

Intelligent networking of wind farms

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In the future, Fraunhofer's Wind Farm Cluster Management System will enable Spanish grid operator REE to steer wind farms from its central control station. Credit: Red Electrica de Espana (REE)

The EU member states have passed a resolution requiring one fifth of their electricity needs to be derived from renewable energy sources by 2020, with wind farms covering a large part of this requirement. Researchers have succeeded in interconnecting large wind farms in clusters.

The future belongs to renewable energies. Wind energy is one of the main forms of renewable energy experiencing a boom. According to the German Wind Energy Association, 952 new facilities were installed in Germany in 2009. The German Renewable Energy Federation predicts that 47 percent of total [electricity consumption](#) in 2020, estimated at 595 terawatt hours, will be covered by [renewable energy sources](#), with wind energy accounting for one quarter.

"Wind on the Grid", one of the EU's biggest network integration projects, has just been completed. A group of European industrial companies and research organizations teamed up to investigate how [wind farms](#) on the Iberian peninsula could be safely integrated in the European electricity grid on a large scale. To assist grid operators in the capture, control and forecasting of wind energy, the Fraunhofer Institute

for Wind Energy and Energy System Technology IWES has made available both its Wind Farm Cluster Management System (WCMS) and its Wind Power Management System, adding new functions to both. The researchers used these software packages to integrate five wind farms in Portugal with a total capacity of 204 megawatts and six in Spain with a total capacity of 107 megawatts in the power grid. The integration was achieved in real-time tests under a variety of weather conditions.

"We used the WCMS to link the scattered wind farms in a cluster, enabling them to be controlled by the central control station of the Portuguese and Spanish power utilities respectively. While the WCMS keeps both the frequency and the voltage of the [electricity grid](#) constant, thus ensuring safe operation, Fraunhofer's Wind Power Management System forecasting software uses artificial neural networks to calculate expected wind energy on the basis of predicted weather patterns," explains Dr. Kurt Rohrig, department head at the Kassel branch of the IWES. Individual wind farms are subject to wide fluctuations in output. The more wind farms that can be interconnected in a cluster, the easier it is to balance out the fluctuations caused by variations in wind force, from gusty winds to totally calm conditions. And the higher the number of installed facilities, the lower the energy price. "The price of electricity produced using wind energy is currently seven cents per kilowatt-hour; by 2025 it should be around four cents," says Rohrig.

Fraunhofer researchers are negotiating with the Portuguese grid operator with the aim of integrating their software in the latter's control system. And Kurt Rohrig is convinced: "In the long term, wind farms will replace traditional power plants."

Provided by Fraunhofer-Gesellschaft

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