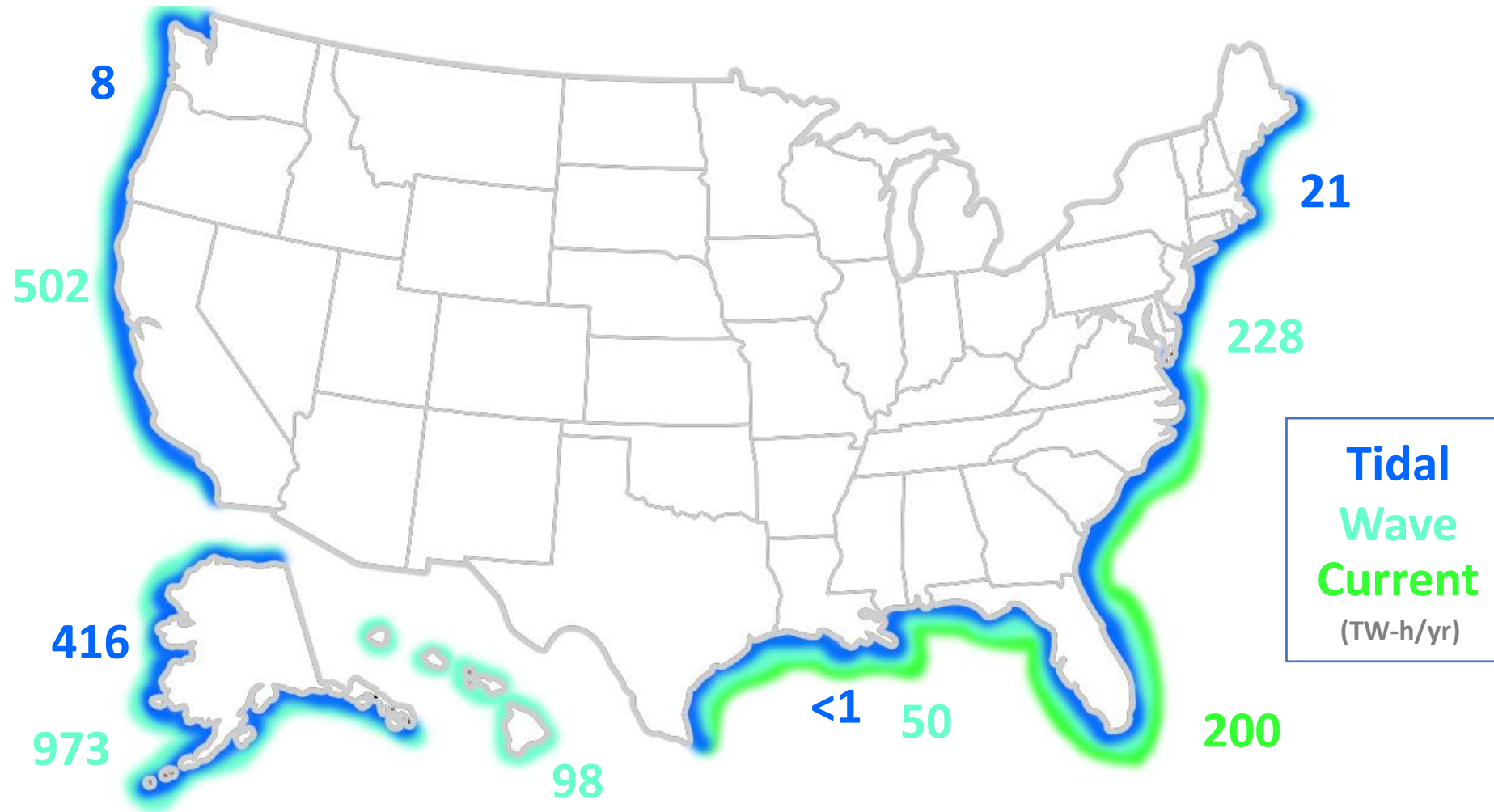
Operational flow horizontal



# Global Currents



# Estimated US MHK Resources



US Department of Energy estimates presented 2012 at the Global Marine Renewable Energy Conference, New York, NY

