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The International Energy Agency
Cooperation in the Research, Development, and
Deployment of Wind Energy Systems



How does Task 41 define Distributed Wind?



Wind Farm

A wind farm is a group of utility-scale wind turbines in the same location used to produce electricity sent over transmission lines. Wind farms are typically greater than 20 MW and may consist of dozens to several hundred individual wind turbines over a large area, but the land between the turbines may be used for agriculture or other purposes. A wind farm may also be located off-shore.

SubstationSteps voltage down from transmission system to

Distribution

The electric distribution system moves energy from a transmission substation to houses, businesses, and other energy users within a local area.

Larger wind turbines can also be connected directly to the distribution system by a local co-op or utility.

Wind turbines
 connected at a
 distribution
 voltage (nominally
 70 kV or lower) in
 a behind-the meter, in-front-of the-meter, or off grid application.

 Distributed wind is inclusive of all sizes of wind turbines and is agnostic to business model.

TransmissionTransmission lines conduct large

amounts of electricity across long distances, linking various regions of the country together. The transmission system connects to the distribution system through a substation.

distribution system.

Agriculture and Businesses

Wind turbines can provide farms and other businesses with low-cost electricity, an important economic boost that can provide direct benefits.

Community Wind

A community wind energy project is an asset owned by a local community. It is defined by an ownership model rather than by the application or size of the wind energy system. Depending on point of interconnection and proximity to end use, community wind projects can also be characterized as distributed.

Schoo

Small turbines, multi-megawatt turbines, and even a cluster of small turbines can be used to power schools with clean energy and provide economic benefits. School districts can take advantage of savings on energy bills and in some cases generate revenue. Wind projects provide a great educational opportunity for students.

Residential

Smaller wind turbines can be used in residential settings to directly offset electricity usage using net metering, where power that is not used by the home is credited to the customer as it flows back to the distribution system, or support a completely off-grid home. These turbines can sometimes be integrated with other components, such as PV systems and storage.

Graphic: NREL / U.S. DOE

Typical Distributed Wind Applications





Wind energy technologies (of all size classes) are used as distributed energy resources on the distribution grid, on the customer side of the meter, or at an isolated off-grid location to support local loads or grid operations. Distributed wind systems are often used to self-generate power in remote communities or offset a portion of energy costs for grid-connected retail power customers.



Task Motivation: Costs



 There have been large cost reductions in distributed energy resources, such as solar PV and energy storage, but limited cost reductions in turbine technologies less than 1 MW in size used in distributed and remote applications.



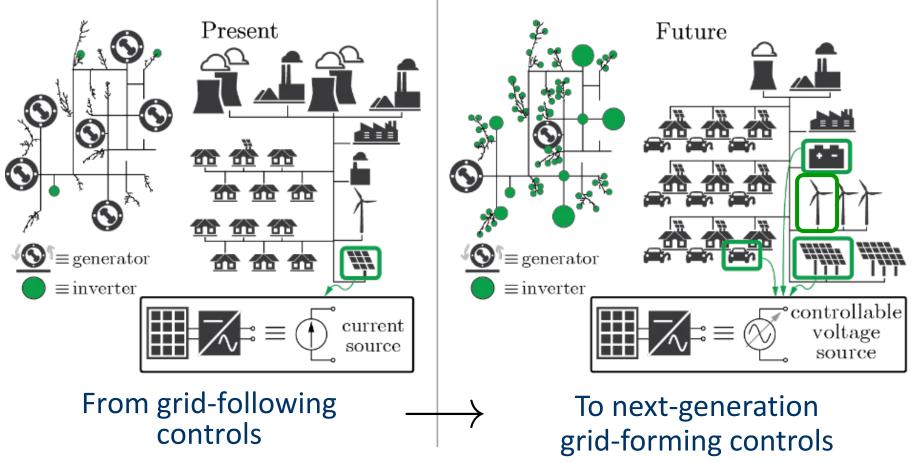
Task Motivation: Evolution of the Grid



- There are large potential distributed energy resource (DER)
 markets across the globe, particularly as grids evolve and the
 need for low-cost clean energy expands.
 - Distributed energy resources provide expanded grid diversity and resiliency.
 - There is expanded potential for distributed energy resources in areas of the world with weak transmission networks.
 - There is huge potential in energy access markets in developing nations (US\$113 billion through 2030) and for isolated energy systems (microgrids), both of which are currently dominated by solar PV.

Task Motivation: Evolution of the Grid





The idea of what constitutes a grid is changing, especially in places with limited existing transmission infrastructure.

Task 41 Goals



- Enable wind technology as an economically competitive and reliable distributed energy resource option.
- Expand collaboration around and understanding of wind technologies as a distributed energy resource.

IEA Wind TCP Task 41 Work Packages



- WP1: Progressing Distributed Wind Technology Design Standards for Small- and Mid-Sized Wind Turbines
- WP2: Data Information Catalog
- WP3: Expand Learning and Support of the Integration of Distributed Wind into Evolving Electricity Systems
- WP4: Outreach and Collaboration with Other R&D Activities
- WP5: Innovation and Downscaling of Utility-Scale Technology



Work Package 1: Standards



Support distributed wind technology design standards for small and mid-sized wind turbines to allow for accelerated innovation and improved consumer confidence

- Convene industry stakeholders to identify issues with current standards as they relate to small and mid-sized turbines in distributed wind installations through forums in the United States, Europe, and Asia
- Report on recommendations for potential changes to the existing standard IEC 61400-2



Work Package 2: Data Catalog



Develop an information sharing catalog for distributed wind research and data

- Identify potential data contributors and users; what shared resources are needed; what data is available on key topics; and recommended practices for data collection, reporting, accessing, and storage
- Catalog and make available meta data about distributed wind data sets so researchers can contact data owners directly about using the data
- Consider including a catalog of data processing tools and decision support tools



Work Package 3: Integration



Work with distributed wind and DER industry players to expand integration of wind into grid and off-grid power systems for expanded controllability, cyber security and advanced grid services

- Develop a best practice guide for the design of isolated power systems
- Report on state of the industry for isolated microgrid power systems
- Research into the value wind can provide in supporting high variable renewable grids
- Review how wind is represented in distributed grid and microgrid systems tools and models
- Summarize national and international electrical standards to support external standards development



Work Package 4: Outreach and Collaboration



Support expanded collaboration with ongoing research efforts and with the wider DER community

- Identify and engage with industry and government research efforts
- Expand engagement with other DER industries (PV, storage, grid) to expand understanding of wind, including in areas such as energy access, energy system resiliency, and community power
- Help define and coordinate larger distributed wind research and encourage opportunities for research collaboration
- Engage with other IEA tasks that can inform Task 41



Work Package 5: Down-scaling



Expand collaboration and research on utility-scale technology innovation for applicability to reduce lifecycle costs of energy (LCOE) for small and midsized turbines

- Assess advances in cost reductions and performance enhancements at utility scale for application to small and mid-size wind turbine technology
- Summarize international LCOE cost reduction roadmaps
- Share LCOE reduction best practices and experiences



Participants





U.S. Department of Energy; National Renewable Energy Laboratory; Pacific Northwest National Laboratory



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New Energy and Industrial Technology Development



Windtak

Thank You!



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