

An Update from the NC Renewable Ocean Energy Program



NC Renewable Ocean Energy Program:
coastalstudiesinstitute.org/ncroep



North Carolina
Renewable Ocean
Energy Program

NORTH CAROLINA RENEWABLE OCEAN ENERGY PROGRAM



WHO WE ARE

Based at the Coastal Studies Institute (CSI), the North Carolina Renewable Ocean Energy Program (NCROEP) advances inter-disciplinary marine energy solutions across UNC System partner colleges of engineering at NC State University, UNC Charlotte, and NCA&T University.

NCROEP MISSION

Use renewable ocean energy wisely to effectively and economically power North Carolina's Blue Economy and in the process create jobs and economic opportunities.

NCROEP VISION

North Carolina is a recognized leader in marine renewable energy design, development, and deployment solutions.

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What is the NCROEP?

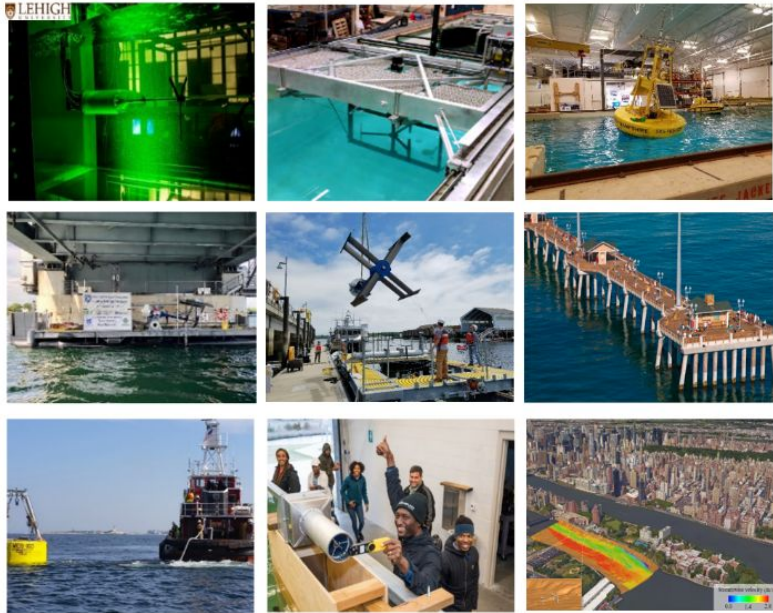
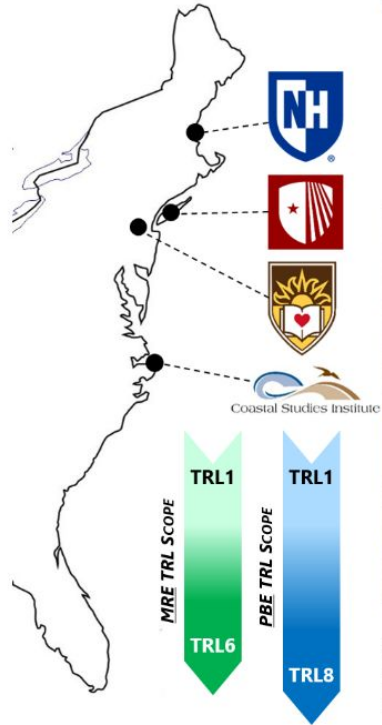
NC legislation provides funding to:

- conduct research to conceptualize, design, construct, operate and market new and innovative technologies
- use renewable ocean energy wisely to effectively and economically fulfill part of the energy needs of the State and in the process create jobs and economic opportunities

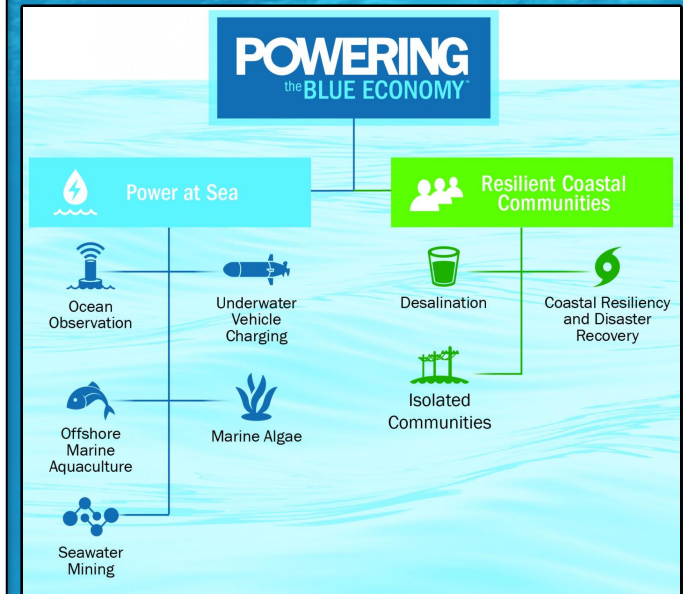
NCROEP Current Federal Funding to NC ~\$5M