# Power from OCEAN CURRENTS in US



could supply **4%** of annual  
**U.S. energy demand** or

**27%** of power consumed  
in coastal Southeast  
U.S. during 2012

could power

**15 Million**  
American Homes



or more than all of the  
households in **Florida, South  
Carolina, and North Carolina**

and represents a

**\$15 Billion**

annual market opportunity

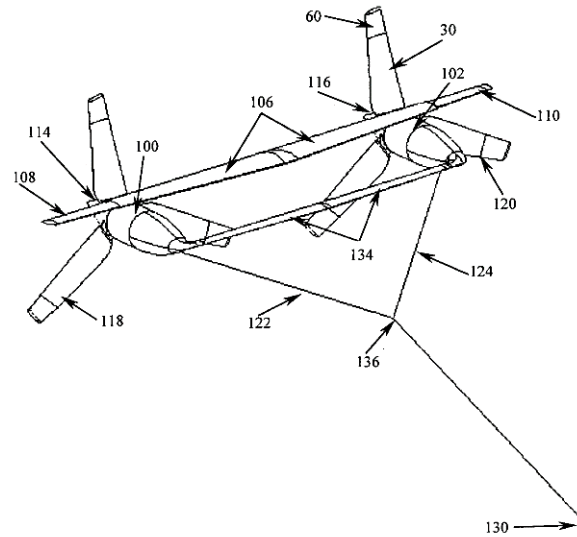




# Ocean Current Power in Florida

4520%6  
TWF

Figure 1a



# 2007

- No formal U.S. regulatory framework
- One openly active ocean current company - Aquantis
- MMS (now BOEM – Bureau of Ocean Energy Management) IP rule and notice of interest issued
- UK EMEC opened tidal full scale testing site the year before (2006)
- FAU receives **\$5M** Centers of Excellence award to establish new center





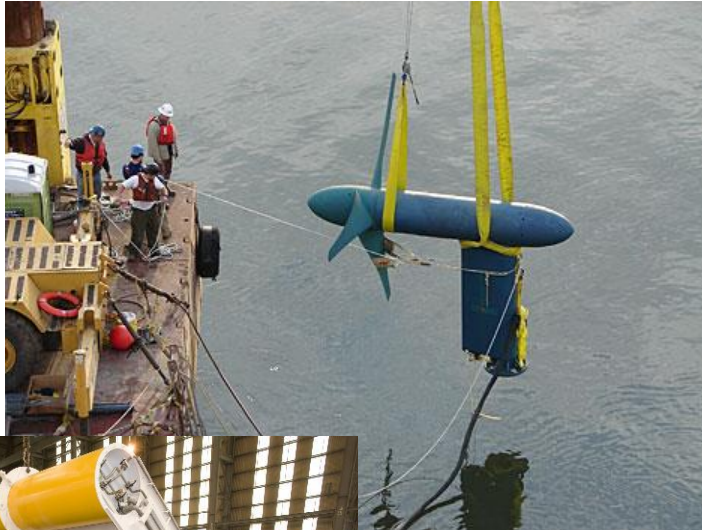
# 2008

- DOE releases 1st MHK Funding Opportunity Announcement (FOA) – centers establishment
- DOE Water Power Program (WPP) receives ~\$10M Congressional funding
- OpenHydro 1st to generate electricity on UK grid
- FAU brings together USACE, Coast Guard, NOAA, and MMS together for first time RE MHK projects



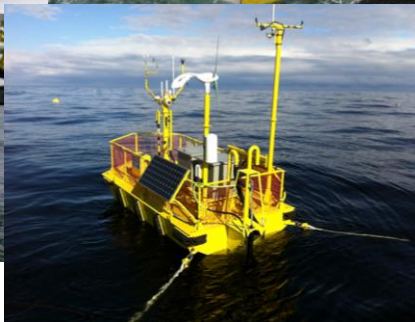
# 2009

- DOE releases 2nd MHK Funding Opportunity Announcement (FOA) – Tech Readiness/major industry funding
- DOE Water Power Program (WPP) receives ~\$30M Congressional funding
- MMS Issues Final Rule for MHK on the OCS
- Verdant Power installs 4th generation tidal turbines in East River, NY
- Aquamarine deploys Oyster (world's largest working WEC) at EMEC





