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New York Wind Energy Guide for Local Decision Makers:

## Wind Energy Site Selection



**NEW YORK**  
STATE OF  
OPPORTUNITY.

**NYSERDA**







## Meteorological Towers

Once an ideal site is identified, the developer will install meteorological towers and remote sensing equipment to record weather information, such as wind speed, wind direction, gusts, and temperature. This information, in combination with regional climatic reference station data, can be used to characterize the long-term wind resource at the site. On-site measurements are necessary to greatly reduce the uncertainty in predicting a project's eventual energy production. Developers are interested in reducing a project's energy uncertainty because most wind projects are financed by third-party investors. Reducing the uncertainty in the energy estimates reduces the risk perceived by the investor, which increases the likelihood for investment and more favorable investment terms.

Meteorological (met) masts or towers are typically 60 or 80 meters (m) tall and have monitoring equipment at multiple heights. These met towers use anemometers, wind vanes, and sensors to measure the wind speed, wind direction, and temperature. This wind resource data is collected and stored by a data logger for later analysis.



**Figure 1**

**Examples of guyed tubular meteorological mast and guyed lattice meteorological tower**

*(Source: AWS Truepower)*

## Remote Sensing

Remote sensing equipment can be used as a complement to met tower data collection to quantify the wind resource. The most commonly utilized remote sensing equipment is sonic detection and ranging (SODAR), but light detection and ranging (LIDAR) may also be used during the assessment process. SODAR and LIDAR are similar to RADAR technology, except they use sound and light instead of radio waves. In the future, remote sensing may be able to provide wind resource assessments of high enough quality to replace current met tower assessment practices.

## Micrositing

If the wind data confirm the viability of a site for a project, developers pursue land rights for the entire project and begin micrositing. Micrositing is the process of collecting additional wind data for the purposes of determining the most appropriate turbine for the site, identifying potential turbine locations, and optimizing the project layout. Wind can be highly variable, being influenced by terrain features, vegetation, and local atmospheric conditions. Experience has shown that limiting the number of met towers can result in erroneous energy production estimates. Therefore, once developers have determined that a specific area has the right mix of wind (based on initial met tower data), land, local support, and energy market, it's common to deploy additional met towers. The number of additional met towers is dependent on land characteristics, turbine size, potential turbine layouts, etc., but can vary from approximately one met tower for every 10 to 30 turbines.

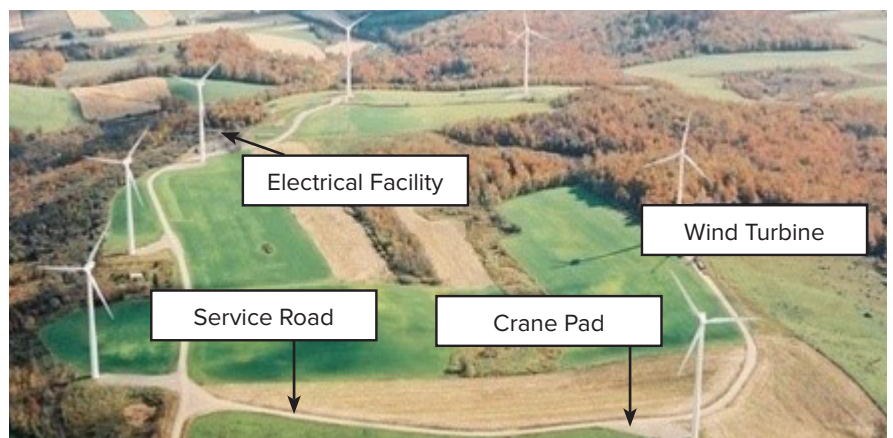
## Land Area Requirements

Wind turbines are typically arranged in single or multiple rows, depending on the size and shape of the landform. A single row is most often found on ridgelines and hilltops where the amount of well-exposed land is very limited. Broader and flatter land features can accommodate multiple rows of turbines. In both cases, rows are laid out to be roughly perpendicular to the prevailing wind direction.

The interference of one wind turbine on the airflow experienced by a downwind turbine is called the wake effect. The wake generated by a wind turbine reduces the velocity of the downwind airflow and causes it to be much more turbulent. Turbines that are closely spaced will experience higher wake-induced energy losses, increased loading (from turbulent airflow), and a shorter operational life. Wide spacing between wind turbines generally maximizes energy production but increases land and infrastructure requirements, such as cabling and roads. Cost considerations must be analyzed before finalizing turbine locations. Developers strive to optimize the balance between the higher wake effects and the lower costs of tighter spacing, while considering underlying land uses and environmental conditions.

The acreage required for a wind power project can be defined either as the overall area containing the entire project, including the open spaces between turbines, or as only the area actually occupied by the project's facilities (turbines and their foundations, service roads, crane pads, electrical equipment, associated buildings).

Figure 2 is an aerial view of a small wind project in Madison, NY, with the facilities labeled. In general, a project's facilities occupy only about 5% of the total project area. This means the large majority of the space within a project area can be used for traditional purposes, such as agriculture.



**Figure 2**

**Aerial View of a Wind Power Project in Madison, NY**

*(Photo by Chris Milian)*