

**Wind Energy Production Farms Feasibility Study Committee Meeting #2**  
**Final Minutes**  
**July 13, 2009**  
**1:00 – 4:00 PM**  
**209 Gressette Office Building**  
**Columbia, SC 29201**

**I. Introductions**

Hamilton Davis, Coastal Conservation League  
John Boyd, Haynesworth, Sinkler, Boyd, P.A.  
Roger Schonewald, GE Energy in Greenville, SC  
Rob Leitner, Director of SC Institute for Energy Studies, Clemson University  
Nelson Hardwick, District 106, South Carolina House of Representatives  
Paul Campbell, South Carolina Senate, Berkeley County  
Earl Hunter, Commissioner of SCDHEC  
Mac Toole, SC House of Representatives, Lexington County  
Erika Myers, SC Energy Office

**II. Review and Discussion of Draft Report**

Myers requested the committee review the draft report and submit comments to her after the meeting.

*Question from Mac Toole:* We're going to have 3 more meetings and then we will put together a proposal?

*Answer from Erika Myers:* Yes, January 1<sup>st</sup>, 2010 is the deadline to prepare the report to submit to the S.C. General Assembly, and at our last meeting in December we will be looking at the final draft based on the findings of this committee. The first draft is very rough and will be updated with information from today in the next few weeks.

*Question from Roger Schonewald:* Is this Chapter 1? Did we get an outline of what the whole report will entail?

*Answer from Erika Myers:* Yes

**III. Presentations:**

***Wind Powering America – Mr. Larry Flowers and Mr. Sandy Butterfield, National Renewable Energy Laboratory (NREL)***

Flowers gave a PowerPoint presentation that focused on the status of onshore wind power and reviewed the 20% report DOE issued last year. Flowers showed pictures of an array of different wind turbine designs. Over the last ten years, more than 25 states have installed a significant amount of wind turbines. Nine states have over 100 MW installed. Wind works well in many places and one can expect to have 30 states with significant wind power in the next few years. The USA is the world leader for wind energy as we had over 8,000 MW installed in 2008, a \$16 billion dollar investment in one year.

*Question from Senator Campbell:* How do construction costs compare with coal and nuclear?

*Answer from Mr. Flowers:* New wind is 6-8 cents/kWh which is comparable to coal and \$90-120/MWh. Wind is very well positioned from an economic standpoint.

Natural gas has half of the pollutants and carbon of coal, so natural gas usage increased the most significantly during this decade, but wind power production has increased rapidly over the last two years.

*Question from Roger Schonewald:* Were the costs mentioned previously for onshore wind only?

*Answer:* Yes, those numbers were only for onshore. Costs are about 50-100% more for offshore wind.

*Question from Mac Toole:* Is the cost you're talking about now strictly generation cost and not transmission?

*Answer:* Yes, but transmission is only 10% of total costs.

*Question (unidentified):* Was 42% of new generation capacity additions really wind power in 2008 in the USA?

*Answer:* Yes. We put in over 8,000 MW of wind power in the U.S. in 2008.

Flowers highlighted drivers for growth in wind power including a dramatic increase in manufacturing for wind turbines in the past few years. Flowers also highlighted the economic impacts of installing 1,000 MW of onshore wind in South Carolina including \$1,000,000 to local economies and 460 long-term jobs. He explained onshore and offshore levelized costs. For 20% wind energy by 2030, 46 states would potentially have substantial wind development and there would be many positive results. Flowers showed the mix of energy generation in 2030 based on the Energy Information Administration and the 20% wind scenario.

*Question from Senator Campbell:* Does the 20% wind scenario assume 100% loading onto wind, or 30 or 40%?

*Answer:* No, we look at the capacity factor and account for it.

If the USA were to install enough wind to meeting 20% of its energy needs, would translate to about \$1.4 trillion and 3 million+ jobs in operations. In the southeast, there would be \$74 billion for local economies and 590,000 operational jobs to support that development. In South Carolina there would be approximately 3,126 MW installed offshore and 327 MW onshore meaning \$7.5 billion infused into South Carolina and 3,000 operations jobs.

*Question from Senator Campbell:* On the economic model, you're showing payment to landowners and local property tax. Would that apply offshore?

*Answer:* The model is for onshore wind, and there are different numbers for offshore wind.

