Lightning Talks – Session 2

Lissa Eng/BOEM

Session 2 Moderator:
Onur Bilgen, Associate Professor, Department of Mechanical and Aerospace Engineering

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Richard Lathrop

Center for Remote Sensing & Spatial Analysis

MARCO Ocean Data Portal:

MARCO is the Mid-Atlantic Regional Council on the Ocean, formed in 2009 by a governors' agreement among New York, New Jersey, Delaware, Maryland, and Virginia. MARCO is a partnership to address shared regional priorities and provide a collective voice for a healthy ocean.

The MARCO Ocean Data Portal is an ocean planning resource center featuring the Marine Planner, an interactive mapping tool. The Marine Planner provides access to over 5000 mapped data sets for easy visualization of everything from administrative boundaries, wind energy lease areas, shipping lanes, marine cables to fishing grounds and marine life habitats. The tool was designed to help a diverse array of stakeholders make decisions, solve problems and improve projects throughout the Mid-Atlantic. https://portal.midatlanticocean.org/

The MARCO ODP, a partnership between Rutgers CRSSA, Monmouth Urban Coast Institute and EcoTrust, is continually updated and expanded based on user feedback.

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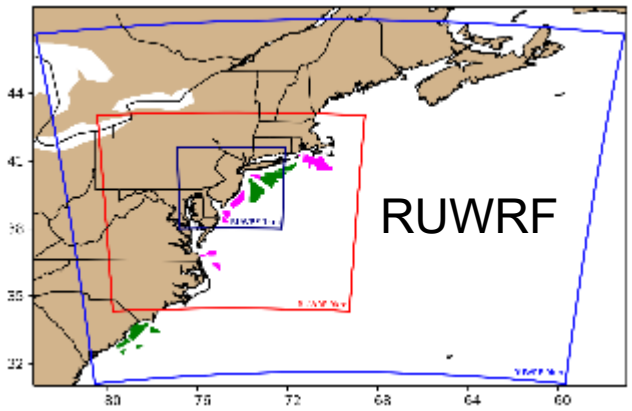
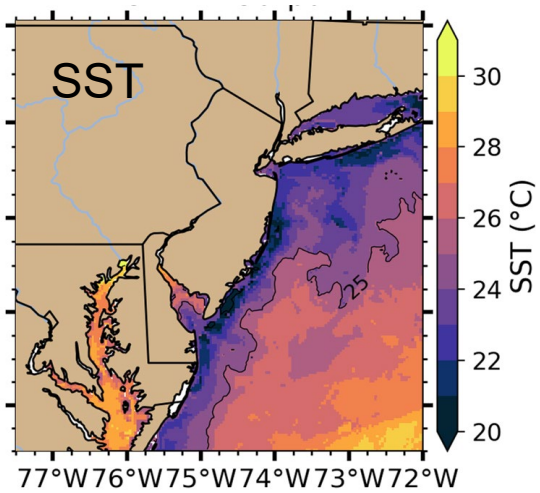
A Decade of Offshore Wind Energy Research Supporting the New Jersey Board of Public Utilities

Scott Glenn, Josh Kohut, Travis Miles, + many
Center for Ocean Observing Leadership, Marine and Coastal Sciences

Overarching theme – The Coastal Ocean impacts the Offshore Wind Resource





RUCOOL – NJBPU Project Fast Facts:

- RUCOOL supported by NJBPU since April 2011
  - Leverages 30+ years of experience and over $100M in projects
  - Focuses activities on providing value to the NJ rate payer
- NJBPU project has three major components
  - Engagement – *to refine needs of diverse stakeholders*
  - Observations & Forecasting - *to provide a planning resource*
  - Research – *to improve understanding*
- Forecast generated daily using RUWRF – "*digital twin" approach*
  - Evaluated by and optimized with NREL in 2019
  - Continuous ongoing validation documents performance equal to, or better than, the evolving national products
  - Full 4-D dataset is available for applications and research
- RUWRF Key Features
  - Triple nested (9 km, 3 km, 1 km) within U.S. global model
  - Sea Surface Temperature boundary condition generated by RUCOOL using state-of-the-art satellite systems
  - Accounts for essential ocean features (upwelling) and essential atmospheric structures (seabreeze)

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Kevin Lyons, Ph.D.

