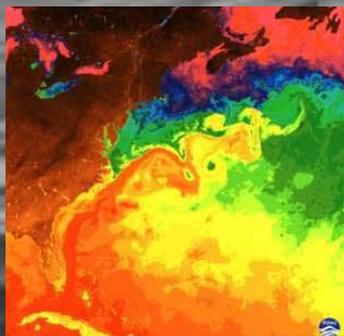


SEA GRANT



Renewable Ocean and Coastal Energy

WIND – WAVE – TIDAL – SOLAR – BIOFUEL



Sea Grant Ocean and Coastal Renewable Energy

Sea Grant has actively supported renewable ocean energy development for years, providing funding for innovative research and technology development at universities across the country. In addition to funding research in this burgeoning industry, Sea Grant programs have drawn on their great strengths in public outreach and education to convene workshops, hold seminars, and provide the most current scientific information regarding renewable energy to coastal managers and residents.

Sea Grant's Capabilities in Renewable Ocean and Coastal Energy Research, Outreach, and Education

- Renewable energy research (technology development)
- Marine spatial planning
- Research on siting and impacts
- Environmental/socio-economic assessments
- Public opinion assessments (surveys, workshops, symposium, etc.)
- Identification and consolidation of BMPs
- SG Law Center: Law and policy analysis/support
- Education, outreach, and engagement programs
- Identifying and addressing potential multiple use conflicts through facilitation and mediation among users and interests

WIND

❖ Research and Technology Development

Michigan Sea Grant is funding two wind energy siting proposals in 2009-2010; 1) "Locating Wind Energy Facilities in Michigan's Coastal Counties: An Integrated Assessment for Muskegon and West Michigan Locating Wind Energy Facilities in Michigan's Coastal Counties: An Integrated Assessment for Muskegon and West Michigan" and; 2) "An Integrated Assessment for Siting Wind Turbines in Coastal Counties in Michigan".

In addition, Michigan Sea Grant is building off of a Michigan State University (MSU) Land Policy Institute study that found that using all of the existing brownfields in Michigan as renewable energy sites with solar panels and wind turbines could capture an estimated 5100 megawatts – enough energy to power about half the homes in Michigan while creating more than \$15 billion in investment and creating more than 17,500 construction and long-term jobs. A research team from Eastern Michigan University (EMU), with support from Michigan Sea Grant, is continuing its integrated assessment of coastal brownfield redevelopment in Michigan to learn what approaches have led to successful redevelopment. The research team is exploring how these strategies can be incorporated into future redevelopment efforts. The aim of research and reports like the MSU study is to create a user-friendly system that will enable policy makers, legislators, business owners and the public to more effectively

understand and accomplish the goals of brownfield redevelopment and renewable energy initiatives.

❖ **Policy and Management Tools**

North Carolina Sea Grant is engaged in several projects relating to renewable energy — in particular, ocean and coastal wind energy. In June 2009, the N.C. Coastal Resources Commission received a report on emerging ocean policy topics – a report developed by Sea Grant through a two-year partnership that included the N.C. Division of Coastal Management and the N.C. Coastal Resources Law, Planning and Policy Center. Sea Grant coastal law, policy and development specialist Lisa Schiavinato, who also co-directs the Center, led the research efforts, discussions with a panel of N.C. coastal experts, and public hearings. The chapter on renewable energy (1) describes how wind energy, wave energy and tidal energy work; (2) describes the current legal environment surrounding renewable energy at the state level and federal level; and (3) provides recommendations on how the state can help prepare itself to meet its renewable energy portfolio standard, known as RPS.

