SOUTHEASTERN WIND COALITION

Understanding Wind Energy Potential in the Southeast

Reviewing Opportunities and Barriers

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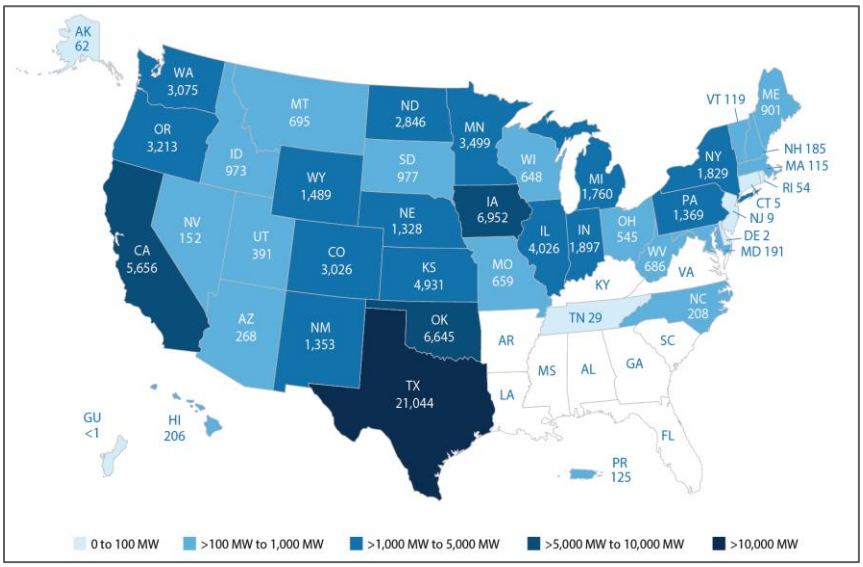
scottmadden MANAGEMENT CONSULTANTS

BACKGROUND

The winds of change continue to blow across the United States. With more than 84,000 MW of wind capacity located in 41 states, wind energy recently surpassed conventional hydroelectric to become the largest source of renewable energy capacity.

U.S. Wind Capacity, Q1 2017 (MW)



Source: American Wind Energy Association

Despite the industry advances, little utility-scale wind energy exists in the Southeast. ScottMadden and the Southeastern Wind Coalition (SEWC) partnered in an effort to better understand the opportunities and barriers facing wind energy in the Southeast. Over the past year, we conducted research and interviewed utility executives, wind developers, and other stakeholders. The research informed a formal report for the SEWC board of directors on the prospects for three specific wind opportunities in the Southeast:

- **Onshore Wind** – With the advancement of taller towers and longer blades, many regions of the Southeast are becoming economically feasible for wind energy development.
- **Offshore Wind** – Even though the U.S. offshore wind industry is still in its infancy, considerable potential offshore wind capacity exists in the Atlantic Ocean and Gulf of Mexico.
- **Wind Imports** – The Midwest and Texas have exceptional wind resources and can supply wind generation to Southeast. With adequate transmission, electricity from Midwest wind can be transmitted, delivered, and serve load in the Southeast.

This document provides an overview of our approach and some key findings from the analysis. The full findings are available to full and board-level members of SEWC.

EVALUATION FRAMEWORK: WIND ENERGY DRIVERS

The purpose of this assessment was to understand, in addition to wind resource, why the Southeast is different than the rest of the country in adopting wind energy and what might cause wind energy to take off in the Southeast in the future. Having a better understanding of these opportunities and barriers will help focus efforts of SEWC in its mission to advance the wind industry in ways that result in net economic benefits to industry, utilities, ratepayers, and citizens of the Southeast.

Our approach involved developing nine criteria to evaluate opportunities and barriers for wind energy development. The criteria can be applied, and may vary, for different wind resources (i.e., onshore wind, offshore wind, and wind imports):

- **Wind Energy Potential** – The presence and access to a viable wind resource is a prerequisite for wind energy development. The key metric for onshore wind is total installed capacity potential assuming a realistic buildout. Offshore wind potential can be evaluated by assessing the number of federal lease blocks available for offshore wind development. Wind imports can be evaluated by the presence, absence, and impediment of long-range transmission assets.
- **State Market Structure** – Wind development is influenced by existing regulatory parameters and electric utility operations. Key considerations include the existence of organized or regulated wholesale markets, current and planned generation supply, wholesale and retail electricity prices, and renewable energy options offered to electric customers.
- **Political Environment** – The state legislature and governor can shape state energy policies and public sentiment toward wind energy. A key consideration is the presence of wind energy champions or opponents.
- **State Energy Policies** – State policies can promote or impede the adoption of wind energy. Key considerations include the presence of a renewable portfolio standard, state wind permitting regime, mandates for utility renewable offerings, or state incentives (e.g., tax credits).
- **Public Utilities Commission** – Electricity service and investor-owned utilities are regulated by a public utilities commission within each state. Consequently, orders issued by the public utilities commission can promote or impede the adoption of wind energy.
- **Electric Utility Engagement** – Electric utilities gain valuable experience from researching wind options and first-hand operational experience by integrating wind resources. Key considerations include utility activities or preparedness for onshore wind, offshore wind, or wind imports.
- **Local Permitting** – Local permitting design, including setback and noise requirements, can promote or impede wind energy development. Key considerations include local permits, regulations, ordinances, and zoning requirements.
- **Educational Resources** – Education resources are critical as wind energy is a new technology to stakeholders in the Southeast. Key considerations include academic institutions and non-government organizations focused on wind energy research or education.