Supply Chain Management

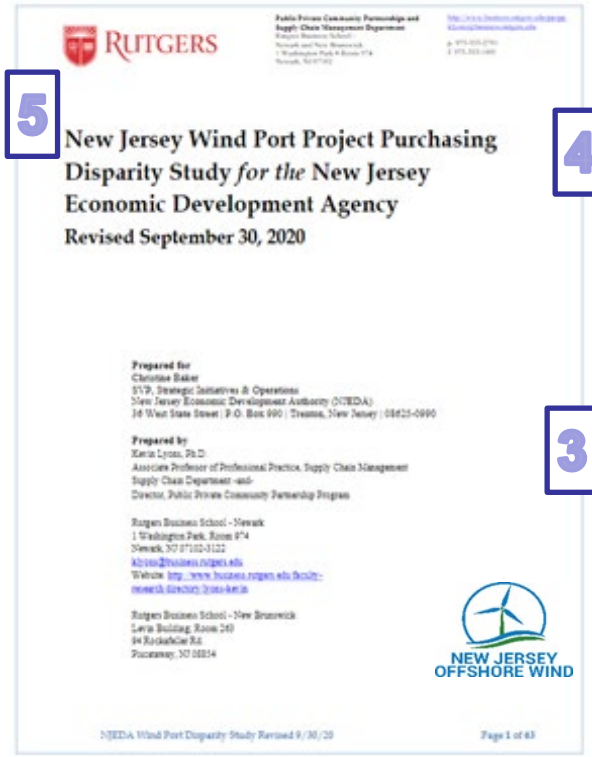
NJEDA Off-Shore Wind Port Purchasing Disparity Study

The NJ Wind Port will be the first purpose-built wind port on the East Coast, with no vertical restrictions and easy access to more than 50 percent of the available U.S. offshore wind lease areas. 1

1 GW – 750,000 Homes!

A gigawatt is equal to one billion watts 2

NJ 7.5 GW (2028)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New Jersey Wind Port Project Purchasing Disparity Study *for the* New Jersey Economic Development Agency

Revised September 30, 2020

Prepared for
Christine Baker
SVP, Strategic Initiatives & Operations
New Jersey Economic Development Authority (NJEDA)
36 West State Street | P.O. Box 990 | Trenton, New Jersey | 08625-0990

Prepared by
Kevin Lyons, Ph.D.
Associate Professor of Professional Practice, Supply Chain Management
Supply Chain Department -and-
Director, Public Private Community Partnership Program

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NEW JERSEY OFFSHORE WIND

NJEDA Wind Port Disparity Study Revised 9/30/20 Page 1 of 63

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NJEDA contracts Rutgers to conduct Pre-RFP Disparity Study

Disparity Study identifies NJ and Newark Based Diverse Suppliers up to 40% of total spend

RFP Language developed for minimum 15% Diverse Spend

Contracts award, construction in progress 30% diverse spend

3 This research project and report are called "disparity studies" because they determine if there is a disparity between the utilization and availability of minority, women, veteran, LGBT-owned firms in the awarding of major construction contracts.

NJ EDA
ECONOMIC DEVELOPMENT AUTHORITY

Site: Test Pile, Mechanical Dredging, Marine Work, Earth Work, Electrical, Concrete, Roadwork & Utilities, Fencing

6

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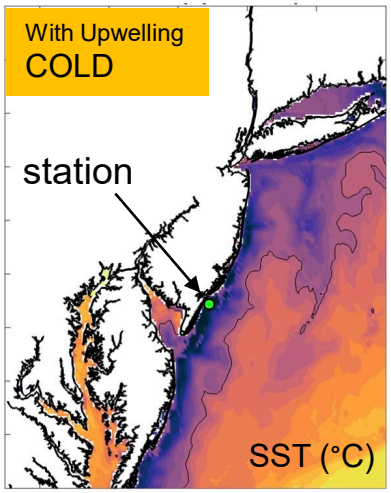
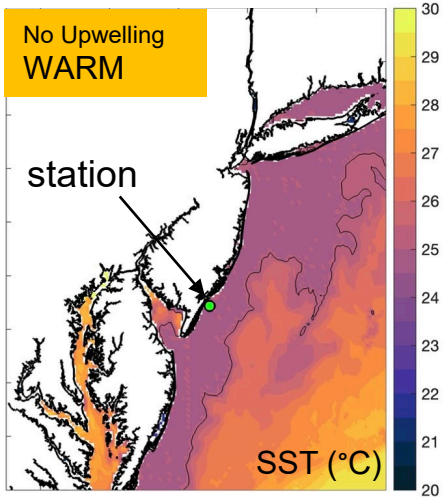
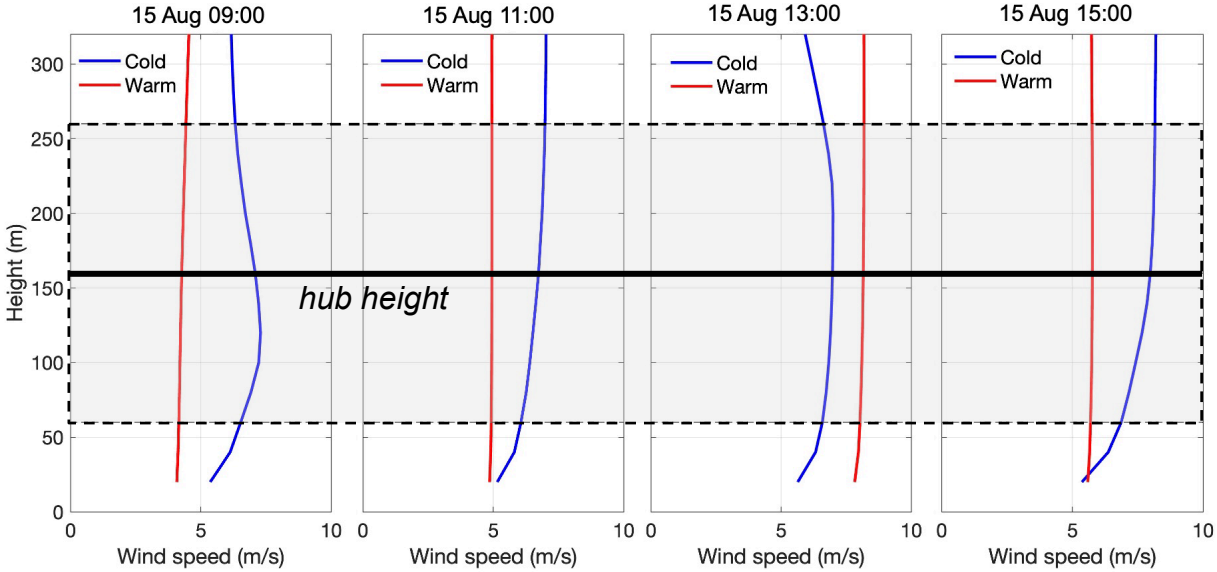
Effect of Coastal Upwelling on Air-Sea Interaction and Offshore Wind in New Jersey