## SOUTHEAST NATIONAL MARINE RENEWABLE ENERGY CENTER



# 2010-12

- U.S. DOE awards FAU with SNMREC designation
- ORPC submits its grid-connected FERC lease application
- Anadarko tows small scale prototype OCT
- Verdant Power receives 1st US commercial MHK FERC license
- ORPC receives 1st US PPA
- NNMREC installs small scale test berth and tests first customer WEC
- More than 11 full scale projects installed and under test at EMEC
- Siemens becomes majority shareholder in UK-based Marine Current Turbines, Ltd.





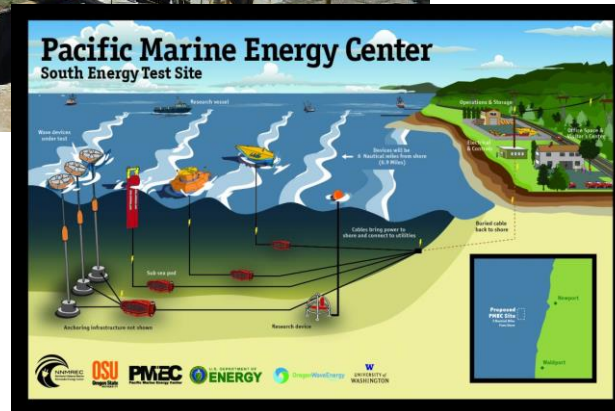
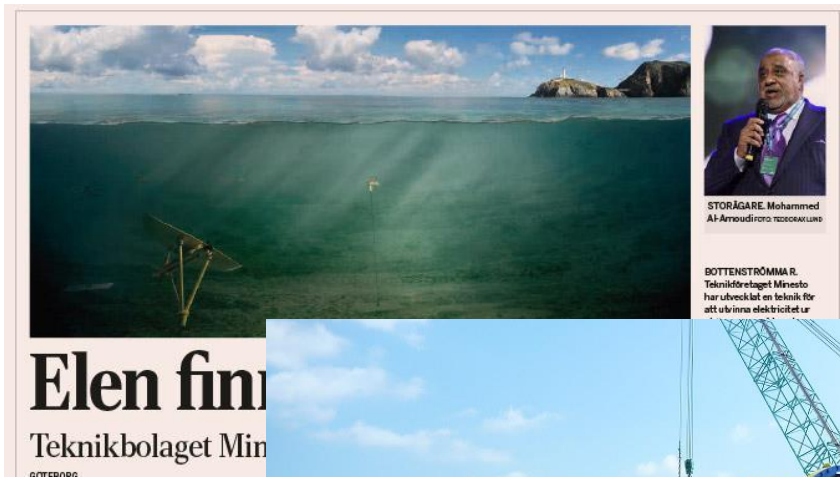
**BOEM**  
BUREAU OF OCEAN ENERGY MANAGEMENT



# 2013-16

- SNMREC research turbine 1<sup>st</sup> tow test
- ORPC installs first US MHK grid-connected project
- SNMREC signs first MHK lease on the U.S. outer continental shelf
- New IEC conformity assessment and certification for renewables System formed
- HINMREC/US Navy complete WEC testing facility
- US EERE MHK funding preserved at \$50M+





# 2017+

- Minesto awarded consent for 0.5MW Whales tidal installation
- IHI expected to test scaled prototype under tow in Japan
- NMREC awarded \$30M for fully energetic grid-connected WEC test facility

# Ocean Current Energy Industry

Less than **10** openly active companies

More than **10** unique concepts proposed

From at least **5** countries

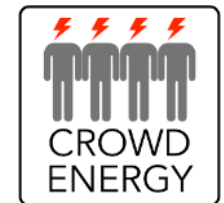
With less than **5** lab scale tests performed and

