Report 2023

Task 41

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.*

Enabling Wind to Contribute to a Distributed Energy Future

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Task 41 is an international group of researchers from twelve member countries dedicated to advancing wind technology as an accessible, cost-effective, and reliable distributed energy resource.

The objective is to coordinate international research on distributed wind energy around priority topics to increase the feasibility and visibility of wind technology as a distributed energy resource.

The calendar year 2023 marked the beginning of a second phase for Task 41. The new work plan is organised around four primary research themes:

1. Informing standards and technical specifications for small, distributed wind turbines.
2. Integrating distributed wind

into evolving electricity systems with a focus on hybrid power systems.

3. Analysing human dimensions of distributed wind through valuation exercises and stakeholder engagement.

4. Disseminating information through collaboration, outreach, and socialisation of Task 41 work products.

In October 2023, Austrian participants facilitated a workshop during an in-person Task meeting to discuss the approval processes for deploying small wind turbines in Austria. The discussion facilitated the comparison of siting and permitting for small wind turbines across member countries, ultimately resulting in a proposal for a simplified procedure process for Austria. Information from participating member countries will be developed into a best practices document, providing actional recommendations for the siting of small and distributed wind turbines. In 2023, Task participants also supported industry outreach at the Wind Energy Science Conference, North American Wind Energy Academy (NAWEA)/WindTech conference, and the eighth International Conference on Small and Medium Wind Energy in the United Kingdom, United States, and Denmark respectively.

Introduction

Task 41 was initiated in January 2019 and extended for a second phase through 2026. Its goal is to advance wind technologies as accessible, cost-effective, and reliable distributed energy resources. Recent studies in the United States have indicated quite large economic opportunities for the use of distributed energy, including wind energy, to economically address rising costs, grid reliability, and increased energy demands through electrification [1]. Distributed wind can also provide an easy-to-deploy alternative to larger land-based and offshore wind projects to support rapid power system transformation. Individuals, businesses, farms, and communities install distributed wind technologies to offset retail power costs or secure long-term power cost certainty, support grid operations and local loads, and electrify remote locations and assets not connected to a centralised grid.

Anticipated results from Task 41 are expected to include technical reports, journal articles, and other products that highlight key research findings. This includes research to inform the fourth revision of the IEC 61400-2 standard, participation in conferences focused on small and medium wind turbines and expanded collaboration and engagement in the wider distributed energy research fields.

Task 41 has members from twelve countries and collaborates closely with researchers from several additional nations who participate as observers. Task members engage closely with national wind energy organisations and undertake outreach through technical conferences and other engagement opportunities.

Progress and Achievements

In May 2023, several Task 41 members participated in and facilitated a mini symposium on small wind turbines at the Wind Energy Science Conference in Glasgow, United Kingdom. Topics included [2]:

- Lessons learned from the operation of a small wind turbine over a low-rise building rooftop.
- Progress on the revision to IEC standard 61400-2 on small wind turbines.
- Non-linear yaw response of generic tail fins for small wind turbines.
- Obstacles effects on wind flow for small wind turbines.

Task members also participated in the NAWEA/WindTech conference in the United States and facilitated and participated in the eighth International Conference on Small and Medium Wind Energy in the United Kingdom, the United States, and Denmark, respectively. Members were also present on the technical committees of the 2024 TORQUE Conference to ensure that distributed wind systems are represented.

Other notable publications and deliverables include:

- A journal article evaluating the influence of roof shapes on performance of small wind turbines. The work assessed two wind energy technologies, one with a vertical axis and helix-shaped rotor blades and another with a horizontal axis and centrifugal force pitch control. The results indicate that some locations on and around buildings are not suited for installing small wind turbines, while others show increased potential. The experiment was conducted at the Lichtenegg Energy Research Park (Lower Austria) [3].
- Although wind and solar have been deployed in isolated communities across the Arctic for over a decade, the experience related to the success of these projects has been hard to determine. Specifically, to understand what has led to the successful development and operation of these isolated microgrids, many of which incorporate wind energy. Technical interviews were conducted with communities in Alaska that are trying to or have deployed renewable-based microgrids. Understanding the key to success is an important first step for any community considering wind-based microgrid energy systems [4].
- Finally, a study that identifies and validates a simplified site assessment methodology for small wind turbines. The method established in the report

Figure 1. Task 41 members at the National Renewable Energy Laboratory's Flatirons Campus in Colorado, United States. *Photo Credit: Rosemary Butler, NREL*.

supports retailers, planners, and manufacturers in identifying wind hotspots within cities both systematically and with low effort. The approach responds to financial constraints that often prohibit small wind installations from collecting onsite wind resource measurements before deployment. This report is to be published in 2024.

Highlight(s)

2023 was a transitional year, kicking off the new phase of Task projects while building on work completed during the first phase of the Task. Current work focuses more specifically on direct collaboration between partner organisations, including international collaboration on the siting and permitting of distributed wind, technical research supporting the revision of IEC standard 61400-2 on small wind turbines, expanded engagement to develop siting guidelines for distributed wind turbines in arctic climates, and the use of wind energy as part of hybrid or microgrid energy systems.

To increase awareness of distributed wind, the United States created a fact sheet that is easily translatable to other languages to support global information dissemination on distributed wind energy. Task 41 members also produced three informational videos that have been viewed more than 400 times worldwide. This series of videos explains (1) how wind energy technologies can be used effectively as distributed energy resources, (2) the purpose of Task 41, and (3) the impact that international collaboration has on distributed wind research [5]. The video interviews were conducted during a Task 41 meeting where participants discussed progress on mining data for turbulence research, upcoming opportunities to disseminate research, system integration topics, social acceptance of small wind turbines, and innovations in cold climate specifications and recyclability of turbines.

Outcomes and Significance

Although it was the first year of the new phase of work, several direct outcomes of significance were developed. Social acceptance of wind energy technologies varies from community to community across the globe. Building from international collaboration, Task 41 members from Austria conducted a survey around perceptions of small wind technologies, which provides a baseline understanding of perspectives within the country. Preliminary results were shared with other Task members to consider cross-country comparisons, which strengthened the collective understanding of the nuanced views of small and distributed wind deployment. Many small wind turbine manufacturers have technologies deployed in multiple countries, ultimately making this work useful to the industry worldwide.

An additional point of collaboration has been active participation in the revision of IEC standard 61400-2 in which several Task representatives

serve on the technical committee while undertaking collaborative research to support some of the proposed revisions to the standards. Additional outcomes, such as the best practice guide for turbine siting in arctic climates, small wind turbine siting and permitting, and the use of wind turbines in microgrid power systems are expected over the course of the project.

Next Steps

Members will continue to expand their engagement across the breadth of Task work, with a goal to develop products related to the appropriate siting of wind distributed wind turbines. Members will present work at the International Conference on Small & Medium Wind Energy in Denmark (September 2024) and the NAWEA/WindTech conference (October 2024). In-person meetings will be held in combination with some of these events to support ongoing collaboration across Task activities, including turbulence, best practices for high wind contributions in isolated hybrid power systems, and a capstone publication.

References

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