- Atlantic Marine Energy Center: DOE
- Waves To Water: DOE/NREL
- Energy Transitions Initiative Partnership Project : DOE/NREL
- Device Design and Robust Periodic Motion Control of an Ocean Kite System for Hydrokinetic Energy Harvesting: DOE
- Manta Ray: DARPA
- Model Validation and Site Characterization for Early Deployment Marine Hydrokinetic Sites and Wave Classification Scheme: DOE/NREL

Atlantic Marine Energy Center



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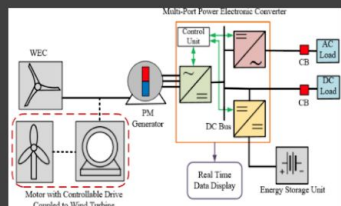
NC: Atlantic Marine Energy Center

Overview Jennette's Pier Wave Energy Test Facility



OPEN

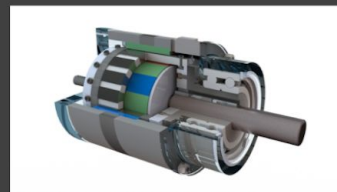
Microgrid



The FREEDM Green Energy Hub Testbed is a portable microgrid that provides circuit protection, power electronic integration, and

OPEN

Magnetic Gears

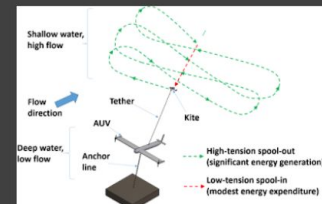


Magnetic gears provide non-contact transmission of torque that leads to:

- Inherent overload protection

OPEN

Ocean Kite



Device Design and Robust Periodic Motion Control of an Ocean Kite for Hydrokinetic

OPEN

Social & Environmental



Factors in stakeholder and public

OPEN



Tethered Coaxial Turbines



OPEN

Waves to Water Prize



Jennette's Pier Wave Energy Test Center
Nag's Head, North Carolina



- \$3.3 million in prizes
- CSI Hosting Final DRINK Phase - April '22

Prize Stages

	CONTEST I CONCEPT Propose a Wave Powered System Up to 20 Winners (\$200,000 Cash Prize Pool)	CLOSED 90 days
	CONTEST II DESIGN Develop Detailed Plan and Model 10-20 Winners (\$800,000 Cash Prize Pool)	CLOSED 120 days
	CONTEST III ADAPT Design for Testing Up to 10 winners (\$800,000 Cash Prize Pool)	180 days
	CONTEST IV CREATE Demonstrate Working Principles Up to 10 Winners (\$500,000 Cash Prize Pool)	180 days
	CONTEST V DRINK Test & Demonstrate in the Ocean Grand Prize up to \$500,000; and individual Metrics Prizes up to \$500,000	180 days

Leads: Drs. Mike Muglia and Lindsay Dubbs

Waves to Water Prize



Leads: Drs. Mike Muglia and Lindsay Dubbs

Energy Transition Initiative Partnership: ETIP

Trusted and knowledgeable organizations to work within their regions on stakeholder and capacity development:

- **Alaska Center for Energy and Power**
(Fairbanks, AK)
- **Coastal Studies Institute**
(Outer Banks, NC)
- **Hawaii Natural Energy Institute**
(Honolulu, HI)
- **Island Institute**
(Rockland, ME)
- **Renewable Energy Alaska Project**
(Anchorage, AK)

Nags Head, North Carolina – Nags Head is extremely vulnerable to severe weather events and long-term, rising trends in global sea level. To build up their resilience and prevent future disasters, Nags Head will explore various renewable energy and energy efficiency deployments and work toward securing 48 to 72 hours of backup generation for vital facilities used by first responders.

