



Wind as a Distributed Energy Resource

Wind Power Grown Locally

Distributed wind projects produce electricity that is consumed on-site or locally, as opposed to large, centralized wind farms that generate bulk electricity for distant end-users. However, wind technology of any size can be a distributed energy resource.

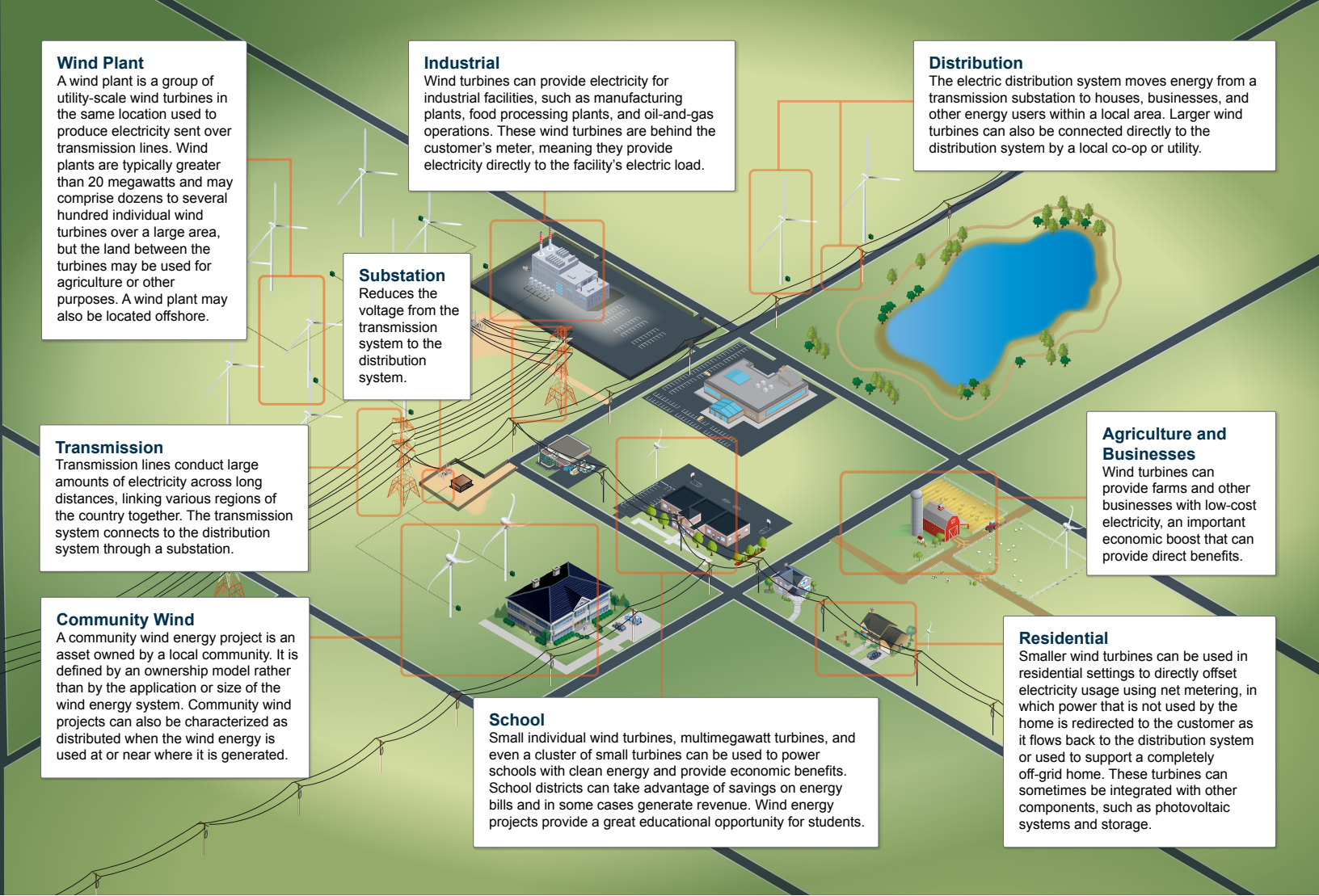
Often used to generate electricity for remote communities or offset a portion of energy costs for grid-connected customers, distributed wind systems can be part of an isolated grid or a grid-connected microgrid in combination with other energy devices. They can also be connected to local power distribution lines to supply local electrical loads or behind a customer's electrical meter for self-generation. In each of these cases, distributed wind energy is used to offset other energy sources while providing additional energy system and community benefits such as:

- Supporting a more resilient power system
- Mitigating energy security concerns and power-quality issues
- Reducing energy system losses
- Delivering cleaner, low-cost energy to end users—especially if combined with other energy technologies, such as solar photovoltaics or storage.

