intertrust®

Case Study

Platform

RWE Renewables optimizes offshore wind farm operations using data intelligence

RWE

Industry
Renewable energy

Location
Essen, Germany and Swindon, UK

Solution
Intertrust Platform™
Powerboard™

Executive overview

In 2020, German-based RWE AG has become one of the world's largest operators of renewable energy and offshore wind power by combining the operations of innogy renewables and E.ON Climate and Renewables. To boost power outputs, raise efficiencies, and reduce costs at its offshore UK wind farms, RWE Renewables partnered with Intertrust to develop Powerboard™, an O&M data platform that blends, analyzes, and visualizes real-time data from multiple sources, enabling multiple stakeholders to collaborate in planning and optimizing wind farm operations.

The challange

Based in Essen, Germany, RWE AG (RWE) provided more than 30,000 million utility customers across the EU with electricity and gas. In 2016, RWE restructured and moved its renewable energy, network, and retail energy operations into a subsidiary company called innogy SE. As a standalone entity, innogy SE quickly emerged as one of the primary operators of onshore and offshore wind energy in the EU and globally. In addition, innogy focused on other forms of renewable energy (solar power, biomass) and invested in technologies to support sustainable development and climate protection initiatives.

In 2019, the European Commission approved an asset swap between the German based utilities RWE, innogy, and E.ON SE. This change was finalized July 1, 2020, with RWE Renewables consisting of innogy renewables and E.ON's renewables sites and becoming the third-largest renewable energy provider in Europe and the second-largest offshore wind operator globally. This reflects a growing trend in the energy industry toward renewable power.

Challenges

- Mission-critical need to streamline and optimize operations
- Key operational information unavailable outside control room
- Lack of unified view of multiple operational parameters, including operations across entire portfolio of wind farms
- Multiple data formats (both internal and external) from multiple sources
- Lack of data aggregation and analysis capability
- Tedious, time-consuming, manual reporting
- Reduce operations and maintenance costs
- Improve safety, forecasting, and trading
- Increase power production revenue
- Increase its ML/AI readiness

Gwynt y Môr wind farm off the coast of North Wales. Photo: RWE

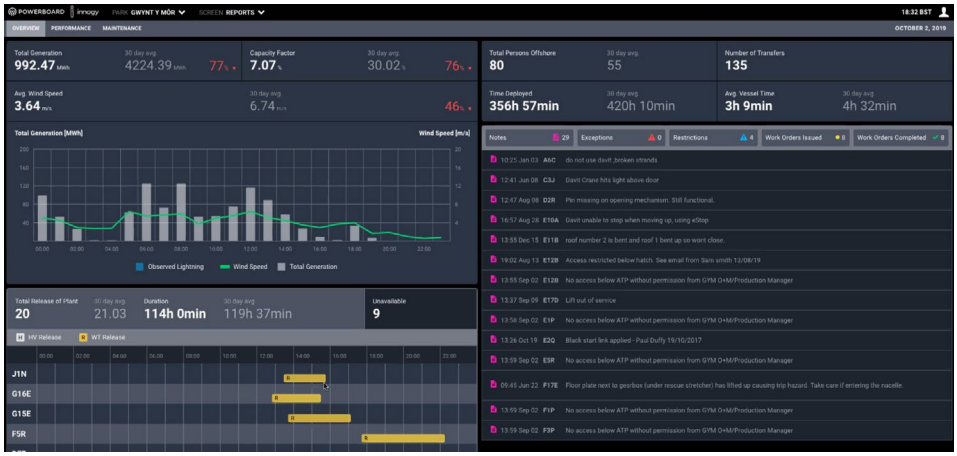
Key results

- Increased profitability and safety
- Clear, intuitive visuals of operational status of multiple wind farm parameters from multiple turbine locations
- Improved operational efficiencies by ingesting, blending, storing, and visualizing operational metrics
- Display and analyses of real-time operational time-series data, including turbine SCADA, substation (high voltage) data, personnel movements, work orders, plant logs, energy pricing data, and more
- Visually rich, interactive analyses
- Improved competitive position

The challenge

Operated by RWE Renewables and its partners, Gwynt y Môr ("Wind of the Sea" in Welsh) offshore wind farm spans across 31 square miles (80 square km) off the coast of North Wales. Currently the fifth-largest commercial offshore wind farm worldwide, Gwynt y Môr (GyM) comprises 160 wind turbines and two offshore substations. With a total capacity of 576 MW, GyM can generate enough renewable energy annually to supply 400,000+ households with electricity. The wind farm began producing power in 2013 and was officially opened in June, 2015.

