# Ten percent more wind power can be put on EU networks

By Chris Rose


Photo: iStockphoto

Recent results from one of Europe's most ambitious renewable energy demonstration projects determined that wise management practices coupled with technological advances could use wind power and other renewables to improve grid operation and security.

The results of the EU-funded TWENTIES project — "Transmission system operation with a large penetration of wind and other renewable electricity sources in electricity networks using innovative tools and integrated energy solutions" — also show that investments in wind energy have beneficial outcomes.

The three-year project, which had a budget of over €56.8 million, and a European Commission contribution of close to €32 million, was charged with advancing the development and deployment of new technologies which facilitate the widespread integration of more onshore and offshore wind power into the European electricity system by 2020 and beyond.

The project was coordinated by Spanish Transmission System Operator Red Eléctrica de España (REE) and involved transmission system operators, wind companies, EWEA and other partners. It was funded by the EU's 7th Framework Programme.

*"The solutions are already in the field."*

A report on the project, which found Europe's transmission grid capacity can be used more efficiently and bring far more power online, was released in Brussels in June.

"Not only did this project take major technical steps forward, it also brought the wind industry and transmission system operators together in a successful collaboration, showing how wind energy can provide essential services to the grid," Vicente González López, TWENTIES technical manager, from REE, said.

The project found that 10% more wind power could be brought online by measuring transmission and distribution lines temperature in real time and confirming the cooling effect that wind produces on the cables.

In addition, deploying TWENTIES technologies could reduce power prices in the German system by 2.2%, marginal electricity prices by up to 0.4% and cut carbon emissions by 3.5% by putting wind turbines together with other power generation in a "virtual power plant."

TWENTIES was organised around six large-scale demonstration projects grouped into three task forces. The large-scale demonstrations were complemented by three work packages.

One of the work packages focused on the assessment of non-technology barriers to the development of a real offshore grid. The other two were related to the replicability and scalability at EU level of the results of the demonstration projects.

Results for the TWENTIES project prove that larger amounts of wind energy can be integrated in such a cost-effective way with existing technologies that the entire sector will be able to benefit, according to two members of the analysis unit of EWEA's policy department.

In essence, Project Manager Filippo Gagliardi said in an interview, the results will also give the industry even more confidence as it transitions from being seen as an "alternative" power source to acceptance as a "mainstream" electricity-generating technology capable of helping Europe fulfill its ambitious energy and climate goals.

"We are no longer thinking about possible solutions because the solutions are already in the field," said EWEA's Research Officer Ivan Pineda.

"This project has large amounts of wind power can be integrated into the grid."

Saying that the demonstration project results "lower the risk of technologies associated with wind power," Pineda added that potentially problematic issues can be solved with existing technologies that are already working.

González said in an interview that the overall project results were far better than his expectations as all demonstration projects achieved their initial goals.

"The lesson learned for both the wind industry and the transmission system operators (TSOs) is that the outcomes of collaboration are more fruitful than the ones of confrontation," he said. "If we would like to support the EU policy targets for the coming years, the wind industry must focus its efforts in supporting system security and TSOs must think in accommodating more renewables in their grids."

Describing the level of cooperation among all the project partners as being excellent,

González added that the results clearly justified the considerable money spent on the three-year project.

"The best proof, in my opinion, is that a large number of companies have also invested a large amount of money during the worst, I hope, period of the financial crisis in Europe."

Both Pineda and Gagliardi said that one of the most exciting findings came out of the part of the project which explored the management of offshore wind power in storms, when winds are extremely high.

That finding, they said, showed that wind energy output could be increased in stormy conditions, especially offshore, by using "high wind ride through control" which meant turbines were cut off at higher wind speeds of 32 metres per second rather than the usual 25 metres per second.

"In stormy conditions, your wind farm will remain in operation much longer and that means more energy produced and less money being lost," said Gagliardi.

Pineda and Gagliardi were also impressed by the part of the project which looked into improving the flexibility of the grid and found using real-time monitoring of the temperature of the power cables, instead of statistical data, allows over 10% more wind-generated power — and sometimes up to 25% more — to be brought online.

That's because, they said, transmitting large amounts of electricity from wind over long distances could potentially mean cable temperatures go too high, leading network operators using only theoretical cable temperatures to limit wind power to avoid that risk. However if the real cable temperature is known all the time, operators will be able to transmit wind power for as long as the temperature remains within the limits. Implementing real-time monitoring could also reduce the need to upgrade or build expensive new grids because the existing systems could be used more efficiently.


Photo: Zacarias Pereira da Mata

Wind farms will produce more power in stormy weather

They also singled out the part of the project which examined the technical specifications of offshore high voltage direct current (HVDC) networks and tested a DC circuit breaker prototype successfully.

Pineda said that the DC circuit breaker prototype showed it can isolate a system fault in a massive offshore wind farm that generates enough electricity equal to a small- to medium-sized nuclear reactor and prevent it from affecting the rest of the power system, much like a typical residential breaker has the ability to protect the fuse-box and household wiring.

This ability, he added, provides the level of security and reliability system operators expect and, in case of a fault, will avoid huge power losses in the system by isolating the problem.

"The TWENTIES project demonstrated that it is possible to integrate more wind power cost efficiently and securely into the grid. The technologies the project tested are already on the market. It is not about R&D anymore, it is about decisive action," said Pineda.

Gagliardi said the results showed that wind players, grid operators and consumers could expect considerable savings in the future.

"This is particularly important for the offshore sector, which presents higher financial challenges in comparison to onshore: any means to reduce costs there will have a hugely beneficial impact on future developments," he said.

"The next step is to ensure that the technology demonstrated by TWENTIES will be implemented on a EU scale, to make sure that the whole energy system will benefit from this game-changing project."

More information about the TWENTIES project, the results achieved and the report are available at: www.twenties-project.eu. ■

*"The results mean more energy produced and less money lost."*