

## **RENEWABLE ENERGY PROGRAM: Ongoing Studies**

**Region:** Atlantic

**Planning Area(s):** South Atlantic

**Title:** Atlantic Offshore Wind Energy Development: Geophysical Mapping and Identification of Paleolandscapes and Historic Shipwrecks Offshore South Carolina

**BOEM Cost:** \$750,000

**Period of Performance:** FY 2015-2017

**Conducting Organization(s):** South Carolina Sea Grant Consortium

**BOEM Contact:** [Brian Krevor](#)

### **Description:**

#### Background:

The submerged continental margin of the southeastern United States records a geologic history of continental collision during Paleozoic time (500-300 Mya), and subsequent continental rifting and break-up with associated magmatism during early Mesozoic time (230-180 Mya). Subsequent development as a passive continental margin has resulted in accumulation of a thick sedimentary cover deposited through numerous cycles of sea level change on the margin. The most recent phase of deposition (Pleistocene; <1.8 Ma) took place during repeated, large-scale (120 m) sea-level changes which resulted in extensive exposure and inundation of the shelf. Accordingly, the shallow subsurface of the near-shore environment under consideration for wind energy development requires thorough analysis of seabed bottom type, seafloor roughness and geomorphology, potential sites of cultural resources and features such as active and inactive faults, filled channels, and potential slope instabilities which would have a considerable potential impact on siting of installations for wind energy.

BOEM's North Carolina Intergovernmental Task Force identified Wind Energy Areas (WEAs) on the OCS offshore North Carolina and the state partnered with BOEM to initiate environmental studies in one of the defined WEAs (Wilmington East). Two of the three WEAs identified in North Carolina extend to the coastal ocean immediately off of South Carolina where quality wind resources and limited utilization conflicts continue to extend to the south- southwest off of South Carolina.

The State of South Carolina partnered with BOEM to establish an Offshore Renewable Energy Task Force that has identified four Call areas offshore of South Carolina. Two of the areas defined by the SC BOEM Task Force for inclusion in the Call for Information and Nominations are (1) an area south of, but contiguous to, the NC Wilmington East and Wilmington West WEAs where areas of quality wind resources and limited conflict for utilization and development extending south into Long Bay offshore

of South Carolina (Enernex, 2011) and (2) a second area of high potential that has already had some utility interest for development of a possible demonstration project in Southern Long Bay off of Winyah Bay. Both the NC/SC border and Winyah Bay areas were sites of a wind resource observational and modeling campaign focused on evaluating the cross-shore gradient of wind resource potential within the coastal boundary layer between 1.5 and 12 miles (Gayes et al., Palmetto Wind Study, 2009) and thus have additional data sets and results to facilitate considering future development.

As an important consideration in the development of offshore wind energy in this region, preservation of cultural heritage from pre-historic to historic materials is paramount. Known and potential cultural resources in this region include submerged prehistoric sites and historic shipwrecks. For this project, both historical archaeologists and geoarchaeologists will be employed in the understanding of the ancient landscapes and historic sites through both an understanding of the history, the landscape changes, and the site-formation processes involved in their preservation. The SC portion of the OCS has the potential to yield critically needed data related to the early peopling of North America and the historic seafaring traditions of exploration, trade, and warfare since historical times. A terrestrial landscape for almost 40,000 years, the modern transgression has covered an ancient landscape that witnessed the arrival of Paleoamericans sometime before 14,000 years ago (Harris et al., 2013). These Paleoamericans would have lived adjacent to the coastal near-shore regions, estuaries, and river systems, following the transgression as it passed the shelf edge some 10,000 years ago up to the modern coast where sea levels stabilized after 3,000 years ago. Potential submerged and inundated archaeological sites include habitation or exploitation sites (quarries) containing evidence of lithic production, i.e., projectile points, tools, and debitage. Other preserved organic artifacts expected, but rare on terrestrial sites, include: bone, antlers, wood and other cultural items. A key research component associated with seeking evidence of early human occupation in the SCOCS is the geophysical identification of relict landforms, e.g., rivers, bays, estuaries, paleochannels, paleovalleys, and rock outcrops that have a high potential to preserve prehistoric archaeological sites.

With rising sea level and coastal inundation the energetic processes of the migrating shoreline, surf zone, shoreface and inlets, erode and rework the paleo-landscapes leaving an erosional unconformity as the record of the transgression. That surface may continue to be reworked by shelf processes after submergence. The region inshore of the study area is characterized by very little preservation of former landscapes with the marine unconformity cut down into much older (pre-human) deposit across much of the inner shelf. The geometry of the unconformity surface, and locally, lenses of preserved coastal deposits particularly along paleo-drainage systems that may not have been completely reworked by the transgression are areas where there is increased potential to find evidence of prehistoric artifacts.

Important historical archeological resources lying on the SC-OCS include shipwrecks and objects of historic significance. From the earliest European explorations to World War II, the Atlantic Ocean contains shipwrecks associated with these endeavors, along with isolated objects, such as anchors, cannons, and other artifacts of historical significance. Other cultural features of a more hazardous nature - Munitions of Explosive Concern

(MEC) or unexploded ordnance (UXO) related to bombing areas or to defensive barriers - are also present in the SC-OCS.

Objectives:

1. Initiate a systematic geophysical survey of two areas offshore of South Carolina that have high probability of being initially developed for wind power generation.
2. Conduct detailed surveys to perform the initial steps to assess geoarchaeological potential of prehistoric habitation at select sites and to provide baseline information concerning the potential to identify prehistoric and relict landforms, historic shipwrecks and objects and hazardous MEC/UXO lying in the SC-OCS.
3. Conduct a detailed geophysical survey connecting the proposed survey area and a similarly extensive geophysical survey completed through a partnership with the USGS from 0-5 miles offshore.

**Importance to BOEM:** The information obtained in this study will directly relate to BOEM's mission by supporting environmentally responsible renewable energy development through informed decision-making on siting both at the leasing phase and during evaluation of the facility lay out.

**Current Status:** The cooperative agreement was executed on November 1, 2014. Survey activity began in March 2015. In partnership with NOAA, extensive surveys were conducted July 7-25, 2015.

**Final Report Due:** November 1, 2016

**Publications:** None

**Affiliated Web Sites:** None

**Revised Date:** August 8, 2016

**ESPIS: Environmental Studies Program Information System**

**All *completed* ESP studies can be found here:**

[http://www.data.boem.gov/homepg/data\\_center/other/espis/espisfront.asp](http://www.data.boem.gov/homepg/data_center/other/espis/espisfront.asp)