L. Fernando Pareja-Roman, Travis Miles, Scott Glenn
Center for Ocean Observing Leadership, Marine and Coastal Sciences





Does colder SST affect winds at turbine hub height?



Power is proportional to cubed wind speed!
Total energy over a two-day model (RU-WRF) run:

Cold SST	Warm SST
7.86 x 10^4 kWh	**5.68** x 10^4 kWh

Sum of energy in the Cold run was 38% higher than in the Warm run

Ocean conditions impact offshore wind power production

Serpil Guran, Lori Dars, Margaret Brennan-Tonetta
Rutgers EcoComplex

Rutgers WindIgnite -Offshore Wind Supply Chain Development Challenges and Opportunities

- NJ has to achieve 3,500 MW by 2030, 7,500 MW by 2035 OSW and 11,000 MW by 2050.
- These ambitious goals express that we have challenges, but also great opportunities.
- The OSW development is strong in Europe and elsewhere, where the supply chain already exists and is well founded. The OSW supply chain is not at the same maturity in the US and quick and efficient transition is needed.
- Acceleration of the development of local supply chain will require efficient planning, collaboration, cooperation, outreach and education so that the local exiting businesses can translate their existing expertise to new industry and its emerging supply chain ecosystem.
- The Rutgers WindIgnite Program positions itself to serve as an accelerator program to provide support to underrepresented small business and start-ups to achieve this transition.

WindIgnite
Offshore Wind Supply Chain Accelerator Program
RUTGERS ECOCOMPLEX – CLEAN ENERGY INNOVATION CENTER

- We will utilize a network of resources to assist new and existing OSW energy supply chain technology companies to successfully maneuver the innovation pathway.
- This pathway includes discovery, concept assessment, business model assessment, technology verification, scale-up and commercialization to support emerging offshore wind industry in New Jersey and Mid-Atlantic Region.

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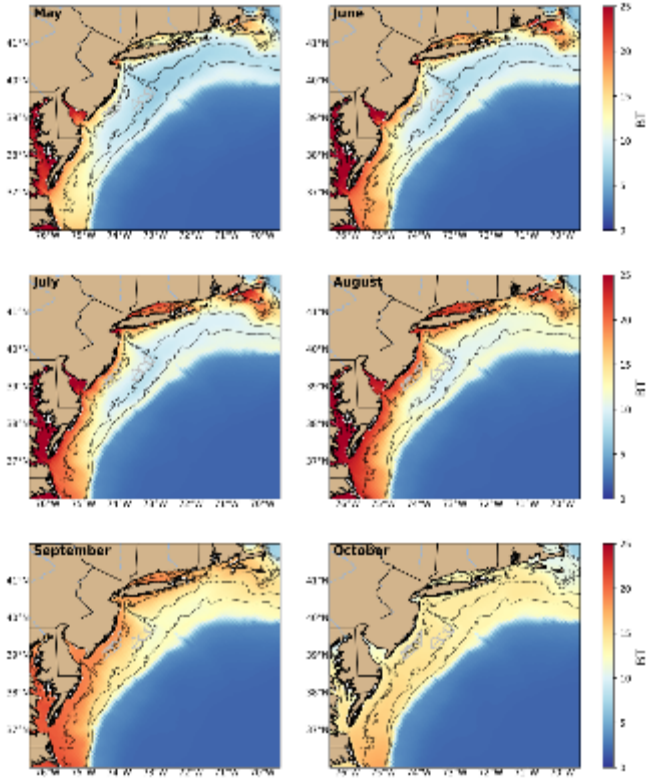
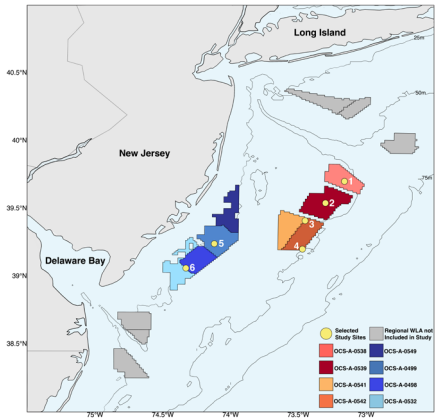
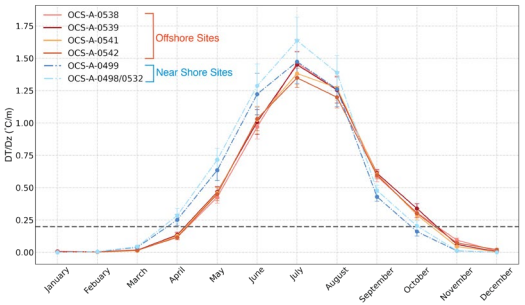
Interactions and overlap between the Mid Atlantic Cold Pool and offshore wind

