

An Offshore Wind Power Industrial Cluster for South Carolina

A white paper by Nicholas C. Rigas Ph.D., Adjunct Professor, Clemson University Restoration Institute and Vice President of Project Development, Eco Energy LLC

South Carolina is well positioned to tap into the growing \$9 billion annual wind power market. Electricity production from wind is one of the fastest growing markets in America, accounting for nearly 30% of all new electricity generating capacity last year. Not only does South Carolina have substantial offshore wind power resources – enough to power the state two times over – its strong manufacturing base and well-situated port facilities make the state an ideal location for an wind power industrial “cluster.”



According to the Department of Energy, manufacturing wind turbines and their components in South Carolina could result in 10,000 to 20,000 new manufacturing jobs. But the true economic development opportunity is even larger. An offshore industrial cluster in South Carolina could potentially capture locally up to 50% of the costs associated with building offshore wind farms, representing an estimated market greater than \$80 Billion over the next twenty years.

Presently, no one Atlantic state has emerged as a clear leader in this lucrative market. However, that is not likely to remain the case for long. If South Carolina is to seize the opportunity and capture the tens of thousands of jobs and billions of dollars in economic impact associated with the wind industry, it must act quickly.

South Carolina must strategically market its strengths to both American and European manufacturers before the opportunity is lost. Key industry, academic, environmental and community leaders must come together to form an alliance to attract this emerging new industry to the state.

The Opportunity



Trends in energy, the economy and the environment have converged to drive public policy and opinion towards innovative solutions to the world's power needs, including wind power. Global energy demand is projected to grow as much as 50% by 2030, driven mainly by explosive growth of the Chinese and Indian economies. At the same time, scientists and policy leaders around the world are urging action to reduce emissions from fossil fuels, which drive global climate change and erode air and water quality. At a moment when the global economy struggles to right itself, dwindling supplies and resource nationalism are leading to rising energy prices and the need for more domestic energy production. In the United States, electrical consumption is estimated to grow by double digits over the next two decades, requiring more new generation to be brought on-line by 2030. Meeting the demand for this new electrical generation capacity will have to balance costs and benefits to the environment, national security and local economic development.

These drivers have led to an increased demand for developing renewable energy resources throughout the world and in the United States. By harnessing clean, indigenous, and inexhaustible energy resources, renewable energy has emerged as a viable and profitable sector of the energy market. It provides diversification of the world's energy portfolio, solutions to environmental challenges, and new regional economic development opportunities. Within this promising sector, wind power is the most viable and profitable industry, yet it is one that the United States, and South Carolina, has yet to take full advantage of and develop.

Wind power has emerged as the fastest growing renewable energy market in the world, with world-wide installations increasing by an annual average rate 27% for the past seven years. By the end of 2007, US installations accounted for about 20% of the global total, with nearly all large scale wind power development occurring on land in the Great Plains, given its excellent wind resources. However, transporting wind-generated energy from the sparsely populated Great Plains to the centers of demand on the east coast is challenging. A significant amount of power is lost in the transmission of electricity. Moreover, the infrastructure required for long-distance transmission is costly. This presents a barrier to further development of wind on the Great Plains.

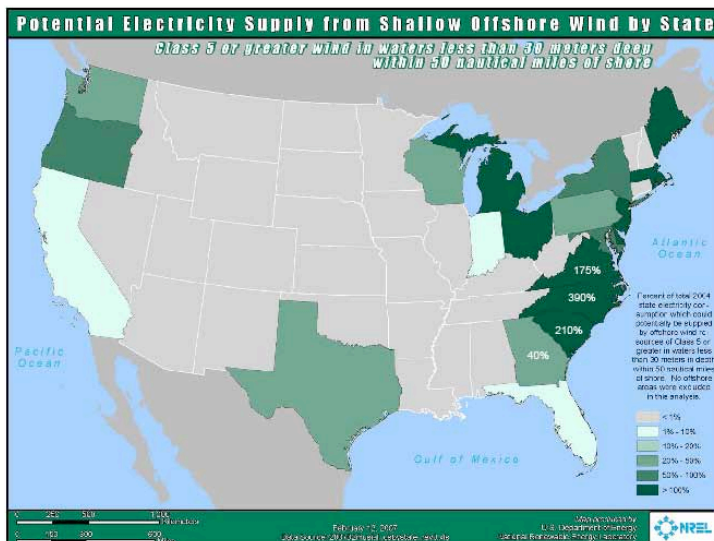
However, there is great potential for offshore wind power development along the Atlantic coast of the United States. Not only is the wind capacity substantial, but it is closer to centers of demand. Nearly 78% of the nation's electrical demand is consumed by 28 coastal states. Offshore wind is well situated to meet the demand of these densely populated regions. As a result, states along the Atlantic have begun to look at offshore wind to meet their growing energy demands. At the same time, they are investigating the huge economic development opportunities that the offshore wind industry can bring to their states.