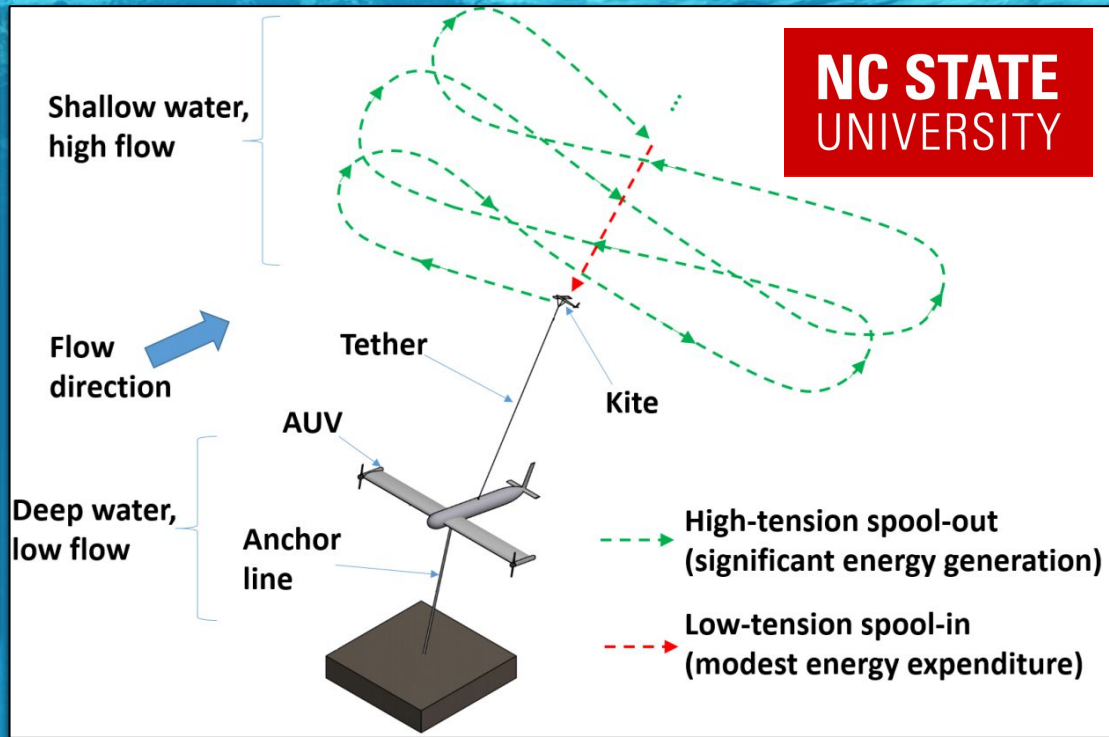
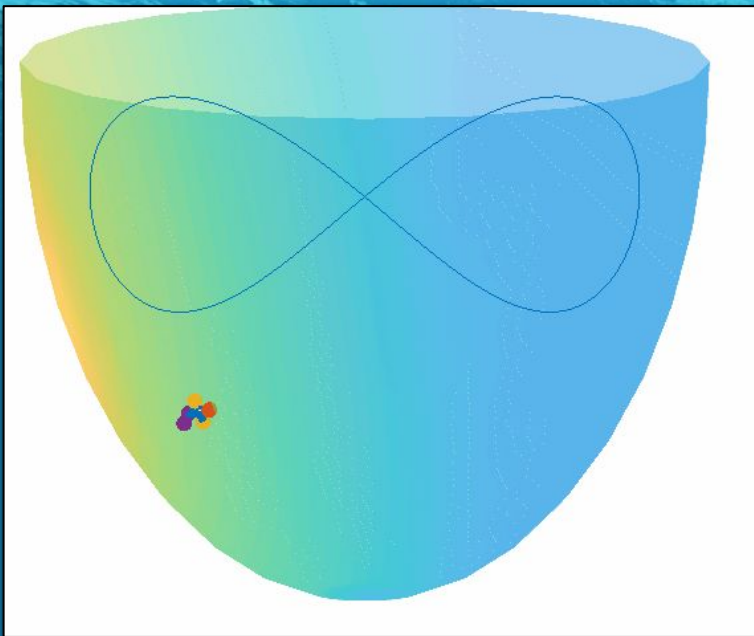
Ocracoke Island, North Carolina – Ocracoke is planning for an electrified future and is exploring electrifying the ferry fleet, which residents are dependent on for transportation to the mainland. ETIPP will analyze the additional grid infrastructure needs that come with an all-electric ferry fleet, and how Ocracoke can best prepare for this future.