North Carolina Sea Grant also participated in a coastal wind feasibility study requested by the N.C. General Assembly and coordinated by the University of North Carolina. The completed study report — including technical, environmental, economic and legal issues associated with wind energy development in the state’s estuarine and coastal-ocean waters — is to be submitted to the legislature in July 2009. Schiavinato was responsible for and crafted a report chapter that (1) describes the current legal and regulatory environment surrounding wind energy development; (2) describes the various legal and regulatory obstacles at the state level; (3) describes the new federal Minerals Management Service regulatory framework on renewable energy development on the Outer Continental Shelf; and (4) makes recommendations on how the state legislature and agencies can address these obstacles.

Also, since 2008, Schiavinato participated in two state-level panels on wind energy: the N.C. Wind Working Group and N.C. Wind Energy Technical Advisory Group. These panels have made recommendations for a wind energy siting and standards bill (S. 1068), which is currently moving through the N.C. General Assembly. Finally, Schiavinato has co-written a law review article on the legal and regulatory issues surrounding wind energy development in the state. It will be published in the *North Carolina Law Review* in Fall 2009.

Sea Grant has also been actively involved in marine spatial planning efforts in Rhode Island. Jennifer McCann, leader of the Sustainable Coastal Communities and Ecosystems Extension Program for Rhode Island Sea Grant and the University of Rhode Island Coastal Resources Center is a co-PI for the R.I. Ocean Special Area Management Plan (Ocean SAMP), a project to define use zones for Rhode Island’s ocean waters through a large \$6.2 million research and planning process that integrates the best available science with open public input and stakeholder involvement. For more than 25 years, RI has been zoning its state waters by use zones intended to protect or enhance current uses, including

habitat and commercial and recreational uses, while providing for future uses, such as renewable energy development. The Ocean SAMP will demarcate use zones for state and federal waters in an ocean area of approximately 1,547 square miles (1,168 square nm). Beyond state waters, the SAMP is being developed with federal agencies that have jurisdiction in federal waters.

❖ **Outreach and Education**

Delaware Sea Grant recently assessed public opinion of wind as an alternative energy. This work was catalytic in moving the state debate forward. Delaware has now approved a \$1.6 billion project to develop a wind farm that will generate renewable energy for the area. Delaware Sea Grant funded researchers are now working to identify potential sites for offshore wind energy facilities, the laws and policies to best regulate possible development, possible economic and environmental impacts, and opinions of coastal residents regarding offshore wind power.

Maine Sea Grant is providing facilitation support to a coalition of partners that is conducting the community engagement and outreach needed to identify pilot sites along Maine's coast. Several of Maine Sea Grant's Marine Extension Team (MET) members will participate in the regions of the coast where the pilot sites are based. More robust and long-term engagement is planned with proposals being submitted to other national funding agencies. Maine Sea Grant is also leading the organization of the Maine Coastal Waters Conference-2009 on October 28th, 2009 in Northport Maine where one of the conference themes is alternative, ocean-related energy.

Rhode Island Sea Grant is sponsoring the International Symposium, "The Ecology of Marine Windfarms: Perspectives on Impact Mitigation, Siting and Future Uses" from November 2 to 4, 2009, in Newport, R.I.
<http://seagrants.gso.uri.edu/baird/2009/>

WAVE

❖ **Research and Technology Development**

Sea Grant-funded research to develop electrical power from ocean waves has jump-started a state and now national initiative. Starting in 2003, Oregon Sea Grant pioneered support for Oregon State University (OSU) researchers with several years of base funding for research that focused attention on this hitherto exotic idea and galvanized additional support. During the past year, OSU researchers have evaluated 18 different "direct drive" wave energy technologies, and successfully tested one in the ocean in September 2008. In addition, a total of \$13.5 million has been raised by the Department of Energy and other partners for a new Northwest National Marine Renewable Energy Center, to be based at the OSU Hatfield Marine Science Center in Newport, Oregon.

From 2007-2008, New Hampshire Sea Grant funded a wave energy project, where a buoy was designed, built, and tested as a means for capturing energy

from waves and converting mechanical wave energy into electricity for offshore aquacultures, oil platforms, and other offshore platforms.