Travis Miles, Becca Horwitz, Luis Fernando Pareja-Roman and Daphne Munroe,
Center for Ocean Observing Leadership and Haskin Shellfish Research Laboratory, Department of Marine and Coastal Sciences







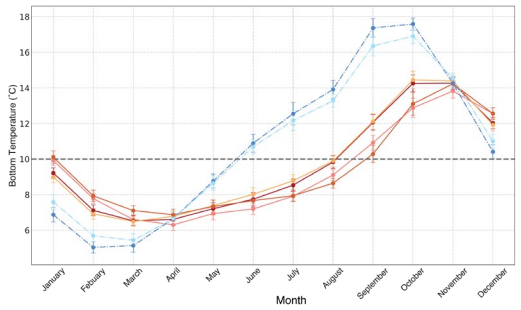
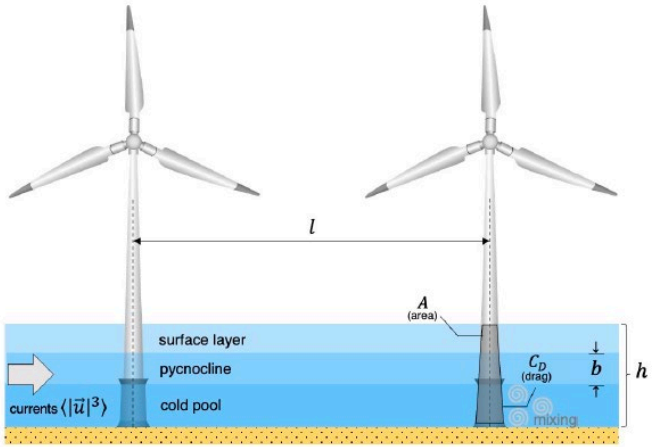


Figure 1. *Peak Cold Pool monthly averaged bottom temperatures based on Rutgers ocean model simulations (2007 to 2020).*

How might flow past a turbine impact mixing of the Cold Pool?



$$\tau_{mix} = -\frac{\phi_{max} H}{Ri_f P_{str} b}$$ *Carpenter et al. (2016)*

From only tidal currents and turbine foundations in the MAB it would take ~300 years to mix the Cold Pool.

Currently evaluating storm events and additional ocean process and time-scales on the shelf.

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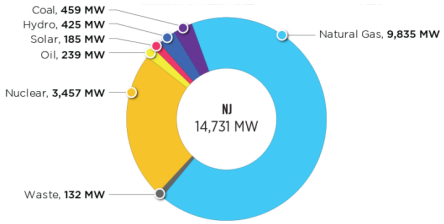
Farhad Angizeh

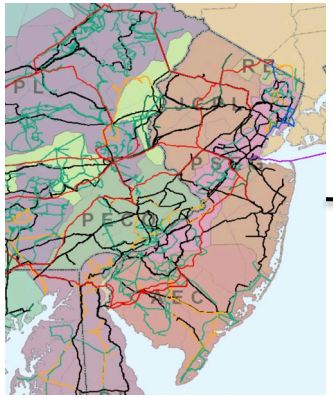
Department of Industrial and Systems Engineering

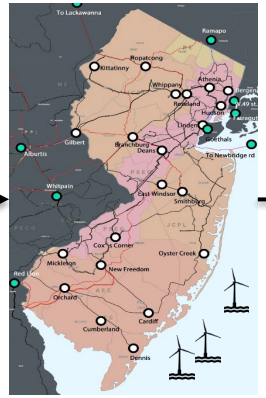
Impact Assessment of Energy Storage & Offshore Wind Integration within NJ Elect. Grid

- New Jersey's Energy Master Plan:
  - 3,500 MW of offshore wind by 2030 & 7,500 MW by 2035
  - 2,000 MW energy storage by 2030 & 2,500 MW by 2035

