

Virginia Coastal Energy Research Consortium: Offshore Wind Power and Coastal Algal Biofuels

Presentation

Senate Appropriations Committee

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Mission and Specific Strategies

Mission: The mission of the Virginia Coastal Energy Research (Working Group) is to identify and develop new coastal energy resources through multidisciplinary research collaborations and environmentally responsible strategies.

Strategies: Conduct research in areas consistent with a ***diversified portfolio*** of energy sources in coastal areas and offshore

Governance: VCERC Board of Directors, Executive Director (P.G. Hatcher, ODU), Research Director (George Hagerman, VT)

Bylaws enacted and funding received Nov. 2007

VCERC Focus on Marine Renewable Energy Technologies with Large National Potential

Offshore wind and wind-wave hybrid technologies

could meet 20% of present US electricity demand

using 8% of the Outer Continental Shelf (OCS) area between 5 and 20 nautical miles offshore and 17% of the OCS area between 20 and 50 nautical miles offshore

Algae cultivation and biofuel processing technologies

could meet US transportation demand

using less than 5% of available cropland

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Legislative Budget Amendment Funding Four Initial VCERC Projects in FY 2008



1. **Feasibility-level design and economic assessment**
for a hypothetical reference baseline offshore wind power project



2. **Preliminary mapping of offshore areas**
suitable for offshore wind power development, with identification of military training areas, shipping lanes, commercial fishing grounds, and marine and avian habitats



3. **Evaluation of economic development potential**
of commercial offshore wind power development and associated workforce training needs, and planning for an ocean test bed



4. **Feasibility-level design and economic assessment**
for an algae-to-biodiesel culture and processing system

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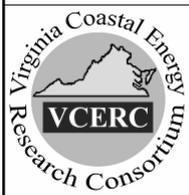
State Funds Received as of January 15, 2007

\$1,005,750.00

(75% of Allocation)

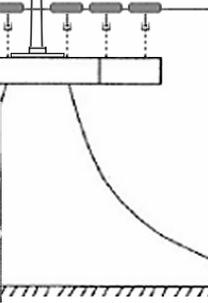
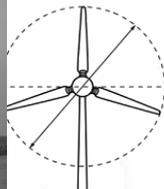
Cost-Share Committed as of January 15, 2007

\$1,357,424.00



VCERC Hybrid Wind-Wave Concept

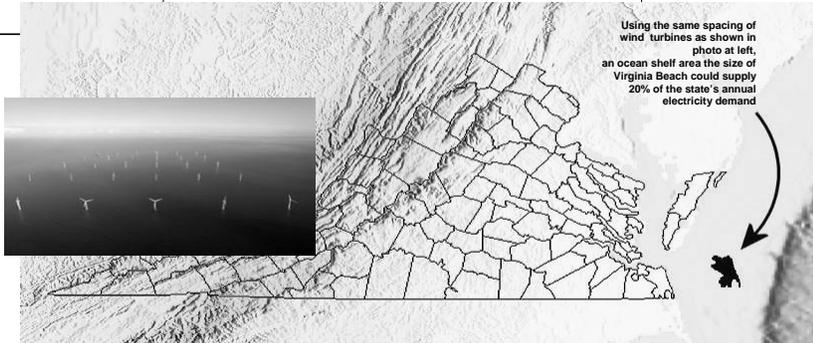
Combining ocean-tested technologies



Advantages:

- Buoy and wind turbine installed on submersible platform in quiet harbor, with tow-out deployment
- Negligible visual impact beyond ~20 km offshore
- Shared platform and power cable costs
- Greater wind and wave power densities with increasing distance from shore
- Greater continuity of output – yesterday's winds are today's waves

Offshore wind studies



Accomplishments

- Assembled hourly wind and wave data from different offshore NOAA stations and built database using Matlab.
- Calculated wind climatology for each offshore NOAA station.
- Compared measured waves on the buoy 44014 and waves determined by models.
- Calculation of design parameters for waves, wind and currents.
- Created database of QuikSCAT satellite wind and determined climatology.
- Build a web page to show the information on the project: <http://ccpo.odu.edu/~jblanco/windenergy/>

Prepared for establishment of a National Marine Renewable Energy Research Development and Demonstration Center (Federal \$\$)