When you look at the nation, over 500,000 jobs would be supported by the industry in 2030 with the 20% wind scenario. The scenario also reduces water consumption by 4 trillion gallons by 2030 with a 17% reduction in electric sector water consumption. Total savings would be about \$205 billion plus water savings. Our progress toward 20% wind in 2030 is ahead of the curve.

*Sandy Butterfield*—Mr. Butterfield gave a PowerPoint presentation that focused on offshore issues and applications. He began by elaborating on the graphic of the New England coast and explained that the red zones are category 6 winds and that the blue zones are even better for wind turbines. The red zones off South Carolina's coast are not quite as close to shore.

*Question from Senator Campbell:* How far off the coast have you seen wind farms done? Ten miles, twenty miles, thirty miles?

*Answer:* It depends on the water depth. That is the cost factor. Underwater cables are actually not that expensive.

Butterfield talked about the Horns Rev site off the coast of Denmark, which has many turbines that are running on a capacity factor of greater than 50%. Officials are counting on offshore to be the dominant wind source in Europe. Forty gigawatts of offshore wind power are expected by 2015 across the globe. Approximately 30 offshore wind projects have been announced in North America. Butterfield summarized offshore wind technology and the future of offshore wind installations, which may include turbines at depths of 90 feet off the coast of South Carolina. Helicopters or boats are used to service offshore turbines. Monopile foundations are the most common, but gravity foundations can be used in shallow enough water. Butterfield outlined different turbine manufacturers, turbine foundations and criteria for commercial projects. No offshore wind turbines have been installed yet in the USA, but there are many projects underway. This is all proof-of-concept stage technology. Butterfield outlined challenges for offshore wind technology including weight of turbines and quality and functionality of foundations. There needs to be some research before current projects are commercially viable.

*Question from Senator Campbell:* Roger Schonewald, are you working on anything like that?

*Answer:* GE continues to look at the market, and it will be a business decision.

*Question from Senator Campbell:* What depths do you mean when you talk about shallow water?

*Answer:* Monopiles up to 20 meters.

*Question from Senator Campbell:* On the construction cost per megawatt, how would you gauge per megawatt wind offshore versus nuclear or coal onshore? *Answer:* Somewhere between 50 and 100 % more.

*Question from Earl Hunter:* What are maintenance issues for offshore versus onshore? What is the viability of these systems long-term?

*Answer:* Onshore machines are fairly reliable. Issues encountered have not been design flaws. People are looking at how to do remote diagnostics for offshore. This is all in the formative stage. I don't have a good number for actual maintenance costs; it is much more variable.

***New Jersey Case Study: Offshore Wind Energy Development – Ms. Rhonda Jackson, Fishermen's Energy***

Ms. Jackson's PowerPoint presentation started with a brief background of Fishermen's Energy: a community-based offshore wind developer that allows the fishing industry to invest and participate in offshore wind industry off the waters of New Jersey. The fishing industry has historically opposed offshore wind. Ms. Jackson then explained the mission of the organization. Fishermen work in the ocean and are familiar with the challenges presented by working there. Ms. Jackson explained why offshore wind and the fishermen's energy paradigm. She elaborated on the experience and knowledge of the organization. Ms. Jackson listed the companies, investors, founders and management, and the development team of Fishermen's Energy. She then explained the NJ Governor's Initiative Energy Master Plan Goals: 1,000 MW by 2012 and 3,000 MW by 2020. Ms. Jackson gave a brief overview of the \$12 million Anemometer Rebate Program.

*Question from Senator Campbell:* Is Fishermen's doing the whole 1,000 MW or 350 MW?

*Answer:* 350 MW

Ms. Jackson mentioned the Offshore Wind Renewable Credit Program, which is designed to provide revenue certainty of offshore wind projects. She then talked a little about the planned location of the anemometer tower, turbine array and an inshore project, and went over key dates and milestones for those projects. Incredible positive public support has been garnered for the projects of Fishermen's Energy. Ms. Jackson showed a photo-shopped version of what the eight or nine turbines will look like from shore. Fishermen's Energy is forecasting 100 long-term operations jobs for the Met Town Wind Farm. Ms. Jackson concluded her presentation by talking about turbine size and manufacturing opportunities.

*Question from Roger Schonewald:* What makes this project economically attractive?

*Answer:* The state involvement.

*Question from Roger Schonewald:* So basically the state buys the electricity from you and sells it at wholesale whether that's higher or lower than the actual cost?

*Answer:* Yes. Exactly.