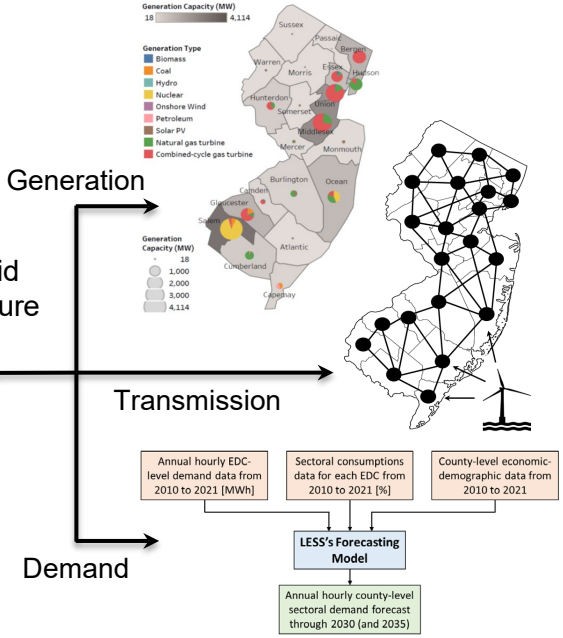


Existing Installed Capacity
as of Dec. 2020 [Source: PJM]

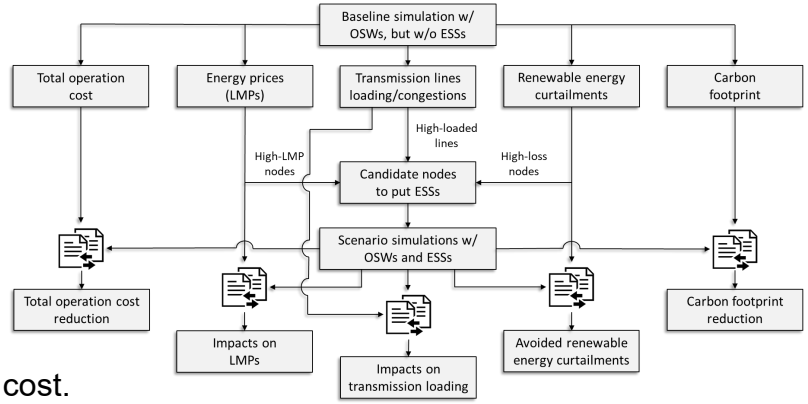




Elect. grid infrastructure model



- Framework to quantify the integration impacts of ESSs & OSWs
  - A state-level Unit Commitment-based optimization model is developed.
  - The model computes "best" power generation/storage mix to balance supply and projected net-demand.
  - 5 Key performance indicators (KPIs) are proposed to quantify impacts of different ESS+OSW configuration scenarios in comparison with the baseline cases (only OSWs).
  - Decentralized ESS configurations with uneven capacities seem to have better impacts on the system operation, i.e., LMPs, congestions, renewable curtailments and the operation cost.



Grace Saba, Josh Kohut, Kira Lawrence, Reneé Reilly
Department of Marine & Coastal Sciences, RUCOOL, BPU, NJDEP

An autonomous-based oceanographic and ecological baseline to inform offshore wind development over the continental shelf off the coast of New Jersey, northeast U.S.

- 4 seasonal deployments (2 years) of paired gliders and spring-to-fall gap fill missions with a full complement of available sensors to simultaneously capture oceanographic and ecological variables

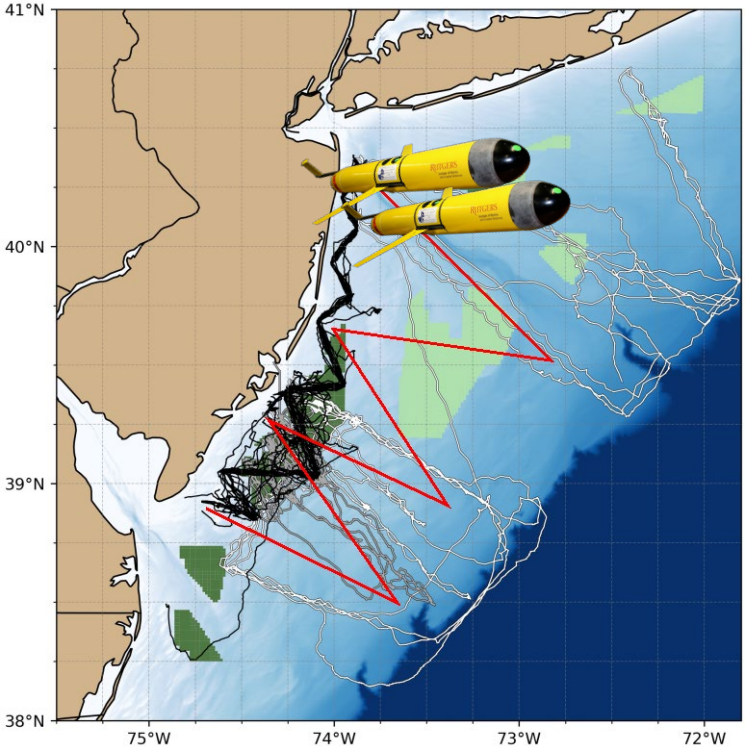
Temperature
Salinity
Density
pH
Dissolved oxygen
Chl Fluorescence
CDOM
Optical backscatter