VCERC Combining Biofuels Production with Removal of Nutrients from Wastewater

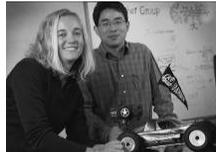
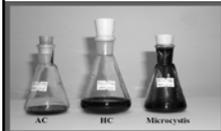
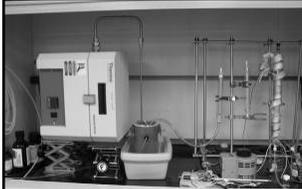
HRSD Virginia Initiative Plant Prototyping Test Bed



Advantages:

- Take advantage of continuous high nutrient flow
- Potential boost in production of oil-precursor lipids from algal heterotrophic growth
- Alternative solution for meeting new nutrient discharge criteria, generating income rather than adding high cost of conventional N and P removal technologies
- Prevents eutrophication and dead zone formation in rivers and Chesapeake Bay
- HRSD matching in-kind services

VCERC Algal Biofuels Accomplishments: July 07 – Jan 08



- Characterized indigenous algal species biodiesel potential
- Built and begun optimization of two pilot scale converters of algae to biofuel
- Installed pilot scale algal growth tanks on waste water plant roof
- Producing biodiesel from algae grown on waste water and agricultural waste
- Conducted preliminary economic feasibility study
- Produced proposal to attract investment for the building of a 100 acre algal biodiesel plant

Proposals submitted to the following:
USDA, NSF, HRSD, DARPA(pre)

Requests for proposals from:
Philip Morris, Perdue Chickens

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Achieving Regional and National Recognition

- Local channel 10 and 13 video reports
- The Science Channel “Invention Nation” segment on algal biodiesel
- Newspaper coverage:
 - The Virginian Pilot
 - USA Today
 - Wall Street Journal
 - Tampa
 - Dan Diego
 - Seattle
 - Many others nationally, up to 22 papers

VCERC Requesting \$4.8 Million in FY09-10

2007 General Assembly Appropriation was \$1.5 million for FY08, to support five universities

2007 General Assembly added three new universities (UVA, HU, VCU)

Sustained level funding to support eight universities would be \$2.4 million per year for FY09-10

**VCERC can compete successfully for DOE grants
NSF grants, USDA grants, Industry funding (direct and in-kind), private \$\$**

Potential for at least 2:1 return on state investment

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Visit www.vcerc.org for More Information

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University Partners

- Old Dominion University
- Virginia Institute of Marine Science
- Virginia Tech Advanced Research Institute
- James Madison University
- Norfolk State University
- Virginia Commonwealth University
- University of Virginia
- Hampton University

Government Partners

- Hampton Roads Clean Cities Coalition
- Hampton Roads Sanitation District - Virginia Initiative Plan
- Hampton Roads Technology Council
- Virginia Department of Mines, Minerals & Energy
- Virginia Marine Resources Commission

Industry Partners

- Science Applications International Corporation
- Virginia Manufacturers Association
- Virginia Maritime Association



In August 2006 an Act of the Virginia General Assembly passed the landmark "Virginia Energy Plan" which establishes a foundation for the research and development of future renewable energy resources.

The Virginia Coastal Energy Research Consortium (VCERC) was established in Chapter 6 of the Virginia Energy Plan. The VCERC was created to "serve as an interdisciplinary study, research, and information resource for the Commonwealth on coastal energy issues" with an initial focus on offshore winds, waves, and marine biomass.

The Consortium is charged with the following responsibilities:

- consult with the General Assembly, federal, state, and local agencies, nonprofit organizations, private industry and other potential users of coastal energy research;
- establish and administer agreements with other universities of the Commonwealth to carry out research projects relating to the feasibility of recovering fuel gases from methane hydrates and increasing the Commonwealth's reliance on other forms of coastal energy;
- disseminate new information and research results;
- apply for grants made available pursuant to federal legislation, including but not limited to research and development calls from the federal government and from other sources; and
- facilitate the application and transfer of new coastal energy technologies.

Further, the Consortium is governed by a board which consists of fourteen members - with representatives from each of the eight partner universities and six government and industry partners. The Consortium is located at Old Dominion University in Norfolk.

University questions?
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Industry questions?
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