The Air Up There: AMC Creates a Model for Wind-Power Siting

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A record number of wind power projects are currently proposed for the Northeast, spurred by tax incentives and the rising cost of fossil fuels. Yet commercially viable inland sites in the region are limited, located primarily on mountain ridges and along the coastline.

Despite the relatively small number of potential sites, there has never been a comprehensive assessment that evaluates the potential environmental impacts of developing these locations, or identifies which would be better suited for erecting the giant 300- to 400-foot-tall turbines. To help address this, AMC scientists have developed a new methodology for wind-power siting.

A typical wind turbine averages 0.5 megawatts (MW) of electricital output, or enough to power roughly 600 homes, explains AMC Research Director Ken Kimball. New England can consume more than 25,000 MW during peak periods and New York City alone can use 13,000 MW. Large coal, gas, and nuclear plants generate about 1,000 MW each. "Such numbers make it apparent that thousands of turbines would be needed to make a significant contribution to the region's energy grid," Kimball says.

Kimball also points out that there are limits to what is even theoretically possible. In Massachusetts, for example, there are roughly 100 miles of mountain ridgelines with sufficient wind for commercial development, mostly located in the Berkshires. On average, eight turbines fit per mile of ridge. Even if all these sites were developed using current technology, they would average less than 500 MW of output. (This does not include offshore sites such as the proposed Cape Wind project, which would generate roughly 170 MW.)

Developing these mountainous sites, many of which lie on conservation land or in biologically sensitive areas, would entail significant environmental trade-offs. "It's a balancing act between what we're willing to sacrifice and the amount of alternate energy we're hoping to gain," says Kimball.

To help solve this dilemma, AMC Senior Staff Scientist Dave Publicover has developed a method that evaluates potential conflicts between wind power and natural resources. The model incorporates more than a dozen established ecological, recreational, and scenic criteria for each potential location, including whether it is on conservation land, in important wildlife areas, or lies within view of the Appalachian Trail. Sites are ranked for each factor on a three-point scale, from having few or no constraints to causing significant impact. Once these factors are combined, the results indicate whether a location has low constraints, and should be investigated further, or if it should be off-limits to wind power due to significant conflicts.

Publicover notes that the method doesn't answer every question related to wind power siting. "It's not intended to replace detailed evaluation of specific sites, but it does outline where development may create an impact on important resources." While locations in western Massachusetts were used to develop the model, AMC is currently expanding the analysis to include Maine, New Hampshire, and Vermont.

States in the Northeast currently evaluate proposed wind projects on a case-by-case basis, and none has established clear guidelines for where wind power should, or shouldn't, go. "Our objective is for this model to be a prototype for the states to develop their own siting policies and regulations," Kimball says. Toward this end, AMC staff have begun meeting with state officials to explain the methodology and encourage them to create state-specific guidelines.

"Most states have programs that encourage the development of renewable energy. They also have programs to conserve open space," Kimball says. "We hope that this model will help states consider these policies together and answer the question of how to balance the preservation of open spaces with the growth of wind power. We need them both."

-Matt Heid is Senior Editor of AMC Outdoors.

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