Less than **4** field demonstrations  $\frac{1}{4}$  scale or larger

**0** production-scale prototypes

**0** commercial leases

## Major Opportunities





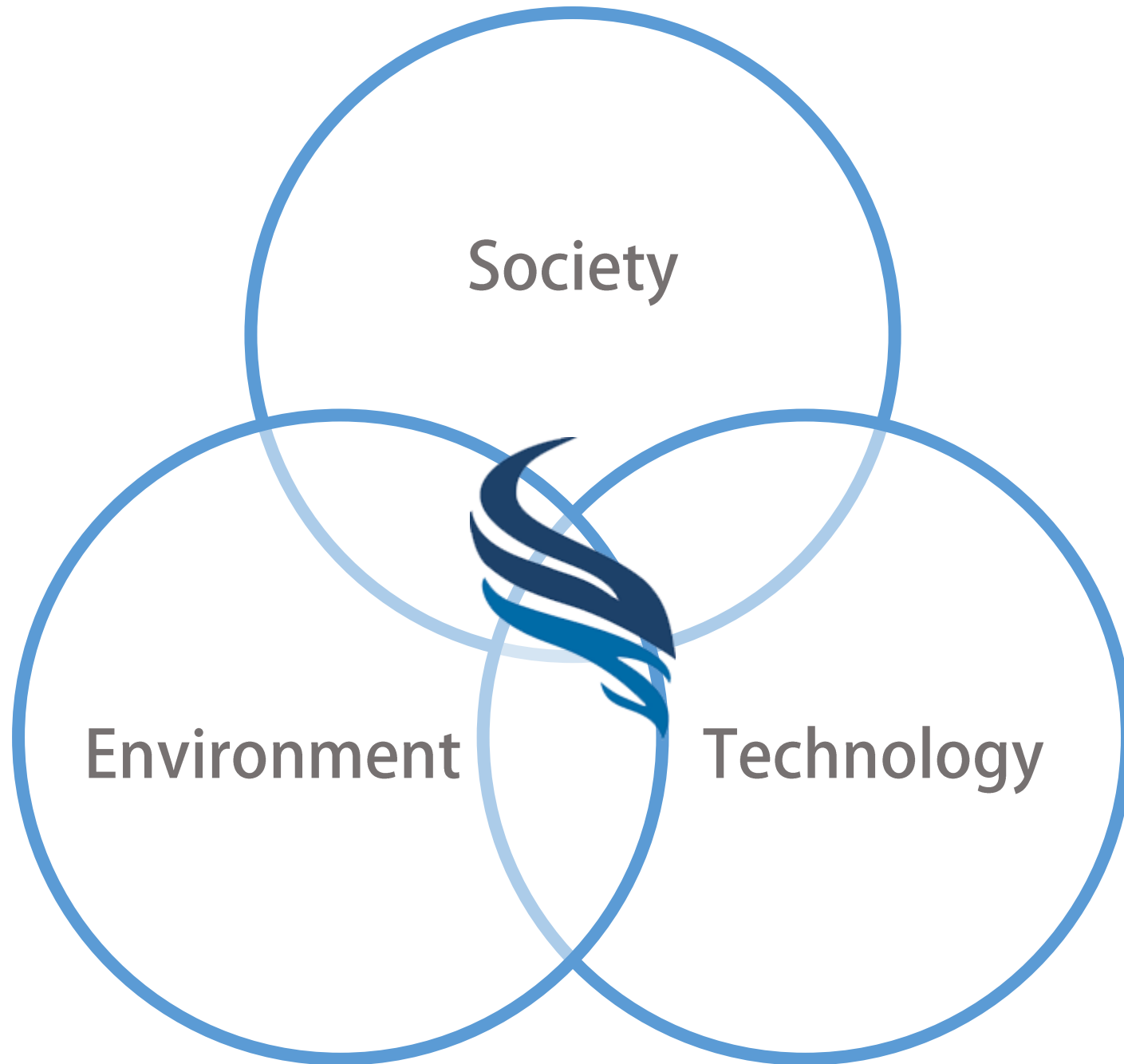