Active acoustics - fish (38, 120, 200 kHz)

Active Acoustics - zooplankton (120, 200, 455, 769 kHz)

Passive acoustics – mammals

Fish Telemetry



- Conduct research and develop data products: e.g., overlap between oceanographic features & distribution of fishes and marine mammals, between marine mammal predators & their prey

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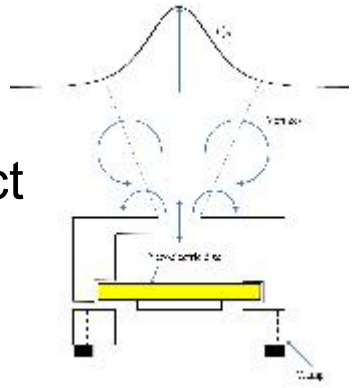
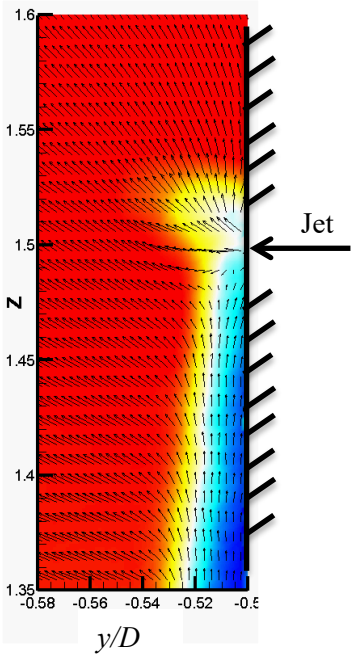
Dr. Edward P. DeMauro

Mechanical and Aerospace Engineering

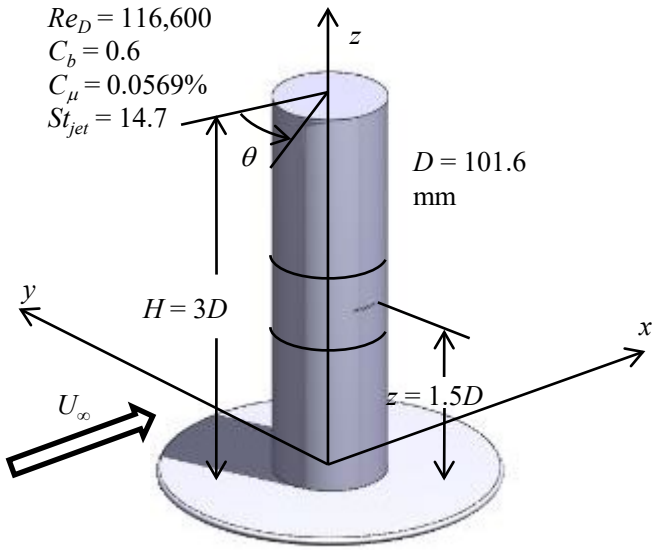
Active Flow Control for Wind Energy

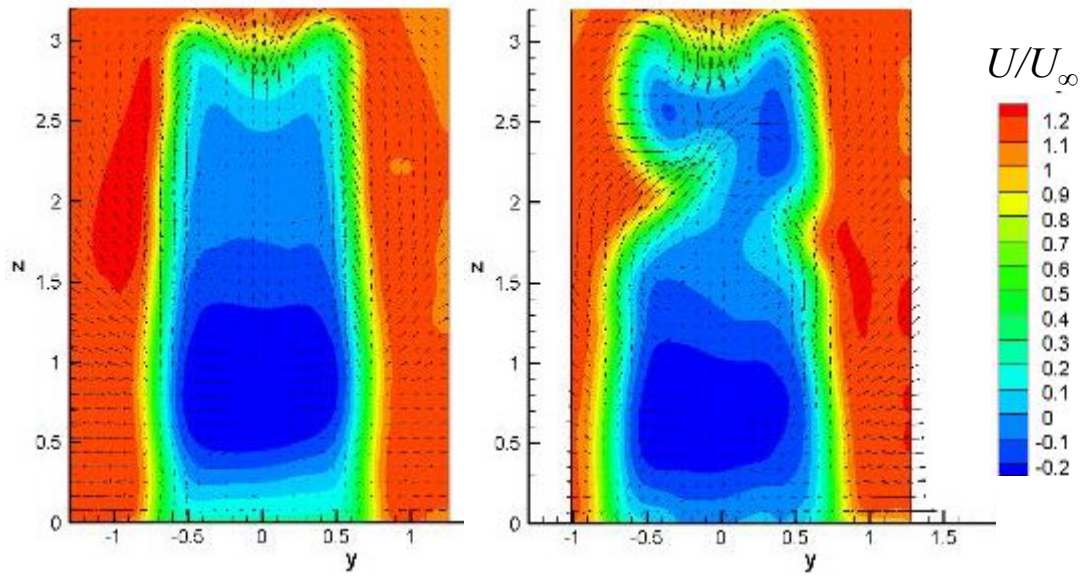
- On-demand techniques for flow manipulation
- Use of a synthetic jet; “virtual shaping” effect
- Increased wind energy generation
- Goal: increase near-surface velocity with minimal energy input