***Britain's Offshore Wind Energy Industry and Meeting Renewable Energy Requirements – Jan Matthiesen, British Wind Energy Association***

Presentation Pre-Recorded – distributed to the committee and posted online

(10 Minute Recess)

***South Carolina Opportunities for Wind – Mr. Ed McCallum, McCallum Sweeney Consulting***

Mr. McCallum's PowerPoint presentation included an introduction to McCallum Sweeney Consulting, an overview of the wind industry, South Carolina's place for economic development, and challenges/opportunities involved. He began by describing MCS's history and services, values, clients and project experience. In terms of the wind industry, a short time ago, Germany was number one in wind energy, and now the USA is number one with the greatest installed wind energy capacity in the world. There has been 20-30% growth every year. Wind energy makes economic sense now. Mr. McCallum showed pictures of the basic components of wind turbines. They are all very large, making it challenging to transport them. In terms of manufacturing, gearboxes are now the bottleneck in the major component supply chain. There will be at least 22,000 jobs created in manufacturing in the 20% wind by 2030 scenario for the USA. The transportation infrastructure is critical to transport large parts that are getting bigger, and an OEM and supplier scenario exists with a lot of companies in the space for awhile. Is South Carolina a major player in wind? Yes and no. There is not much wind onshore, but there is opportunity for wind energy offshore. Production tax credits greatly affect the installation of wind turbines. Freight and labor is the needle mover. Transportation accounts for about \$1,000,000 per unit. Training is also important. Most labor needed is unskilled or semi-skilled. The gas turbine business presence in South Carolina is probably why we have an offshore opportunity. Access to the Port of Charleston is imperative. The economy slowing down has been a godsend because it will allow South Carolina to catch up in the wind business.

*Comment from Senator Campbell:* We need to be looking at both installation and job creation in South Carolina.

*Comment:* We appreciate the presentation, and in the long-term we are competing with Georgia and North Carolina and others, and it is great to have a company like yours helping us out.

*Response:* Thank you.

*Comment from Roger Schonewald:* Thank you for your comments Ed. GE in Greenville performs manufacturing of gas turbines and wind turbines. I can go back to GE and see what needs GE foresees for the State of South Carolina to support local growth of the wind industry. The transportation infrastructure is very critical for blades.

***Local Perspectives:***

***Charleston – Mr. James Meadors, City of Charleston Green Committee***

Mr. Meadors began by thanking the committee. His presentation is part of a PowerPoint put together for the mayor of Charleston. The case for SC to become a wind power industrial hub is compelling and urgent. The need combined with the opportunities we have at this moment creates a critical mass for success in the areas of jobs, stewardship

and economic revitalization. Important factors in developing an offshore wind farm include wind power capacity, shallow waters and proximity to the port, and we have an existing rail & interstate system to transport components. Wind power becomes practical at Class 4 wind power density – we have Class 5 & 6 indicated by violet and red in the key below. South Carolina could generate 210% of its energy needs from offshore wind. In terms of jobs, according to the US Department of Energy, manufacturing wind turbines and their components in South Carolina could result in 10,000 to 20,000 new manufacturing jobs. We have an existing manufacturing base. There is an existing pro-forma for a community college program for training technicians. Key industry players such as GE, Fluor, Nucor Steel, and others are already established in SC. South Carolina has existing large-scale shipbuilding facilities and a low-cost manufacturing environment. In terms of stewardship, wind power is clean, renewable and does not create the disposal problems associated with nuclear power. Dependence on foreign energy sources makes the USA more vulnerable. An estimated \$1.5 billion per day leaves the USA from oil imports. Nearly 78% of the nation’s electrical demand is consumed by 28 coastal states. In addition to the energy it generates, the potential reduction in greenhouse gases from the reduced transportation costs is significant. A multi-year Danish study on the impact of offshore wind farms on the environment shows minimal impact and many benefits. In terms of economic revitalization, wind power is the fastest growing renewable energy market in the world. The trend toward plug-in-electric vehicles will require increased demand for electricity. Economic impact on manufacturing, construction, operations and maintenance, and rural economic development will help our state. The technology has been proven. An offshore wind industrial cluster could potentially capture locally up to 50% of the costs associated with building a wind farm. Taking action now will prevent the need for companies like GE, Fluor and others to relocate to areas more invested in the technology. Vestas, the world leader in turbine manufacturing, established their industrial hub to service land-based wind farm development in Denver due to its rail infrastructure, access to Midwest markets, and manufacturing base. Meadors encouraged the state to take aggressive action, especially now that the climate change debate is no longer an issue. Mayor Riley understands the challenges that come with this mission and is committed to meeting it head on.