FAU<sup>TM</sup>

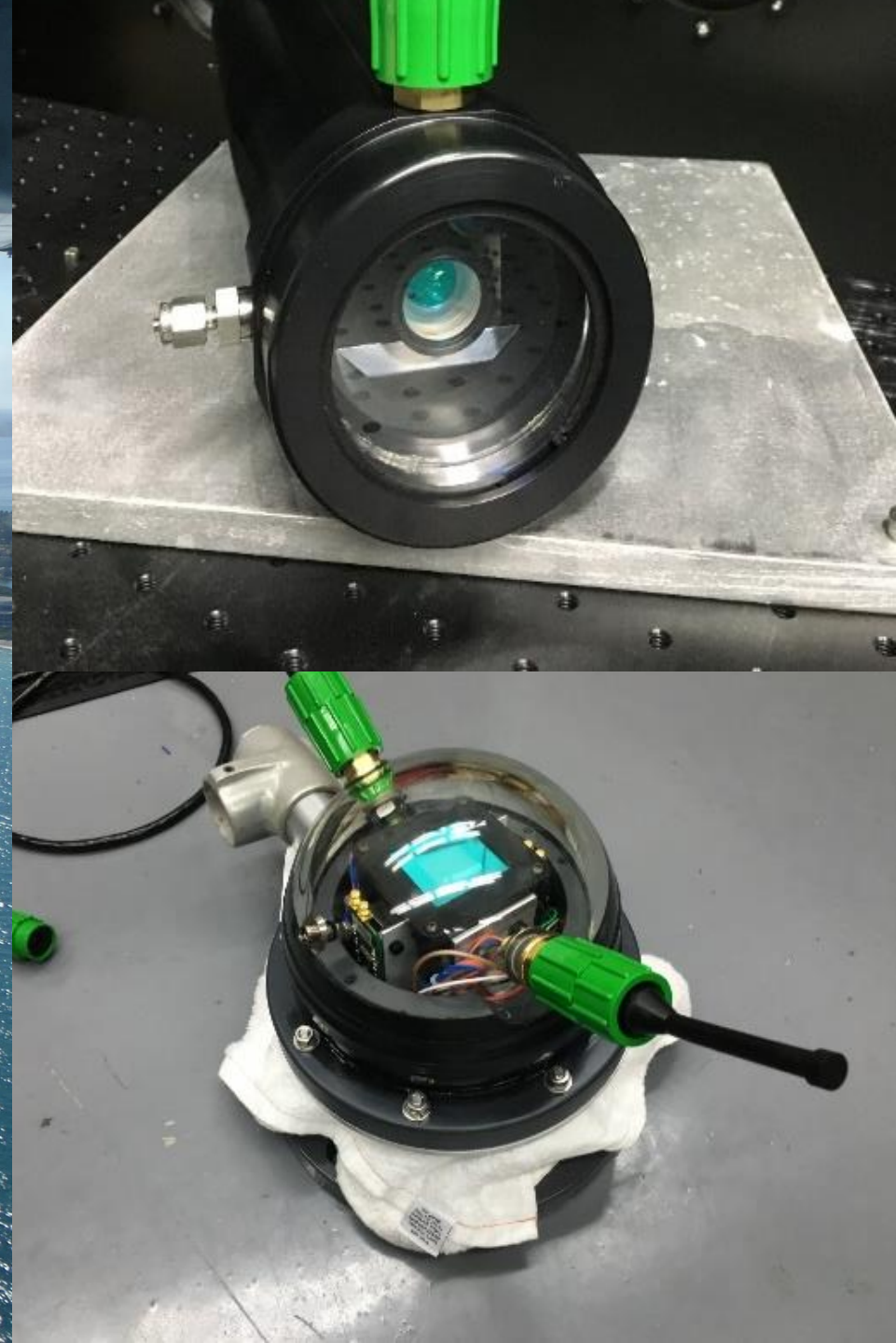
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SOUTHEAST NATIONAL MARINE  
RENEWABLE ENERGY CENTER