The Offshore Wind Industry

The wind industry has emerged as one of the fastest growing energy markets in the world. Offshore wind farms have been generating clean, home-grown electrical energy in Europe since 1991 with 1250 megawatts in operation, 1500 megawatts under construction and over 20,000 megawatts permitted throughout the region (1000 megawatts of wind energy is enough to power over 300,000 homes). Current European targets for wind generated power aim to supply 25% of projected electrical demand by 2030. To achieve this goal, more than \$25 billion will be invested annually. When completed the annual fuel cost savings and reduction in trade deficit are estimated to be more than \$45 billion.

A new study recently released by the United States Department of Energy shows that 20% of the nation's power needs can be met by wind power with:

- continued technology improvement,
- upgrades to transmission infrastructure,
- improved ancillary services and
- development of offshore wind power along the Atlantic and Pacific seaboard.



This scenario includes more than 50,000 megawatts of offshore wind power along the northeastern and southeastern coasts of the United States, representing a market in excess of \$170 Billion.

As the lessons learned from the rapidly expanding offshore wind market in Europe are transferred to the United States, a domestic offshore wind industry is emerging. Growth will be concentrated along the

Atlantic coast due to its large demand centers, excellent wind resources and shallow waters.

Signs of this growth are already evident. Delmarva Power recently signed a Purchase Price Agreement (PPA) for power from a proposed 200 megawatts offshore wind farm. The project will make Delaware the first to build an offshore wind farm in the United States. Rhode Island and New Jersey have quickly followed with Requests for Proposals (RFPs) for offshore wind farms. Despite political delays in Massachusetts, permitting of an offshore wind farm in that state continues to proceed.

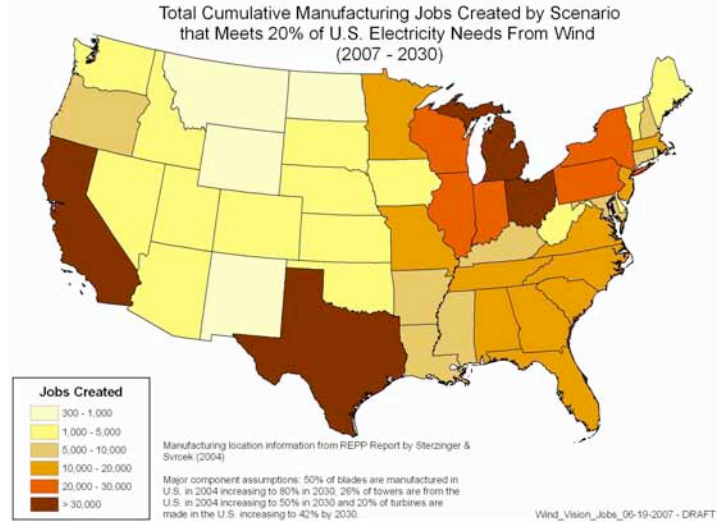
Closer to home, the United States Department of Energy has identified South Carolina as one of the states along the Atlantic Coast with a strong offshore wind potential. According to the National Renewable Energy Laboratory, South Carolina has more than twice as much untapped offshore wind capacity as is presently installed throughout the entire state. Further, with the development of offshore wind

projects in North America, and along the East Coast in particular, industrial hubs must emerge to support these large projects.

Economic Development and Offshore Wind

The offshore wind industry presents an opportunity for significant economic development in South Carolina.

Offshore wind energy costs currently range from \$3.5 to \$5 million per megawatt of installed capacity depending on water depths, foundation requirements, proximity to the coasts and nearby port facilities. Of these costs, most have the potential to remain in the local economy. For instance, an estimated 35% is for local infrastructure including electrical substations, onshore electrical support, cable installation, foundation construction and installation of the wind turbines themselves. Another 45% of the estimated cost accounts for manufacture of the turbine, blades and tower support for the windmill.