- $Re_D = 116{,}600$
- $C_b = 0.6$
- $C_\mu = 0.0569\%$
- $St_{jet} = 14.7$





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Daphne Munroe

Department of Marine & Coastal Science

Modeling Interactions Among Commercial Shellfish Fishing and Wind Energy

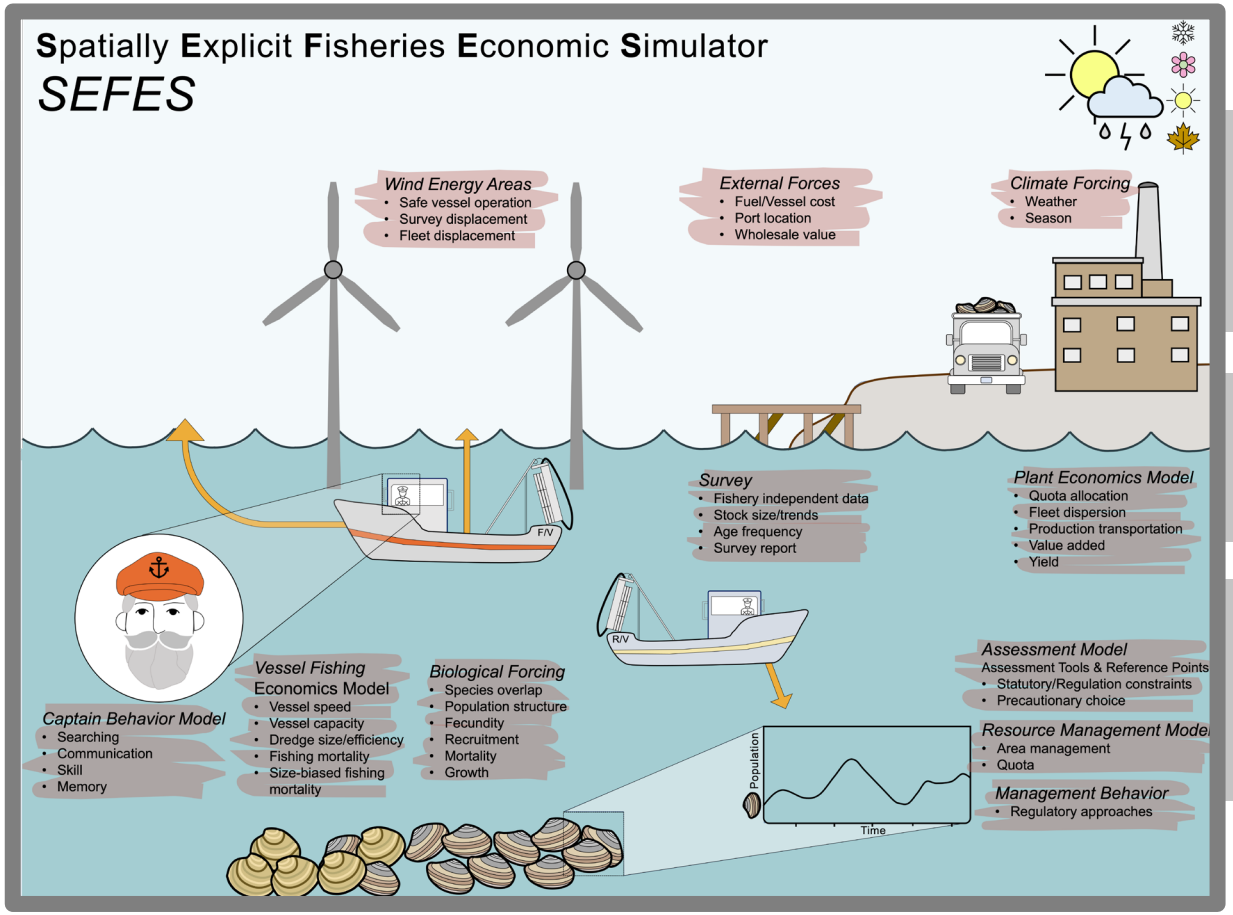
RUTGERS
School of Environmental and Biological Sciences