Maine Sea Grant is currently funding research on wave conditions that could inform future alternative energy development. Information about wave conditions has many applications, including the safety of boat or ship operations, the transport of sediment or nutrients in the water, the siting of aquaculture activities, and coastal engineering. This project will develop an atlas of the detailed fine-resolution wave climate in coastal Maine and a computerized wave prediction system for forecasting wave heights. Collaborative Governance: Maine Sea Grant Extension's Maine Solutions is now also partnering with Maine Maritime Academy's Tidal Energy Device Evaluation Center to gauge community issues and concerns regarding proposed tidal energy generation in the Bagaduce River.

❖ **Policy and Management Tools**

The Sea Grant Law Center recently released the report, "Offshore Renewable Energy: A Regulatory Primer," which provides basic information on regulatory authorities with respect to offshore wind, wave, tidal, and ocean thermal energy conversion projects. It also briefly discusses state authority, local concerns, and an emerging alternative management framework—marine spatial planning. Its brevity and straight-forward explanations should help Sea Grant extension agents, communicators, local decision-makers and anyone else struggling to understand the complex regulatory framework.

The Regulatory Primer is available online at:

<http://www.olemiss.edu/orgs/SGLC/National/offshore.pdf>

❖ **Outreach and Education**

Oregon Sea Grant has developed a coast wide wave energy outreach and engagement program, focusing on engaging coastal communities in ocean renewable energy planning. Oregon Sea Grant has also created a human dimensions of wave energy program, which is studying various social and political aspects of wave energy development. Oregon Sea Grant has been active in working with communities and wave energy interests to identify and address potential environmental and multi-use concerns and recently produced a video entitled, "Wave Power," which has been used extensively to communicate with decision makers, the media, and public.

TIDAL

❖ **Research and Technology Development**

MIT Sea Grant is currently funding a project entitled, "An Assessment of the Tidal Kinetic Energy Resource off the Massachusetts Coast and Potential Impacts of Extraction". The researchers are assessing the tidal energy resource off the Massachusetts Coast and evaluating the potential impact of large-scale turbine deployments on regional hydrodynamics. This project will help produce a modeling tool to determine the size and placement of turbines to optimize the level of energy extraction while keeping impacts on regional hydrodynamics

below an acceptable threshold. By enhancing the information base available to decision makers, this research will also be of value in the environmental impact assessment process.

In spring of 2008, New Hampshire Sea Grant funded a project entitled, “Tidal Power Generation in the Piscataqua River”. This project was the first stage of a tidal power generation system in the Piscataqua River, which will act as a starting point for the state’s tidal energy work.

SOLAR

❖ **Policy and Management Tools**

According to a study released through the Michigan State University (MSU) Land Policy Institute, using all of the existing brownfields in Michigan as renewable energy sites with solar panels and wind turbines could capture an estimated 5100 megawatts – enough energy to power about half the homes in Michigan while generating \$15 billion in investment and more than 17,500 construction and long-term jobs. A research team from Eastern Michigan University (EMU), with support from Michigan Sea Grant, is conducting an integrated assessment of coastal brownfield redevelopment in Michigan to learn what approaches have led to successful redevelopment and how such strategies can be incorporated into future redevelopment efforts with the aim of creating a user-friendly system that will enable policy makers, legislators, business owners and the public to more effectively understand and accomplish the goals of brownfield redevelopment and renewable energy initiatives.

❖ **Outreach and Education**

Hawaii Sea Grant has established the Center for Smart Building and Community Design at the University of Hawaii. Projects include: Marine Labs for the 21st Century (upgrading the Hawaii Institute of Marine Biology (HIMB) at Coconut Island with energy-efficient technologies), Energy Efficiency at the University of Hawaii, Energy Star Dorm Demonstration Project, University of Hawai’i High Performance Building Standards, and the University of Hawai’i Solar Study.