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Leads: Dr. Linda D'Anna and George Bonner CSI

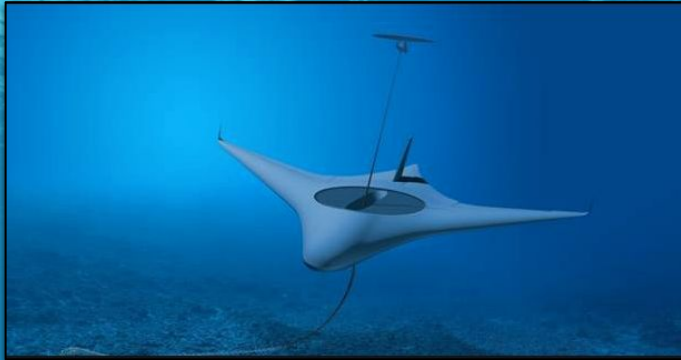
Device Design and Robust Periodic Motion Control of an Ocean Kite System for Hydrokinetic Energy Harvesting



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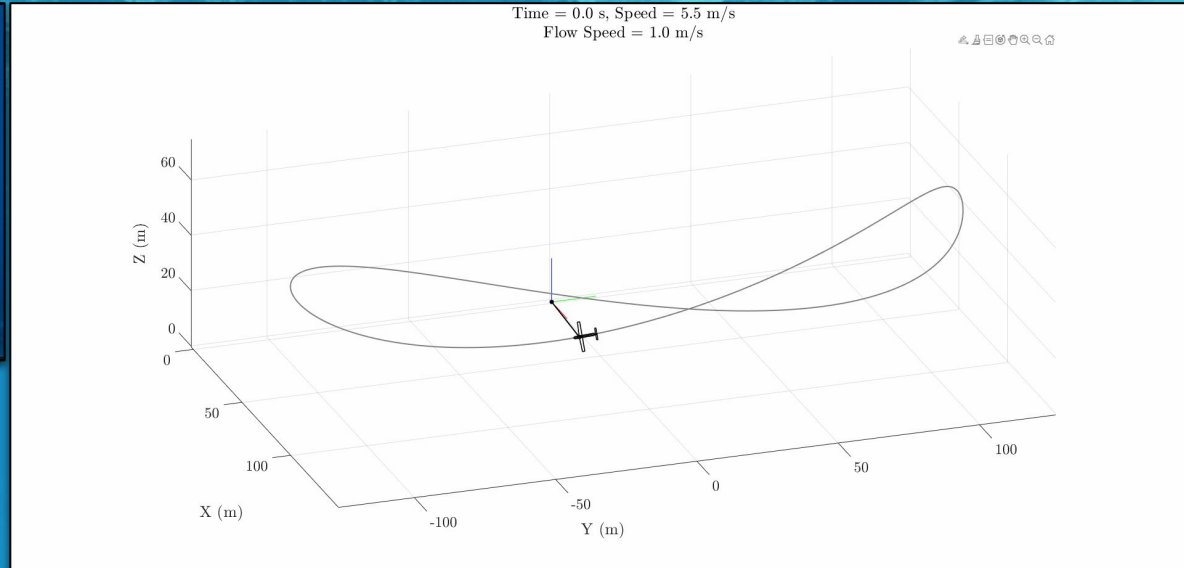
Lead: Dr. Chris Vermillion NCSU

Manta Ray Program: Defense Advanced Research Project Agency



Lead: Dr. Chris Vermillion NCSU

**NC STATE
UNIVERSITY**



Model Validation and Site Characterization for Early Deployment Marine Hydrokinetic Sites and Wave Classification Scheme: DOE/NREL



Coastal Studies Institute
A MULTI-INSTITUTIONAL RESEARCH PARTNERSHIP

ECU

NREL
Transforming ENERGY

US Army Corps of Engineers®

CDIP

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CDIP# 250 Wave
Data Available at:
<https://cdip.ucsd.edu/m/products/?stn=250p1>

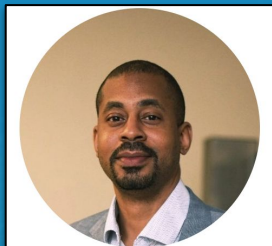
~13 miles
35° 15.554' N
75° 17.167' W

NOTICE
New wave buoy ~13 miles east of Buxton, NC

Lead: Dr. Mike Muglia

Education: NC A&T Rising Star Award Marine Energy Collegiate Competition

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Lead: Dr. Michael Atkinson

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