Offshore Wind Energy: Considerations for Georgia

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Executive Summary

Offshore wind and other potential renewable energy sources will likely play an increasingly important role in our nation's energy supply. Although the U.S. does not currently have significant offshore wind generating installations, Atlantic offshore winds possibly contain up to 1,000 gigawatts of energy. A recent Department of Energy study estimated that Georgia's offshore wind resources could supply approximately 6 percent of the energy generated by the state. This document provides some basic background about offshore wind energy, with a focus on its potential development in Georgia coastal waters.

Wind power is generated when winds blow through a turbine, converting the kinetic energy to electricity. The major components of a wind turbine are a rotor (blades); a nacelle (enclosure) containing a drive train, a gear box, and a generator; a tower to support the rotor and nacelle; and electronic equipment. Currently, most offshore turbines are supported by pilings sunk into the ocean bottom. The output of individual turbines is collected at an electric service platform which then transmits the power to shore through a number of high-voltage undersea cables. Once the cables reach land an inter-connection point sends the power to the electrical grid.

Wind turbines are ideally located in areas where the potential for wind energy generation is greatest. Siting variables to be considered include wind power density, direction, and consistency, as well as storm events, water depth, wave characteristics, and substrate type.

Unlike other forms of energy, wind power must be either delivered to the electrical grid as quickly as possible or safely and efficiently stored. Consequently, detailed studies of potential bottlenecks, grid connection challenges, and storage issues must be conducted. The Southern Winds Project, which studied potential landfall sites in Georgia, identified substations at Tybee and Jekyll Islands as potential sites for transmission interconnection, with the Tybee site being favored because of better proximity to maintenance and industrial resources and less visual impact from shore.

There are environmental considerations associated with every stage of a wind project, including pre-installation surveys, construction activity, operation and maintenance, and decommissioning. Possible impacts include collisions with turbines, which pose a risk to many species of sea birds and bats, as well as indirect effects such as alterations in migration patterns and displacement from foraging habitat. Installation of tower foundations cause a physical disturbance to the sea bed and create noise pollution and vibrations, which can potentially impact fish and marine mammals. The towers themselves can alter water and sediment movement and also provide underwater structure for fouling communities. Cable installation can disrupt benthic habitat, and the electromagnetic fields associated with both buried and land-based cables are a potential concern. Other considerations are associated with increased marine vessel traffic, waste disposal from both construction and operations, and visual effects. Mitigation tools can address some of these concerns.

Offshore wind development takes place within the context of the U.S. National Ocean Policy, which specifies that planning be conducted at the regional level. The Coastal and Marine Spatial Planning process is an example of the type of coastal management tool that can be useful for this process, as it can integrate information about natural and cultural resources. A preliminary assessment of the southeast conducted by Geo-Marine, compiled baseline information on wind speed, transportation corridors, location of essential fish habitat and artificial reefs, as well as the distribution of marine mammals, birds, and sea turtles within the planning area.

There are a number of ongoing offshore wind planning initiatives at the Federal, State, local, and regional levels. They focus on collaborative efforts to facilitate all aspects of offshore wind development including funding, site evaluation, permitting, and designation of potential wind energy areas or zones. The Georgia Wind Working Group, a coalition of representatives from utility companies, wind developers, government agencies, and universities, has hosted eleven public forums on wind energy issues since 2006.

Some overall considerations for planning and evaluating offshore wind include understanding the cumulative impacts of a project, from exploration to decommissioning and taking into account indirect effects. Timing of project activities can be important, especially in relation to wildlife impacts. Post-installation environmental monitoring can provide data on the project's effects. To the extent possible, mitigation techniques should be employed to minimize impacts.

Despite potential concerns associated with offshore wind power, all forms of energy have associated trade-offs, and not only offshore wind but all potential forms of energy from a long-term, cumulative perspective.

The full report is available at: http://www.gcrc.uga.edu/PDFs/GCRC_GA_OffshoreWind.pdf