Offshore wind farms require a great deal of infrastructure support. This includes the marine vessels that deliver and install the turbines and their foundations, the operations and maintenance (O&M) crews that travel to the sites to service the turbines, and the controllers tasked with monitoring and analyzing the vast amount of data coming from each offshore location. While many of the data sources are similar to those found in an onshore facility (e.g., human safety systems, production forecasts), offshore farms require analysis of some unique weather data like wave height and wave direction.



Powerboard reporting dashboard shows key metrics for the Gwynt y Môr wind farm.

Other relevant data includes real-time performance information coming from turbine SCADA systems, high-voltage SCADA, general weather reports, industrial sensor data from marine systems, data from external geospatial datasets, and historic and real-time data on wind patterns. With so many streams of information coming in, having an integrated approach to collect, harmonize, visualize, and make sense of all this disparate data is paramount.

Justin Grimwade, Business Information Manager at RWE Renewables, is part of the Information Management team that supports the IT requirements and control room systems for RWE Renewables' offshore operations, including GyM. He explains, "Gwynt y Môr was our first major offshore wind park—at the time it launched, it was actually the second-largest offshore wind farm in the world. In order to continue developing various enhancements, we wanted to have uniform operational oversight over all the systems and establish common procedures for the operators and controllers. Furthermore, we needed a robust data intelligence solution, but there wasn't really anything that could aggregate all the data into one place."

The solution

As part of the construction of GyM, RWE partnered with Intertrust to develop Powerboard™, an O&M data platform that became part of the first dedicated offshore control room in the UK. In addition to supporting conventional industrial sensor data, Powerboard can process all major geospatial, weather forecasting, and Earth observation data types and formats, including NetCDF and Grib2. All of this data can then be combined with the real-time operational and industrial data from the wind farm and accessed via easy-to-use dashboards. The data is securely stored in the cloud, with Powerboard providing intuitive, clear visuals. Powerboard reporting dashboards can summarize all of the wind farm's offshore activities, across different dates.

Grimwade notes, "All of the metrics for a wind farm's long-term performance ultimately tie back to the data coming out of the systems that are used by the operators in the control room. We approached the development of Powerboard in conjunction with those on-site teams, prioritizing the functionality that would be most useful to them for integrating their systems and streamlining day-to-day operations." In addition to operators and technicians who use Powerboard locally, managers and executive staff can access the system remotely to look at the current status of the wind farm and understand metrics such as the power price, current power output, how many people are offshore, and other key information.

Powerboard's first production deployment went live at GyM in October 2016, with reporting screens added in December, 2018. In addition to GyM, two other RWE Renewables offshore wind farms—Galloper (56 turbines) and Rhyl Flats (25 turbines)—are also using Powerboard. The intention is to implement Powerboard across more of their global wind farm operations.

Operations dashboard shows the real-time status of all 160 Gwynt y Môr turbines.

The results

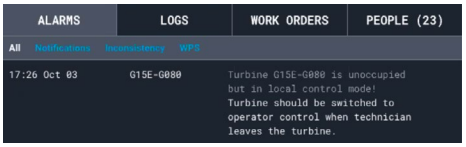
All in one—a unified view to optimize operations

In a typical control room for an offshore wind farm, the information coming in from various systems is displayed on separate monitors. Powerboard displays an aggregated view of all wind farm operations on a single screen, allowing controllers to drill down as necessary to see patterns, monitor performance, and compare data from all the different systems. The dashboard is updated every 10 seconds with live data. Grimwade explains, "The operators were used to seeing their data in different formats. But as Powerboard developed, and they could easily see all of the key parameters across the wind park, in a single-pane-of-glass view, it was a game changer."

Most importantly, with Powerboard, operators no longer have to be in the control room physically to view the screens.

Having a unified view into the data significantly impacted operational efficiency—with Powerboard, operators can move and display the data in whatever order is important to them, whether it's to see which turbines have work activity, or which turbines are generating the most energy. Grimwade adds, "With Powerboard, what we've done is given the right bit of data to the right user and it's just made their lives easier. And that, in turn, has allowed extra understanding of the data, which has helped us make further operational improvements. It's easier to spot anomalies and address actionable items."

