Virginia Coastal Energy Research Consortium:

Offshore Wind Power and Coastal Algal Biofuels

Presentation

House Appropriations Committee

Richmond, VA

21 January 2008

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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 (G. Hagerman, VT)

Bylaws enacted and funding received Nov. 2007

Virginia Coastal Energy Research Consortium
VCERC

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

Legislative Budget Amendment Funding
Four Initial VCERC Projects in FY 2008

Virginia Tech | Old Dominion University

James Madison University | Virginia Institute of Marine Science VIMS

Old Dominion University

Virginia Tech | SAIC From Science to Solutions™ | NSU Norfolk State University

Old Dominion University

Virginia Institute of Marine Science VIMS

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*

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

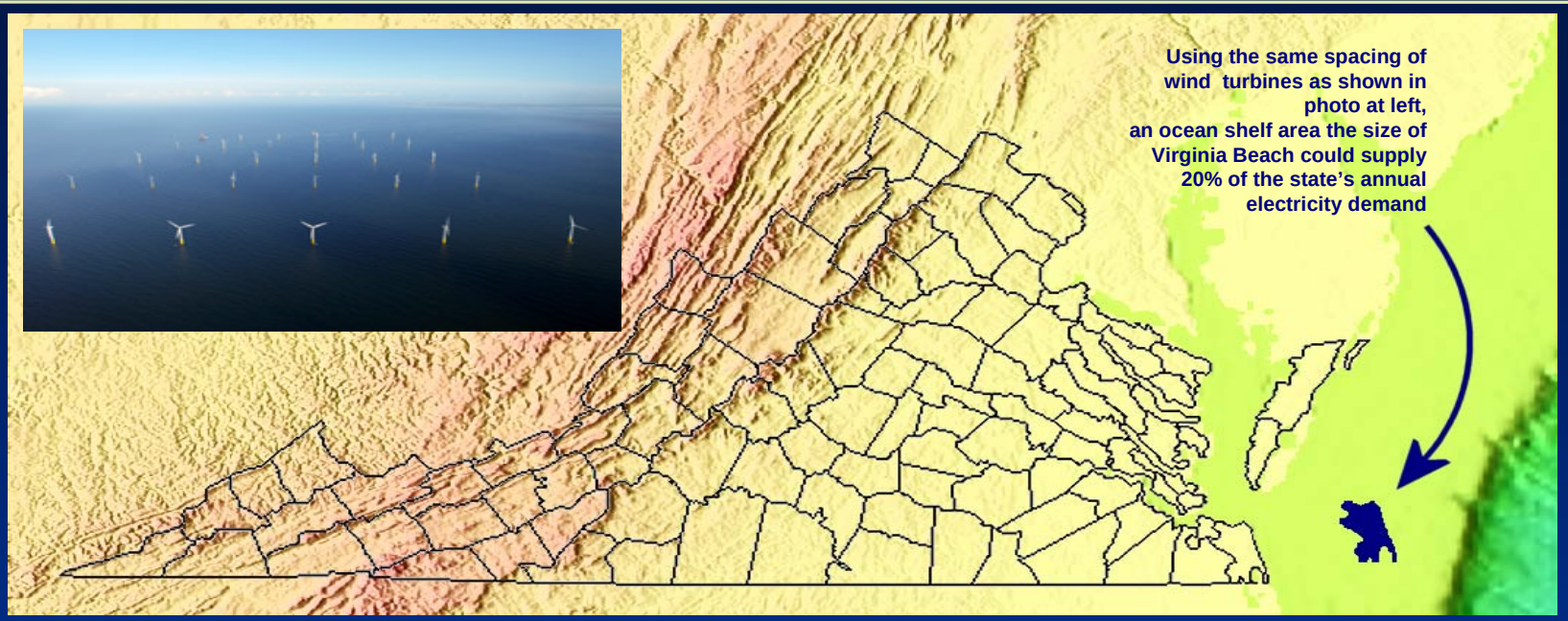
VCERC Hybrid Wind-Wave Concept

Combining ocean-tested technologies

Advantages:

- Buoys 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: July 07 – Jan 08



- 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.
- Start comparison of QuikSCAT satellite wind and buoys wind
- Build a web page to show the information on the project: http://ccpo.odu.edu/~jlblanco/windenergy/

Oregon Investing $4.2 million
Florida Investing $5 million

January 11, 2008

Oregon Wave Energy Trust Gets Funding

Portland, Oregon [RenewableEnergyAccess.com]

The Oregon Wave Energy Trust (OWET) has received the first part of its $4.2 million budget approved by the 2007 state legislature, and is moving ahead with plans and activities to make Oregon a global leader in the industry. The group has received $1 million from the Oregon Innovation Council.

USA. Florida Atlantic University to receive $5 million to establish Ocean Energy Technology center

Monday, 20 November 2006

Florida Atlantic University has been selected by the Florida Technology, Research and Scholarship Board to receive $5 million to establish The Florida Center of Excellence in Ocean Energy Technology. Ranked in second place, FAU is among six Florida universities that have been selected out of 32 proposals submitted to the Board. This new center will be FAU's second Center of Excellence -- its first Center of Excellence in Biomedical and Marine Biotechnology was established in 2003.

The Center of Excellence in Ocean Energy Technology will address Florida's energy crisis by looking at

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

Opportunity to Attract Federal and Private Funding of Algae-to-Biofuels Center

One Hundred Tenth Congress
of the
United States of America

AT THE FIRST SESSION

size.

"(2) GEOGRAPHIC DISTRIBUTION.—The Secretary shall establish at least 1 bioenergy research center in each Petroleum Administration for Defense District or Subdistrict of a Petroleum Administration for Defense District.

"(3) GOALS.—The goals of the centers established under

Strategic Technology Office (STO)

Broad Agency Announcement (BAA) 08-07 **VCERC asked to join SRI**

BioFuels – Cellulosic and Algal Feedstocks to jet fuels

Proposals submitted to the following:

USDA, NSF, HRSD

Requests for proposals from:

Philip Morris, Perdue Chickens

Utah Investing $6 million

Science News

Pond Scum: Fueling Our Future?

ScienceDaily (Feb. 2, 2007) — Utah State University researchers are using an innovative approach that takes oil from algae and converts it to biodiesel fuel.

See also:

Plants & Animals
- Nature
- Extreme Survival

Matter & Energy
- Alternative Fuels
- Petroleum

Earth & Climate
- Energy and the Environment
- Renewable Energy

Reference
- Biomass
- Fossil fuel
- Biodiesel
- Ethanol fuel

USU is currently conducting research on algae and plans to produce an algae-biodiesel that is cost-competitive by 2009. Algae, plainly referred to as pond scum, can produce up to 10,000 gallons of oil per acre and can be grown virtually anywhere.

"This is perhaps the most important scientific challenge facing humanity in the 21st century," said Lance Seefeldt, USU professor of chemistry and biochemistry.

"There are several options for solving the world's energy problem, but at this point, none of them are realistically viable for long-term use."

Biodiesel is a clean and carbon-dioxide-neutral fuel that is becoming more popular, but most of the current product comes from soybean and corn oil. As supply and demand grows, so does the price of soybeans and corn. People and animals rely on soybean and corn as a food commodity, eventually causing competition between commodities and growing enough product. Meeting this demand would require the world to use virtually all of its arable land, said Seefeldt.

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
- 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

Visit www.vcerc.org for More Information

Virginia Coastal Energy Research Consortium - Windows Internet Explorer

http://www.vcerc.org/

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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 Plant
- 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?
Email: PHatcher@odu.edu

Industry questions?
Email: rondorfn@saic.com

ODU algal biodiesel studies get local and National attention

Science Channel segment to be aired Monday, Jan. 21 @ 10 PM