

# Wind Energy Production Farms Feasibility Summary of Presentations—April 20, 2009

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## SC WIND SPEED AND CAPACITY

- Wind Power capacity has been steadily growing on average about 30% annually worldwide. Wind is a non-dispatchable type of energy because it is weather dependent. However, in the future we are seeing increased storage technologies that will make this a capacity resource which would be dispatchable.
- Wind speed increases with height and vary based on groundcover and topography. Because power in a windmill is exponentially related to cube of wind speed, an increase in wind speeds of 33% increases power outputs by 300%.
- South Carolina has wind power capabilities for offshore according to wind mapping. We have from good to outstanding classes of winds. Onshore wind power generation is not feasible on the utility level scale. According to the current data that is being compiled, previous wind mapping appears accurate. That means SC can expect feasible winds for offshore wind energy generation. The next step in this verification process will include placing the anemometers offshore to collect data.

## ECONOMIC DEVELOPMENT OPPORTUNITIES AND WIND FARM COSTS

- The market for wind is driven by the high interest in green, renewable energy close to load centers. Current constraints include the risks and costs of technology, construction, operation and maintenance; accessibility for servicing; exposure to hurricanes and winds; and the cost of energy in the US.
- GE in Greenville, SC has over 3,000 employees in its wind turbine manufacturing which are split between engineering and GSCM. Under the 20% wind scenario by 2030 supported by DOE, SC could expect to gain 20,000 jobs in manufacturing.
- The capital cost of off-shore wind farms will be between \$2,400/kw to \$5,000/kw (USDOE, 2008, *20% Wind energy by 2030*, [http://www1.eere.energy.gov/windandhydro/wind\\_2030.html](http://www1.eere.energy.gov/windandhydro/wind_2030.html)) which is more expensive compared to an average cost of on-shore wind generation of \$1,740/kw (USDOE, 2007, *U.S. Wind Power Installation, Cost, and Performance Trends: 2007*, Fig. 22, [http://www.windpoweringamerica.gov/filter\\_detail.asp?itemid=1926](http://www.windpoweringamerica.gov/filter_detail.asp?itemid=1926)).
- Capital cost is not the only piece of the economic equation. Capacity Factor is a measure of how much wind energy is captured. Part of the factor is the wind speed and how often the wind blows. Offshore wind turbines will tend to have a higher Capacity Factor than on-shore wind turbine. This should off-set some of the up-front capital cost difference. Another economic factor is the Maintenance cost. Here the off-shore turbines will have a higher cost than on-shore.

## IN-STATE RESEARCH

- Currently, SC has the benefit of intense studying of offshore wind. Resources from this include wind mapping, the Southeast Regional Off-shore Wind Symposium, 5 anemometer stations,

SODAR development for offshore use, Coastal Wind for Schools program, extensive study of offshore wind potential.

- SODAR means “sound detection and ranging.” It chirps and reflects sound collected by a transceivers array. This information can determine wind speed and direction at 11 different heights, up to 200m. These devices are beneficial because they are cheaper, operate in adverse weather conditions, use little power, and are portable and rugged.
- Right now, SODAR equipment has been purchased and is mounted for transport to coast. Testing will begin on Goat Island and on a US Coast Guard platform in mid May 2009.
- Acceptance of SODAR data will reduce the cost of wind power assessments and accelerate offshore wind power development.
- The Palmetto Wind Research Projects includes 3 parts and partners include SCEO, CURI, CCU, Santee Cooper, and NCSU. 1) Transmission Infrastructure Study; Wind, Wave and Current Energy Study; and Regulatory Task Force to develop the permitting process.
- Timeline of Work for the grant:
  - May 2009: Deploy Buoys to get daily data
  - October/November 2009: Tentatively construct offshore tower to gather hub height data
  - October/November 2010: Complete one year monitoring
- Future efforts needed include a permit application for offshore anemometer, a port refurbishment study, public outreach and education of offshore wind development, workforce development in SC, recruiting new industry, and an environmental study.

#### FACTORS USED TO CONSIDER WIND FARM LOCATIONS

- Preliminary studies show environmental impacts to be acceptable. However, careful site selection is critical and must take into consideration bird migratory and breeding areas, marine mammals, and turtles. Navigational paths for shipping, aviation areas, radars, wrecks, reefs, dredge dump sites, etc. must also be avoided.
- South Carolina’s Grand Strand provides the most potential because:
  - Wind resources are closer to shore (shorter transmission distance)
  - Shallow Water Depths (better for foundation/structures)
  - Close to demand centers