***Onshore Wind Energy Along the Grand Strand:***

***North Myrtle Beach – Mr. Monroe Baldwin, City of North Myrtle Beach***

Mr. Baldwin began by introducing himself and talking a little about the Myrtle Beach Economic Development Council, whose primary objective is to seek diversification and expansion to our coastal region, provide economic stability and an increased quality of life. Mr. Baldwin introduced Doug Chastain and Scott Wolfry, an intern at CCU, both of who have been putting up anemometers in N. Myrtle Beach.

Mr. Baldwin informed the committee about N. Myrtle Beach’s efforts to study the wind energy potential on rooftops along the ocean front. The Grand Strand has hundreds of ocean front towers, many 200 feet tall. Harnessing the wind brings two levels of economic opportunity: Micro – benefits to *individual* building owners, and Macro – benefits to the *city*, region and state. Micro level of opportunity: Simply provide free power to offset the house account of a condo building. Effects include reducing the

expense to the condo investor, shoring up the value of the asset, and protecting the property tax valuations for the county and city. Additionally, vacationers get excited about wind turbines. Macro level of opportunity: Provide a viable market for the vertical axis turbine industry and a key component to a future smart grid system. How do we maximize the economic impact for the state of South Carolina? Build a wind industry commons: Build a collective area for the benefit of the industry to supply research and development and innovation in engineering. Also, provide structure for the industry to supply the product for local installation and export. Wind Energy Incubator Program: The North Myrtle Beach Chamber of Commerce in partnership with the City of North Myrtle Beach stands ready to facilitate this program. Bring vertical axis turbine companies to innovate for an oceanfront application. Bring upstart businesses to learn installation and maintenance. There is an opportunity for new areas in architecture, electrical engineering, and structural engineering. What's missing is that there is no local level industry to install and maintain turbines. Where are we now? We are conducting tests to determine if there is enough wind on rooftops. We have equipment and grant money to get answers but have none yet. We are establishing a wind index (Apache pier) that allows shorter survey periods and easy comparative analysis between buildings, and offers an academic frame for a business perspective. Concepts for the future: We are constantly asking, "Is there enough wind to feasibly install the wind turbines?" But what if the wind can be manipulated to our advantage? Any increase in wind speed brings exponential returns:

Power in the area swept by the wind turbine rotor:  $P = 0.5 \times \rho \times A \times V^3$

P = power in watts (746 watts = 1 hp) (1,000 watts = 1 kilowatt)

$\rho$  = air density (about 1.225 kg/m<sup>3</sup> at sea level, less higher up)

A = rotor swept area, exposed to the wind (m<sup>2</sup>)

V = wind speed in meters/sec (20 mph = 9 m/s) (mph/2.24 = m/s)

Mr. Monroe showed a picture of a building that formed a wind funnel, an example of unintended consequences. Part of the new industry commons is a new future in architecture and structural engineering along the ocean front, and it is exportable! The City of North Myrtle Beach, in conjunction with its partners, fully endorses and stands ready to support this Onshore Wind Energy project. Furthermore, North Myrtle Beach seeks additional support and funding to become a "Demonstration City for the Advancement of Wind Energy Production." North Myrtle Beach Chamber of Commerce is on record in the support of seeking alternative energy solutions, working cooperatively with our local, state, and federal governments, and supporting the research being conducted by Coastal Carolina University in the development of wind and tidal energy sources. Contact information for the North Myrtle Beach Chamber of Commerce can be found on Mr. Baldwin's PowerPoint.

*Question from Senator Campbell:* Offshore, what kind of impact would wind turbines have on commercial people on the beach?

*Answer:* South Carolina is different than other states. SC will rally around an economic opportunity like this.

*Question from Senator Campbell:* What is the generation capacity of the smaller units?  
How many would it take to power a building?

*Answer:* Those are probably about 5 kW for each turbine. An array of turbines could not completely power one of these buildings, but could put a dent in the power needed.

#### V. Other Discussion Items

- Approval of the minutes – approved.
- The presentation that was skipped will be e-mailed out to committee members and can be reviewed outside of the meeting.

#### VI. Next Meeting

September 21<sup>st</sup>, 2009, 1pm-4pm in 209 Gressette Building, Columbia.

#### VIII. Adjourn (4:10pm)