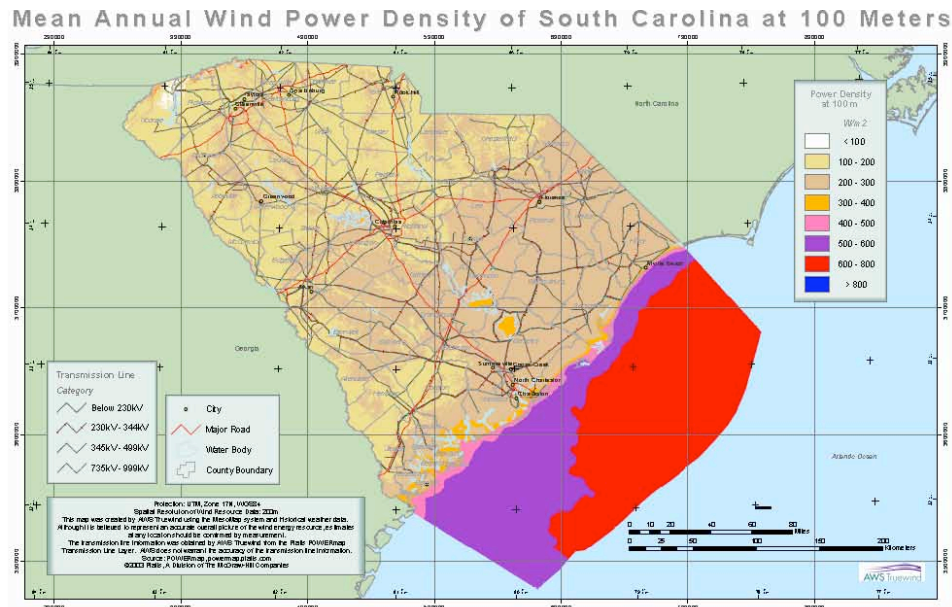


These costs entail significant local job creation and economic impacts. Regional economic impacts by land-based wind projects have been largely associated with local construction jobs and subcontract services. The offshore industry will not only include these benefits but will require local maritime resources and facilities to build, transport and stage the large equipment. Based on the experience of Denmark, which is currently the world leader in offshore wind, the industry can provide the equivalent of 17 jobs per megawatt of wind turbines manufactured and 5 jobs per megawatt of wind turbines installed over the life of a project. The 50,000 megawatts of wind power in the United States projected by the Department of Energy could produce nearly \$950 billion in cumulative economic activity and generate in excess of 250,000 jobs over the next twenty years. In South Carolina, this could result in 10,000 to 20,000 new manufacturing jobs alone. Further, an offshore industrial hub in South Carolina could potentially capture locally up to 50% of the costs associated with building of offshore wind farms, representing an estimated market greater than \$80 Billion over the next twenty years, and potentially even more jobs. Presently, no one Atlantic state has emerged as a clear leader in seizing this lucrative market. However, that is not likely to remain the case for long. If South Carolina is to compete for wind industry dollars, it must act quickly.

South Carolina Strengths

Fortunately, South Carolina is well positioned to take advantage of the opportunities of the growing North American wind power industry. First, South Carolina's offshore wind potential, as documented by AWS Truwind and reported by the US Department of Energy, is excellent. South Carolina's wind resources are situated close to its

growing coastal demand centers, are located in shallow waters and are near outstanding port facilities -- three of the most important factors in developing an offshore wind farm.



Second, as the offshore wind market emerges along the East Coast of the United States and land-based turbines continue to grow in size, South Carolina is strategically positioned to serve as an industrial hub from this growing industry. For example, Vestas, the world leader in wind turbine manufacturing, established their industrial hub to service land-based wind farm development in Denver, CO due to its rail infrastructure, access to the Midwest markets and manufacturing base. Similar criteria will be applied to support the offshore wind industry that is growing along the Atlantic seaboard. Indeed, as larger turbines are introduced into the market, access to port facilities for transporting large components will become increasingly important and will drive location of new manufacturing hubs along the coast.

The Charleston area already exhibits many of the characteristics necessary for a successful wind manufacture and distribution center. These include:

- outstanding port facilities,
- established large scale ship rebuilding facilities, which are transferable to wind component fabrication,
- local steel manufacturing,
- a favorable manufacturing environment,
- excellent research institutions, and
- existing key industry players including General Electric and Fluor Corporation.

Add to this a demonstrated entrepreneurial spirit, and South Carolina – and the Charleston area in particular – emerge as a leading candidate to incubate an offshore wind energy hub that services not only the Atlantic coast of the United States but also the growing European market.

It is important for South Carolina to strategically market its strengths to both US and European manufacturers before the opportunity is lost. Key industry, academic, environmental and community leaders must come together now to form an alliance to attract this emerging industry to the state.