Maintenance dashboard shows weather conditions and work order status.



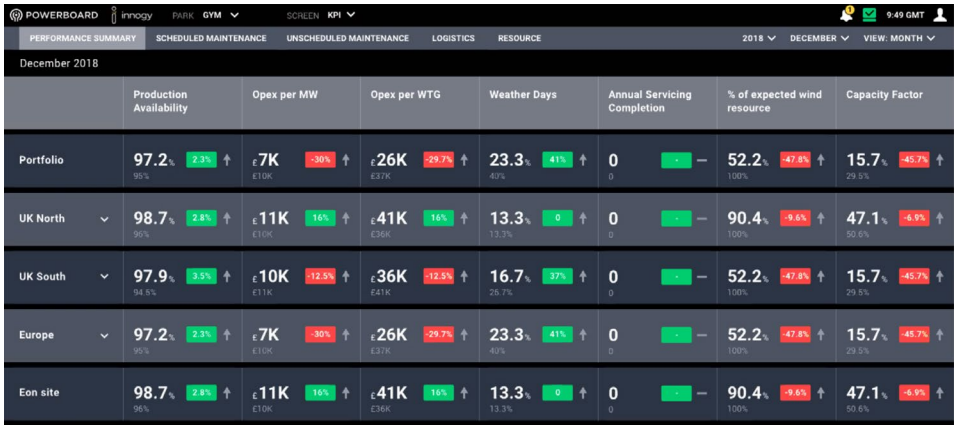
Real-time alarm describes inconsistency in turbine status.

Timely—and safe—maintenance

One complicated maintenance element at an offshore wind farm is the mandatory annual turbine servicing, which can take several days per turbine. This involves O&M technicians taking transfer vessels out to the offshore site, disembarking to work on the turbine, then being picked up at the end of the work day. At GyM, there are only about 200 servicing days available per year, due to "weather days"—unsafe conditions such as high winds and dangerous wave heights. Correlating data from the works management system and weather data within Powerboard enables operators to schedule maintenance effectively, ensuring that technicians take advantage of every potential servicing opportunity to meet the requirements in a timely fashion. Since they now have visibility into how these different data points interconnect, management can more easily budget for servicing appropriately at different times of the year.

With the marine tracker systems, turbine SCADA systems, and safety management systems all feeding data into Powerboard, the platform also helps enhance safety. For example, control room operators can see when a turbine is still online (in operations mode), even if the technician is en route (at which point it should be in service mode). As a result of analyzing inconsistent data between the safety system and commercial (operations) system in Powerboard, RWE Renewables was able to make enhancements to the way the systems interacted. Grimwade says, "Even outside of the control room, you can get a narrative of all the activities onsite, down to granular details such as when the technicians set sail, when they got to the turbine, when the turbine went offline, how long they worked and what job they were doing, and when they returned back again. You can see it in real time via the operations board and historically through reporting."

The Intertrust Platform facilitates secure data exchanges and collaboration between businesses and partners, allowing them to secure, govern, and monetize their data, across any cloud service or infrastructure.



Performance dashboard showing specific metrics across multiple sites.

Park performance and beyond

Interestingly, while the number of "weather days" can impact maintenance, higher winds correspond to higher power output from the work site. Understanding this real-time relationship between production output, service, and other activities is key to management, especially when they want to compare the performance of the various offshore wind farms in the fleet.

To address this need for next-level operational data visibility, Intertrust is developing a Powerboard performance dashboard. Instead of having to pull data from the ecosystem to generate a monthly report, managers will be able to enter the platform to get a real-time view of the data, which will be in daily resolutions. With this level of reporting, they'll be able to drill down into the data to spot any underlying issues and take proactive action to prevent a systems failure, in real time. Eventually, they'll be able to develop and use analytics algorithms for advanced scheduling, all based on data within Powerboard.

The Powerboard performance dashboard implementation should be fully operational later this year, covering 241 turbines across the three offshore wind farms. Grimwade concludes, "Powerboard is a best-in-class program that's allowing us to improve the various operational and systems aspects of our offshore business. We can now make real-time decisions in a safe, controlled way without having to move data between systems."

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