



Empowering Communities: Exploring the Potential of Wind and Solar Hybrid Microgrids

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As the world shifts towards using more alternative energy sources, distributed wind can become a key player, supporting electricity generation in communities. Distributed wind systems, coupled with solar and energy storage, have the potential to significantly enhance the diverse energy mix. These solar and wind hybrid microgrids have the potential to promote energy independence and improve energy security.

Hybrid microgrids can empower communities by providing a reliable and

long-lasting energy solution that can operate independently from the main grid during instances when grid power is not readily available. By combining wind, solar, and energy storage technologies, hybrid microgrids enable communities to generate electricity on-site. The Wind Hybrid Integration Platform (WHIP) is a three-year Department of Energy project funded through the Wind Energy Technology Office that started last October. This project is led by Dr. Rachid Darbali-Zamora of the [Distributed Systems Integration](#) program at Sandia National

Laboratories. The objective of the project is primarily to design and develop a Distributed Energy Resource Management System (DERMS), considering wind, solar, and energy storage assets. The main research is to identify advantages that distributed wind can provide that have not been considered. The locations we are evaluating are in Puerto Rico, Alaska, and Texas. Using Sandia National Laboratories' Power Hardware-in-the-Loop platform at the [Distributed Energy Technology Laboratory](#), we plan on testing these controls with actual wind turbine power converters.

Remote villages in Alaska, such as St. Mary's and Kotzebue, are examples of communities that have tapped into the power of distributed wind. These Alaskan communities face unique energy challenges, often relying on diesel generators. However, distributed wind systems are transforming the energy landscape, harnessing the region's abundant wind resources. The integration of solar and energy storage with these wind systems provides a stable and reliable power supply, reducing the dependency on diesel fuels. These hybrid microgrids offer Alaskan communities a long-term energy solution, ensuring continuous access to electricity.

In a similar manner, Puerto Rico, an island still recovering from the devastation caused by Hurricane Maria in 2017, could

benefit from distributed wind. The island's vulnerable centralized power grid suffered extensive damage during the hurricane, leaving many communities without electricity for months. In response, Puerto Rico has embraced the implementation of other energy sources, such as solar. By integrating distributed wind with solar and energy storage, some communities can fortify their energy infrastructure, enhancing robustness and reducing dependence on fuels impacted by logistical constraints and price volatility. Distributed wind power, together with solar and energy storage, can ensure a more reliable and enduring power supply.

As the world shifts towards using innovative energy technologies, distributed wind can become a key player, supporting electricity generation in communities. Distributed wind systems, coupled with solar and energy storage, have the potential to significantly enhance our energy supply. These solar and wind hybrid microgrids have the potential to promote both energy and community independence.