VIMS | William & Mary
Virginia Institute of Marine Science

Old Dominion University

The University of Southern Mississippi

SCAN
PROJECT WEBSITE

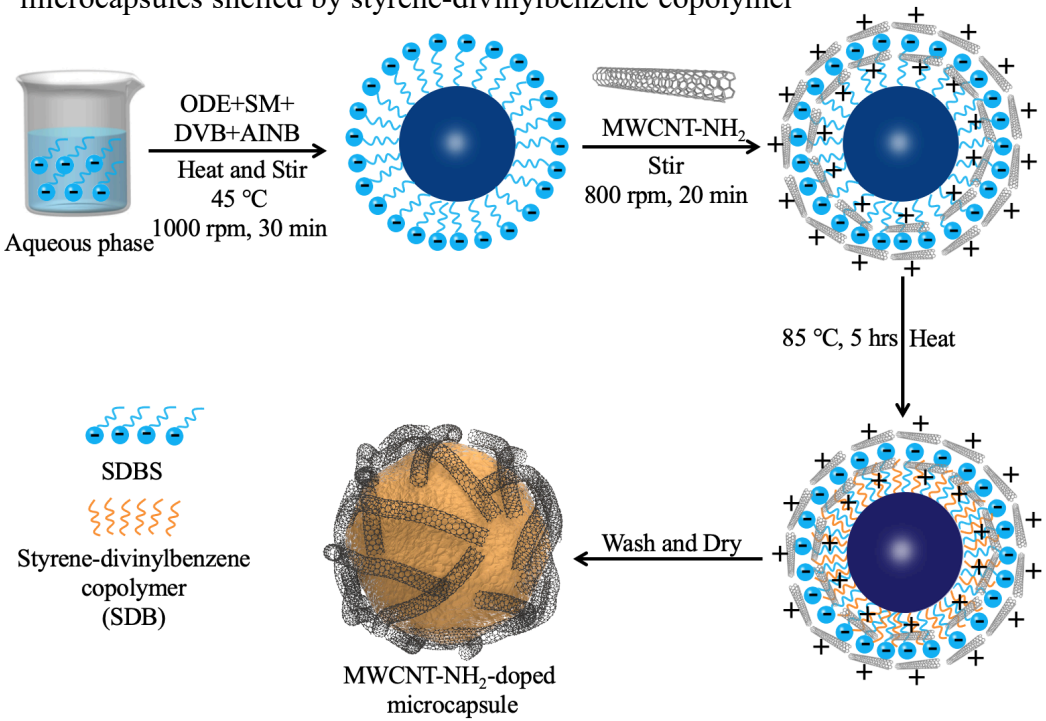


- Fishing trips decline while time to obtain catch increases
- Decreased fishing activity decreases revenues 3-15%
- Costs increase by 10% and revenues decline by 25% for Atlantic City fleet

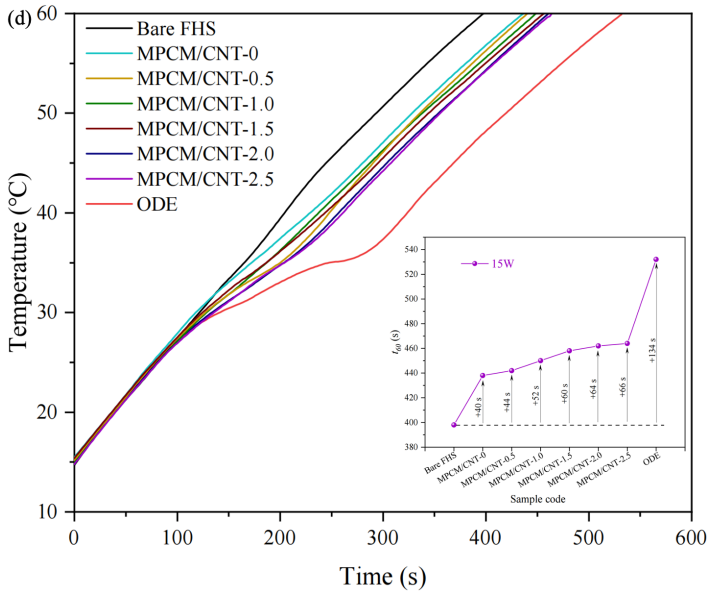
Zhixiong "James" Guo
Mechanical and Aerospace Engineering

Microcapsulated and Doped Phase-Change Materials for Energy Storage and Related Applications

Synthetic route for the aminated MWCNT doped n-Octadecane microcapsules shelled by styrene-divinylbenzene copolymer



Test of the microcapsules in fined heat sink showed time delay in temperature rise.



- Energy storage is an important component of renewable energies. To use energy efficiently is to store and manage it. Energy storage also reduces the discrepancy between energy supply and demand as well as plays a vital role in saving of energy by converting it into other reliable forms.
- Disadvantages such as low thermal conductivity, low thermal stability, and leakage may prevent phase-change materials in practical applications. Encapsulation and additives could resolve these issues.
- Doping 2.5% MWCNT in the shell could enhance the thermal conductivity by 229%.

Closing Remarks

Lissa Eng/BOEM

Please help us improve the program by completing the Program Evaluation.

Thank you for attending!

osw.rutgers.edu