

## **Transmission Infrastructure Costs Associated with Wind Power**

Wind power, because of its obviously low resource costs, is likely to be a primary source of renewable generation under a federal mandatory renewable portfolio standard (RPS). However, when considering RPS proposals, Congress also should be aware of the significant indirect costs associated with wind, including the cost of transmission infrastructure needed to move wind power from geographically remote wind farms to population centers where the power is needed.

In the mid-1990s, the United States Energy Information Administration (EIA) studied the transmission line costs associated with wind power. The cost-related issues that EIA identified in its 1995 report still exist today, but have only increased in terms of magnitude due to inflation as well as rising construction material and commodity prices. Here is what EIA found:

In addition to the power plant construction and operating and maintenance costs, there are costs for connection of wind resources to the transmission grid. The further a wind energy development project is from transmission lines, the higher the cost of connection to the transmission and distribution system.

The distance from transmission lines at which a wind developer can profitably build depends on the cost of the specific project. Consider, for example, the cost of construction and interconnection for a 115-kilovolt transmission line that would connect a 50-megawatt wind farm with an existing transmission and distribution network. The cost of building 1 mile of 115-kilovolt line is assumed to be \$286,000, the midpoint of the range for the relevant voltages. That amount includes the cost of the transmission line itself and the supporting towers. It also assumes relatively ideal terrain conditions, including fairly level and flat land with no major obstacles or mountains. (More difficult terrain would raise the cost of erecting the transmission line.) The cost of constructing a new substation for a 115-kilovolt transmission line is estimated at \$1.08 million. The cost of connection for a 115-kilovolt transmission line with a substation is estimated at \$360,000.

Representative costs of a wind energy project and connection to existing transmission lines are as follows: Assuming that a 50-megawatt wind farm costs \$50 million, 10 miles of transmission line (at \$286,000 per mile of line) adds \$2.86 million to the total cost, construction of a new substation costs \$1.08 million, and connection to an existing substation for a 115-kilovolt line is \$360,000. These costs add 8 percent to the total cost. The costs of construction of 10 miles of transmission line and interconnection to an existing substation would add 6 percent to the total cost.

Although 10 miles was chosen for purposes of illustration, a wind developer might economically build closer to or farther from transmission lines, depending on site-specific conditions, including the voltage of the transmission line constructed, cost of interconnection to higher voltage transmission lines, the project's overall capital costs, specific wind resource characteristics, and project economics. There are, however, land and environmental constraints on transmission line construction, such as the existence of densely populated urban areas, national parks, reserves or recreation areas, national forests and grasslands, national scenic waterway and wilderness areas, wetlands, lakes, marshes, and terrain that is steeply sloped or inaccessible to roads. These factors, which were not considered in the above example, can also increase the cost of connecting to transmission lines. Although the costs for wind development in the United States are significant, efforts are being made to develop wind resources in some States.

*Source: Energy Information Administration (EIA), Background Information and 1990 Baseline Data Initially Published in the Renewable Energy Annual 1995.*  
<http://www.eia.doe.gov/cneaf/solar.renewables/renewable.energy.annual/backgrnd/tablecon.htm>

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