Distributed wind can be installed in a wide range of locations and wind conditions to provide electricity for millions of distribution systems or as part of hybrid power systems. Distributed wind has the technical potential to provide thousands of gigawatts of power production capacity. As a result, utilities, communities, and nations are looking to distributed generation as an effective way to meet future energy needs.



Power for Homes and Farms. The Gob Nob wind turbine in Farmersville, Illinois, supplies power to about 380 area homes and farms. *Photo courtesy of Rural Electric Convenience Cooperative*



Power Grown On-Site. Distributed wind generates energy on-site for use in individual homes, farms, small businesses, and industrial and commercial facilities. Turbines in this category range in size from smaller than 1 kilowatt for off-grid applications to 1 megawatt and larger. *Image by Josh Bauer, NREL*

Energy for Homes, Farms, Small Businesses, and Industrial and Commercial Facilities

Distributed wind creates energy for individual homes, farms, small businesses, and industrial and commercial facilities. Turbines can range in size from a few hundred watts for a boat or recreational vehicle, to thousands of watts for a single residence or small business, to multimegawatts for powering manufacturing facilities or connecting to local distribution systems.

Distributed wind projects can be located anywhere with consistent winds, energy needs, and available land to install the turbine, including:

- Agricultural properties and other large areas of land
- Businesses, corporations, and industrial facilities
- Military installations
- Rural electric cooperatives
- Schools, water treatment plants, and other community facilities
- Remote or isolated communities.



Energy Used Near Where It's Generated. This Bergey Windpower Excel 15-kilowatt wind turbine provides power to a residence.
Photo by Jordan Nelson, Nelson Aerial Productions

International Support for Distributed Wind Advancement

Dedicated to advancing wind technology as a cost-effective and reliable distributed energy resource, the International Energy Agency Wind Technology Collaboration Programme (IEA Wind) Task 41 comprises an international group of researchers from numerous member countries and associations. Researchers are examining a broad spectrum of solutions involving wind turbines deployed in the four main distributed wind use applications: behind the meter, in front of the meter, microgrid, and off-grid.

The four primary research themes of the task are standards and technical specifications, integration, social science, and information dissemination. Task 41 researchers are focused on addressing topics for which international collaboration can have a significant impact:

- Expanding access to general information
- Improving consumer understanding, confidence, and engagement
- Pursuing ways to continue technology cost reductions
- Articulating the benefits of integrating distributed wind into energy markets and systems.

U.S. Research Aimed at Achieving Distributed Wind's Potential

In the United States, the U.S. Department of Energy's National Renewable Energy Laboratory and the Pacific Northwest National Laboratory conduct distributed wind research focused on improving:

- Design methods, tools, and standards
- Resource characterization, forecasting, and mapping
- Technology development
- Market data tracking, storage, and analysis
- Manufacturing designs, materials, and processes.

These efforts help increase understanding of distributed wind's potential in U.S. and international wind energy markets, inform state and federal policies, reduce the cost of distributed energy, and accelerate the adoption of distributed wind technologies.

Distributed Wind Resources

U.S. Wind Maps

<https://windexchange.energy.gov/maps-data/325>

Global Wind Atlas

<https://globalwindatlas.info/>

Distributed Wind Basics

<https://windexchange.energy.gov/markets/distributed>

Small Wind Guidebook

<https://windexchange.energy.gov/small-wind-guidebook>

Large Community Wind Handbook

<https://windexchange.energy.gov/large-community-wind-handbook>

Distributed Wind Research

<https://www.energy.gov/eere/wind/distributed-wind>

Small Wind Turbine Certification

<https://smallwindcertification.org/>

More Information

iea-wind.org/task41/

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iea wind

TASK 41
Distributed Wind