BIOFUEL

❖ **Research and Technology Development**

Delaware Sea Grant is funding projects to identify new coastal biofuels. Delaware Sea Grant researchers Jack Gallagher and Denise Seliskar are examining the potential of seashore mallow, a salt-tolerant plant known for its hibiscus-like blooms, as a biofuel and as a viable crop to grow on low-lying farmland that is increasingly exposed to salt water. With further understanding of the native marsh perennial’s many strengths, including its oil-rich seeds, ability to grow on non-arable land, and erosion-fighting deep-root system, Delaware farmers may soon have a new option for sustaining the ecological and economic uses of agricultural land threatened by sea-level rise.

Scientists working with Mississippi-Alabama Sea Grant Consortium are looking into the viability of turning shrimp processing waste into a diesel-like fuel. The

main purpose of this research is to find a higher value for shrimp waste. Seafood-based biodiesel would also help processors eliminate some waste disposal costs, which have been estimated at about \$145,000 per year per producer.

ALASKA

Paula Cullenberg, Director
Alaska Sea Grant Marine
Advisory Program
Anchorage, AK
Phone: (907) 274-9692
Email: anjpc@uaa.alaska.edu

CALIFORNIA (2programs)

Russell A. Moll, Director
California Sea Grant
University of California, San
Diego
La Jolla, CA
Phone: (858) 534-4440
Email: rmoll@ucsd.edu

Linda E. Duguay, Director
University of Southern
California Sea Grant Program
Los Angeles, CA
Phone: (213) 821-1335
Email: duguay@usc.edu

CONNECTICUT

Sylvain De Guise, Director
Connecticut Sea Grant
University of Connecticut
1080 Shennecossett Road
Groton, CT 06340-6097
Phone: (860) 405-9138
FAX: (860) 405-9109
Email: sylvain.deguise@uconn.edu

DELAWARE

Nancy Targett, Director
Delaware Sea Grant
University of Delaware
Graduate College of Marine
Studies
Newark, DE
Phone: (302) 831-2841
Email: ntargett@udel.edu

FLORIDA

Karl Havens, Director
Florida Sea Grant
University of Florida
Gainesville, FL
Phone: (352) 392-5870
Email: khavens@ufl.edu

GEORGIA

Charles Hopkinson, Director
Georgia Sea Grant
School of Marine Programs
Athens, GA
Phone: (706) 542-1855
E-mail: chopkins@uga.edu

HAWAII

E. Gordon Grau, Director
Hawaii Sea Grant
University of Hawaii
Honolulu, HI
Phone: (808) 956-7031
Email: sgdir@hawaii.edu

ILLINOIS-INDIANA

Brian K. Miller, Director
Illinois-Indiana Sea Grant
University of Illinois
Urbana, IL
Phone: (217) 333-6444
Email: millerbk@uiuc.edu

LOUISIANA

Charles Wilson, Director
Louisiana Sea Grant
Louisiana State University
Baton Rouge, LA
Phone: (225) 578-6710
Email: cwilson@lsu.edu

MAINE

Paul Anderson, Director
Maine Sea Grant
University of Maine
Orono, ME 04469
Phone: (207) 581-1435
Email: panderson@maine.edu

MARYLAND

Jonathan Kramer, Director
Maryland Sea Grant
University System of Maryland
College Park, MD
Phone: (301) 405-7500 x10
Email: kramer@mdsg.umd.edu

MASSACHUSETTS (2 programs)

Chryssostomos
Chryssostomidis, Director
MIT Sea Grant
Massachusetts Institute of
Technology
Cambridge, MA
Phone: (617) 253-7131
Email: chrys@mit.edu

Judith E. McDowell, Director
WHOI Sea Grant
Woods Hole Oceanographic
Institution
Woods Hole, MA
Phone: (508) 289-2557
Email: jmcdowell@whoi.edu

MICHIGAN

James Diana, Director
Michigan Sea Grant
Ann Arbor, Michigan
Phone: (734) 763-5834
Email: jimd@umich.edu