**A U.S. Department of Energy Center**  
designated at Florida Atlantic University







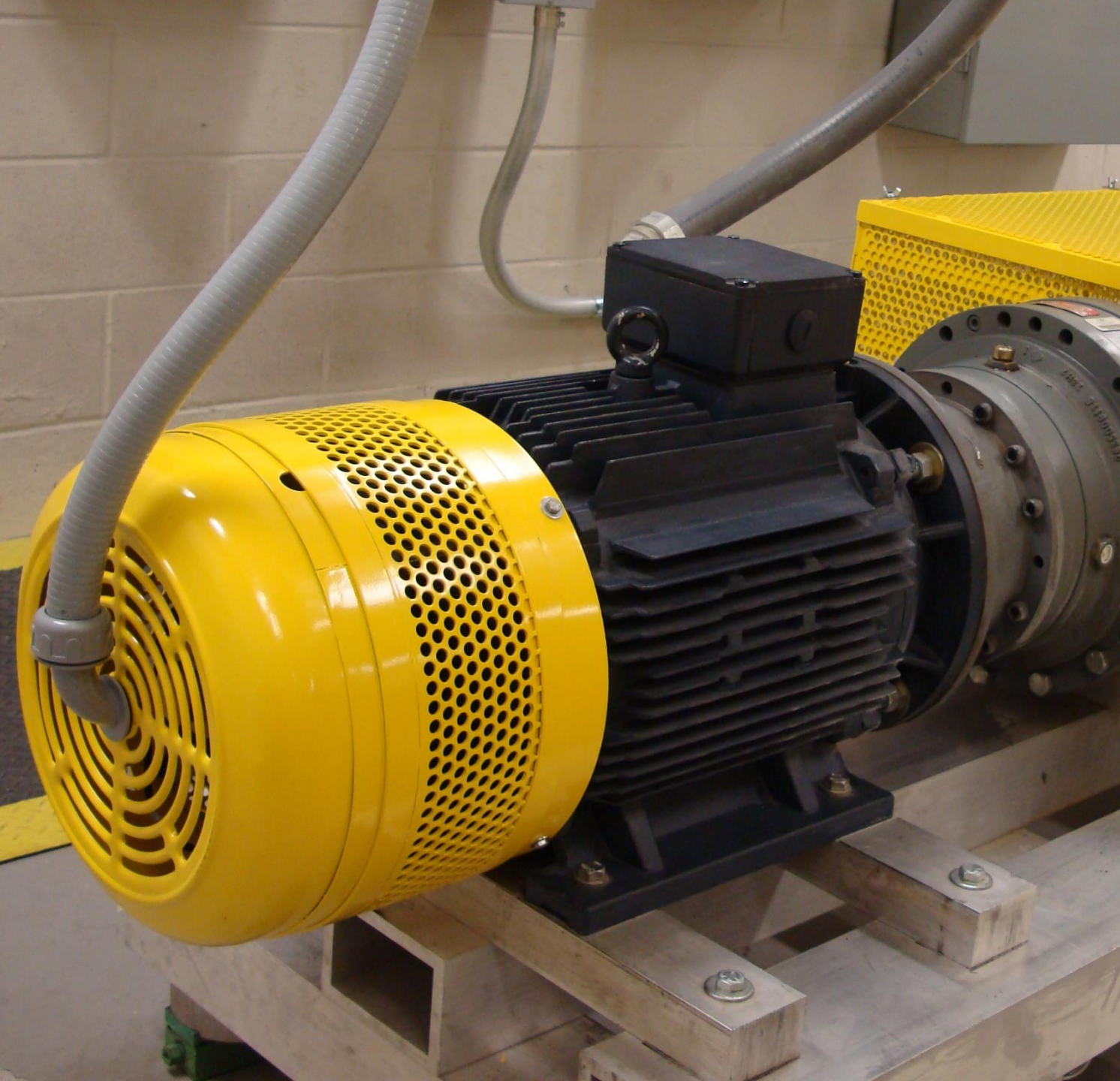


















# What is Left to do?

- Help companies refine concepts into viable products
- Establish offshore/onshore grid infrastructure to receive generated power during testing
- Continue to identify and reduce barriers to siting
- Create community ecosystem to support industry





