

Distributed Wind Tools Assessing Performance



Streamlines Colored by Streamwise Velocity Component
-4.8e-01 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.4e+00

The above figure demonstrates wind speed around obstacles, which is critical to understanding the potential performance of distributed wind turbines placed in proximity to those obstacles. Warmer colors (e.g. orange) represent increased wind speed around the object, and cooler colors (e.g. blue, purple) represent decreased wind speed.

Partnering to reduce cost and uncertainty in preconstruction distributed wind project performance estimates to increase consumer confidence and optimize the siting of distributed wind turbines.

Illustration courtesy of Argonne National Laboratory.

Advancing Resource Assessment

Unlike utility-scale wind projects, for distributed wind (DW), it can be too expensive and time consuming to construct a meteorological tower to measure wind speed on-site because of the small size (and budget) of these projects, which often use only one turbine. Furthermore, because DW projects tend to be located closer to where the energy is used, the wind resource is more likely to encounter obstructions before reaching the turbine. This emphasizes the importance of modeling obstructions, which is a capability that is not well developed in affordable desktop tools used for producing site-specific wind resource data. As a result of these challenges, it is difficult to accurately predict energy production prior to turbine installation, creating a barrier to DW development.

The Tools Assessing Performance (TAP) project aims to improve wind resource assessment so distributed wind system developers can better predict turbine performance—enabling wind turbines to become a more economically viable and reliable distributed energy resource.

The TAP project team is led by the U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory, with support from Argonne National Laboratory, Los Alamos National Laboratory, and Pacific Northwest National Laboratory.

Expanding Tools for Wind Developers

Using its collective computational and atmospheric science expertise and supercomputing capabilities, the DOE Lab team is creating an online portal that provides the DW industry with access to newly developed wind resource data

which builds on DOE's Wind Integration National Dataset (WIND) Toolkit and a collection of simplified modeling capabilities.

The TAP portal will:

- Provide access to newly available wind resource data
- Allow users to perform timely and accurate performance assessments
- Enable modeling of obstructions that may impact turbine performance
- Deliver a validated methodology for developing and documenting distributed wind turbine performance assessments

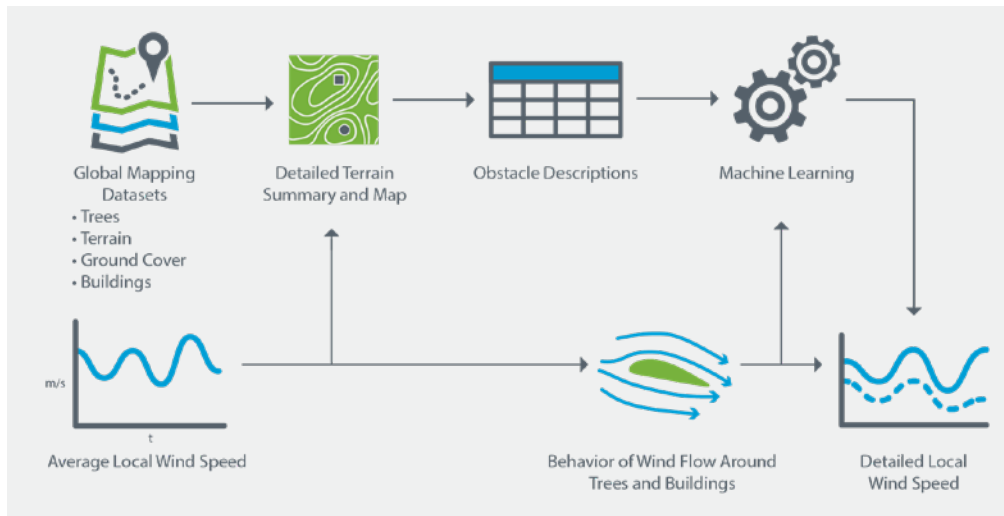
Looking for industry partners and experts to participate in model validation. More information on back.

Accurate Performance Estimates for Customers

The TAP project will produce accurate modeled wind resource data that can be used in place of on-site wind resource assessments. These data will be packaged in a format that tool developers can use to develop or improve simple tools for estimating project performance. Specific outcomes for stakeholders are shown in Figure 1. This suite of products and services includes all of the necessary inputs for tool developers to create performance estimates with ease and accuracy.



Figure 1. Products and services for end users.



WIND Toolkit data, supporting GIS data, and obstruction models are being used to develop the detailed local (site-specific) wind speed, as illustrated in Figure 2, with uncertainty quantification being one of the elements of the final output. This site-specific wind speed data can then be accessed through the online portal.

Figure 2. Flow chart illustrating the method of conducting national/regional analyses.

Industry Partners and Experts Needed

To address the gap in distributed wind resource data, the team is looking for industry partners to provide meteorological data to validate existing models and help create a new wind resource data sets. We are seeking full years of data at heights relevant to the distributed and large-scale wind industries (30 to 100 meters). The time period of interest is focused on, but not limited to, 2007–2013. Data received from project participants will be treated in a proprietary manner (i.e., used strictly for model validation and bias correction). The team is also seeking experts across the distributed wind industry to participate in research advisory boards.

To learn more about partnering with the TAP project team, please contact any of the lab project leads.

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