MINNESOTA

Jeff Gunderson, Interim
Director
Minnesota Sea Grant
University of Minnesota
Duluth, MN
Phone: (218) 726-8715
Email: jgunder1@umn.edu

MISSISSIPPI-ALABAMA

LaDon Swann, Director
MS-AL Sea Grant Consortium
Ocean Springs, MS
Phone: (228) 818-8843
Email: swanndl@auburn.edu

NEW HAMPSHIRE

Jonathan Pennock, Director
New Hampshire Sea Grant
University of New Hampshire
Durham, NH
Phone: (603) 862-2921
Email: jonathan.pennock@unh.edu

NEW JERSEY

Peter Rowe, Director
New Jersey Sea Grant
New Jersey Marine Science
Consortium
Fort Hancock, NJ
Phone: (732) 872-1300 ext. 21
Email: prowe@njmsc.org

NEW YORK

James W. Ammerman, Director
New York Sea Grant
State University of New York
Stony Brook, NY
Phone: (631) 632-6906
james.ammerman@stonybrook.edu

NORTH CAROLINA

Michael Voiland, Director
North Carolina Sea Grant
North Carolina State University
Raleigh, NC
Phone: (919) 515-2455
Email: michael_voiland@ncsu.edu

OHIO

Jeffrey M. Reutter, Director
Ohio Sea Grant
Ohio State University
Columbus, OH
Phone: (614) 292-8949
Email: reutter.1@osu.edu

OREGON

Stephen Brandt, Director
Oregon Sea Grant
Oregon State University
Corvallis, OR
Phone: (541) 737-3396
Email: stephen.brandt@oregonstate.edu

PENNSYLVANIA

Robert W. Light, Director
Pennsylvania Sea Grant
Penn State University
Erie, PA
Phone: (814) 217-9018
Email: rw12@psu.edu

PUERTO RICO

Ruperto Chaparro, Director
UPR-RUM
Mayaguez, PR
Phone: (787) 832-3585
Email: rchaparr@uprm.edu

RHODE ISLAND

Barry A. Costa-Pierce, Director
Rhode Island Sea Grant
University of Rhode Island
Graduate School of
Oceanography
Narragansett, RI
Phone: (401) 874-6800
Email: bcp@gso.uri.edu

SOUTH CAROLINA

M. Richard DeVoe, Director
South Carolina Sea Grant
Consortium
Charleston, SC
Phone: (843) 727-2078
Email: Rick.Devoe@scseagrant.org

TEXAS

Robert R. Stickney, Director
Texas Sea Grant
Texas A&M University
College Station, TX
Phone: (979) 845-3854
Email: stickney@tamu.edu

**LAKE CHAMPLAIN
(VERMONT)**

Dr. Mary C. Watzin, Director
Lake Champlain Sea Grant
The University of Vermont,
The Rubenstein School
Aiken Center
Burlington, VT
Phone: 802-656-4057
Email: Mary.Watzin@uvm.edu

VIRGINIA

Troy Hartley, Director
Virginia Sea Grant
Marine Advisory Services
VA Institute of Marine Science
Gloucester Pt., VA
Phone: (804) 684-7248
Email: thartley@vims.edu

WASHINGTON

Penelope D. Dalton, Director
Washington Sea Grant
University of Washington
Seattle, WA 98105-6716
Phone: (206) 543-6600
Email: pdalton@u.washington.edu

WISCONSIN

Anders W. Andren, Director
Wisconsin Sea Grant
University of Wisconsin,
Madison
Madison, WI
Phone: (608) 262-0905
Email: awandren@seagrant.wisc.edu

NATIONAL SEA GRANT OFFICE

Leon Cammen, Director
NOAA/Sea Grant, R/SG
1315 East-West Highway
SSMC-3, Eleventh Floor
Silver Spring, MD 20910
TEL: (301) 734-1077