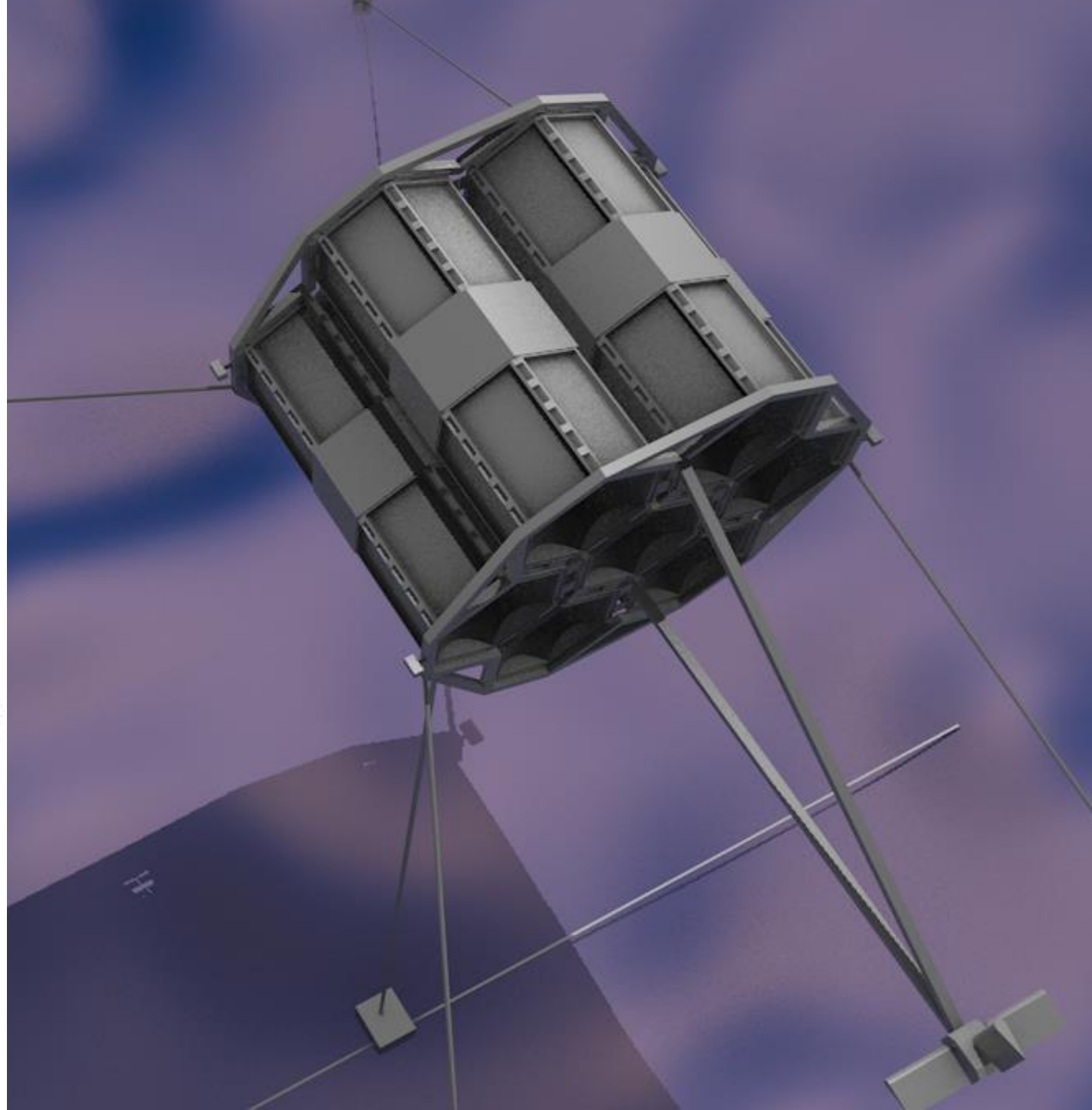
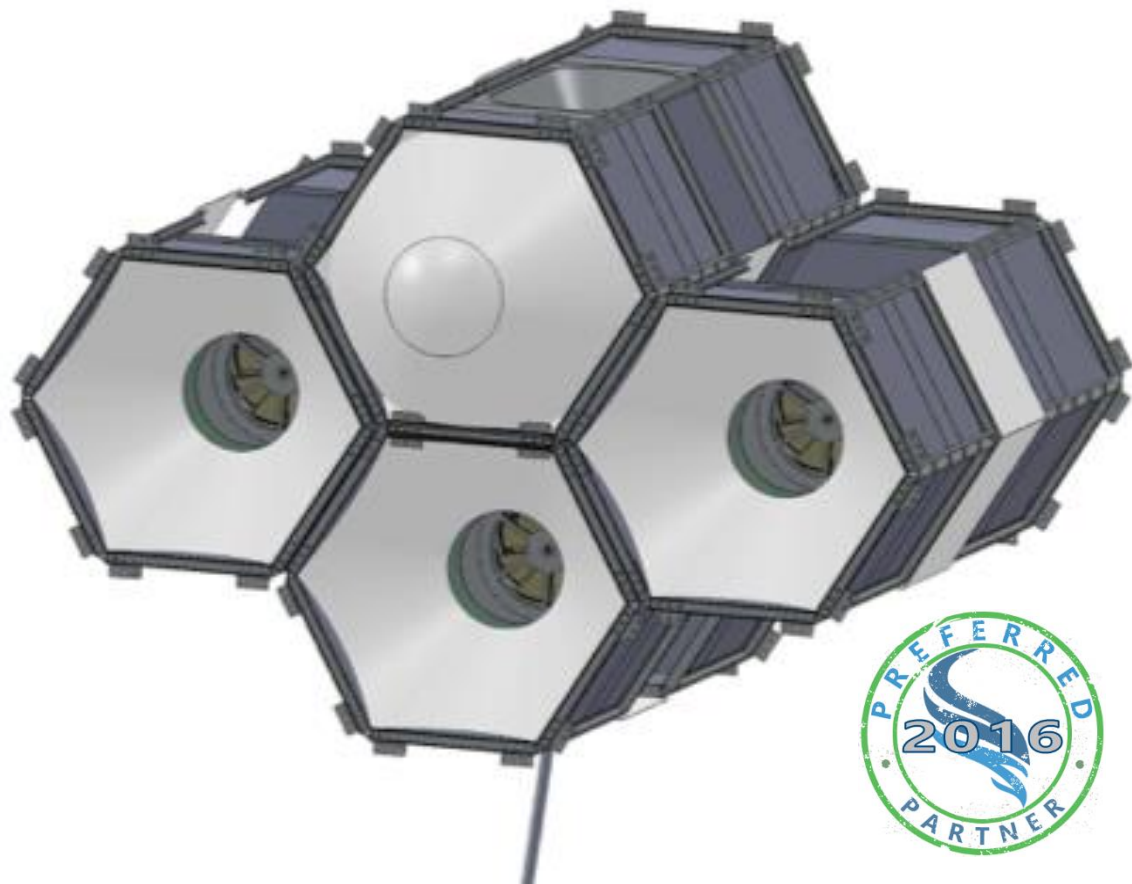
*City of*  
**Lake Worth**

JAN 11 2025  
10:00 AM

GALAXY

DAKTRON







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## RESEARCH

## FAU's SNMREC Lands \$360,000 Grant from NSF

FAU's Southeast National Marine Renewable Energy Center, a U.S. Department of Energy designated center, has received a \$360,000 grant from the National Science Foundation for undergraduate research.







FAU<sup>TM</sup>

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SOUTHEAST NATIONAL MARINE  
RENEWABLE ENERGY CENTER

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