- **Public Perception** – Public opinions toward wind energy can influence elected officials, regulators, and electric utilities. Key considerations include recent media coverage, community support, and wind opposition groups.

KEY FINDING: OPPORTUNITIES AND BARRIERS DIFFER ACROSS THE SOUTHEAST

One fact immediately became clear when ScottMadden and SEWC completed the evaluation of the first five states against the wind energy drivers. The two common issues across the states analyzed are low overall power price and marginal wind resources at current hub height development. But that is poised to change as wind technology improvements (i.e., higher hub height and longer blades) increase onshore outputs, the wind industry gains experience developing offshore wind projects, and transmission infrastructure expansions bring in additional wind imports. As the tables below indicate, these fundamental shifts could result in significant wind energy development.

Potential Onshore Wind Capacity in Southeast States (MW)

State	80 m Hub Height	110 m Hub Height	140 m Hub Height
Alabama	25	16,814	193,376
Arkansas	2,126	180,978	185,713
Florida	0	11,164	153,485
Georgia	35	6,786	188,657
Kentucky	0	76,606	128,123
Louisiana	0	92,823	165,431
Mississippi	0	43,578	188,275
North Carolina	2,201	7,174	102,730
South Carolina	557	10,299	98,638
Tennessee	99	60,329	110,717
Virginia	2,273	9,539	72,112

Source: Department of Energy, Office of Energy Efficiency & Renewable Energy's WINDExchange

Potential Offshore Wind Capacity in Southeast States (MW)

State	0 to 3 Nautical Miles	3 to 12 Nautical Miles	12 to 50 Nautical Miles
Georgia	426	2,648	38,248
Louisiana	776	8,123	75,163
North Carolina	35,136	44,923	288,219
South Carolina	3,083	23,316	122,961
Virginia	23,794	15,233	89,923

Source: Department of Energy, Office of Energy Efficiency & Renewable Energy's WINDExchange

However, adoption of these potential advances will come at a different pace for each state given significant variation from state to state in those dynamics that affect wind development. Each state has a unique mix of opportunities and barriers. Further, developing strategies to expand wind energy in the

Southeast will require some customized, state-by-state approaches as opposed to a one-size-fits-all approach. This point is illustrated by examining several of the key drivers:

- **Market Structure** – An important distinction is the presence or absence of a regional transmission operator (RTO). The one RTO in the region studied so far, PJM Interconnection, manages wholesale electricity markets in all of Virginia and the northeast portion of North Carolina. The presence of an RTO allows bilateral contacts or power purchase agreements between wind energy facilities and retail customers. This market structure was critical to the 208 MW Amazon Wind Farm U.S. East. Located in northeast North Carolina, the wind energy facility sells power to Amazon Web Services data centers connected to the PJM Interconnection. Such an arrangement would not be feasible in other areas of the Southeast.
- **Electric Utility Engagement** – The Tennessee Valley Authority (TVA) has signed contracts to import wind from nine wind farms totaling 1,542 MW of capacity. The wind contracts include facilities located in Iowa, Illinois, and Kansas. TVA is also considering importing wind energy from Oklahoma and Texas through a 700-mile power transmission line proposed by Clean Line Energy. Prior experience with wind imports will allow TVA to evaluate this new opportunity with import expertise gained from prior engagements.
- **State Energy Policy** – Virginia has encouraged wind development through a permit-by-rule process. In 2010, the Virginia Department of Environmental Quality established state permitting rules for wind energy facilities. Permit by rule provides a well-defined permitting process that states "up front" the criteria that an applicant must meet. Wind facilities that are 150 MW or less are eligible for the predictable permit-by-rule process. Projects over 150 MW must receive a permit through the Virginia State Corporation Commission. Virginia is the only state in the Southeast with permit-by-rule regulations for wind energy development.

The Southeast currently lags other regions of the country in wind energy development. In order to advance wind energy development or imports in the region, it is essential to first understand the opportunities and barriers facing each state. This analysis provides a clear framework to accomplish this goal and develop an informed strategy for the future.

ABOUT SCOTTMADDEN'S CLEAN TECH & SUSTAINABILITY PRACTICE

Leveraging our energy expertise, the ScottMadden Clean Tech & Sustainability practice helps our clients effectively navigate through the quickly changing energy landscape. We specialize in assisting our clients with sustainable energy strategies and making smart portfolio choices. We work with our clients to understand and effectively utilize cleaner, renewable sources of energy, such as nuclear, wind, solar, biomass, and biofuels. Our experienced team of energy practitioners understands the roles of energy efficiency, demand response, and storage as part of an integrated strategy. We also assist clients with sustainability, bringing an understanding of energy-unique concerns.

ABOUT SOUTHEASTERN WIND COALITION

The Southeastern Wind Coalition is a non-profit that works to advance the wind industry in the Southeast. We focus on supply chain, land-based wind, offshore wind, and wind imports. Our mission is to advance the wind industry in ways that result in net economic benefits to utilities, citizens, and ratepayers. The

Coalition takes an objective, data-driven, and economic development focused approach to ensure the Southeast can take advantage of this clean, low-cost fuel source.

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