RWE

ConnectPoint for RWE

Optimization of wind farms performance

Executive summary

ConnectPoint and RWE cooperate on the field of digitalization of RWE wind farms. In this project ConnectPoint collaborated on an application for simulating impact of different maintenance strategies on key production and financial indicators. Simulations are executed over a requested time horizon for given configuration of assets, maintenance activities and resources (manpower, materials, vehicles, facilities). They take into account unpredictability of weather, maintenance events and workload in time and deliver estimates of asset availability, energy production, revenues and costs. The application can be used by RWE to support decision-making on maintenance strategies for operational projects and to provide more accurate costs assumptions for projects in development.

About RWE

One of the world's leading renewable energies companies, operates a wind portfolio of more than 11 GW in Europe and the USA. New sites are continuously added to the portfolio.

1 Challenges in renewable energy asset management

A key factor in managing renewable energy assets at such a large scale is to minimize downtime. Any interruption in the operation of a wind turbine or an inverter in a photovoltaic plant results in the loss of some revenue.

Maintenance activities require the availability of resources in the form of service teams, warehouses, spare parts or vehicles, which in turn generate costs. Choosing the optimal number and distribution of these resources, estimation of costs they generate and the loss of revenue caused by device unavailability is a complex task with many challenges.

One of them is the unpredictability of maintenance events and workload of service teams in time. Insufficient number of technicians can cause long downtime when several devices require repair at the same time. On the other hand, too many technicians on standby while repairs are not required can lead to unnecessary and often substantial costs.

Another challenge is the unpredictability of weather, on which maintenance work often depends. Yet another challenge that arises during revenue loss estimation is volatility of energy prices over time. Therefore, an in-depth analysis of a selected maintenance strategy is timeconsuming. The goal of the ongoing project is to create a tool for comparative analysis of multiple strategies for any number of renewable assets to facilitate selection of optimal solution.



> This tool could be of great value for RWE. With the biggest transformation of the company since inception 125 years ago. We have fundamentally changed. From a local electricity producer with nuclear and coal-fired power into a leading global renewables company. The company is under a massive transformation and rapid growth. With investments of more than 50 billion euros gross by 2030 in a green energy world of tomorrow with an ambitious goal: climate neutral by 2040. Digitalization and maximizing asset value are key to remain competitive in this fast paced environment, and this solution contributes to both. The cooperation with ConnectPoint has been easy and very fruitful.
>
> **Manuel Alvarez Fernandez**
> Product Owner

2 Solution

ConnectPoint collaborated with RWE to develop an application to simulate maintenance work carried out on wind and photo-voltaic farms in time domain and to bring clarity on its impact on production and financial results.

Advanced Time-Domain Simulation

Simulates operational and maintenance work on wind and photovoltaic farms, providing clear insights into production and financial impacts.

Multi-Scenario Generation

Feeds real and user-entered data into a simulation model to instantly generate pessimistic, typical, and optimistic future scenarios.

Interactive Dashboard

Presents complex outputs through intuitive graphs and tables, allowing users to analyze detailed metrics or view aggregated data.

Strategy Comparison Tool

Enables side-by-side evaluation of an unlimited number of maintenance strategies to easily identify the optimal approach.

Auto-Scaling Capabilities

Leverages Microsoft Azure computing resources to scale automatically with demand, optimizing infrastructure costs.

Data Science-Driven Decisions

Integrates advanced data science methods into asset operations to achieve maximum commercial optimization.



The application, developed using the Microsoft Azure platform, allows the creation of an unlimited number of strategies describing operational and maintenance resources and failures being serviced. Data entered by the application users and retrieved from other systems feeds a simulation model that generates outputs representing pessimistic, typical and optimistic scenario.

The simulation makes it possible to examine the impact of a given strategy on key production and financial indicators, such as turbine availability, the amount of energy produced and lost, revenues gained and lost from the sale of green energy and operating costs generated. The results are presented to the user in the form of graphs and tables using an interactive panel. User can both compare multiple strategies using a table with aggregated values and examine outputs of a selected strategy in detail.

The tool supports the analysis and makes it easier to identify the strategy that gives optimal results. The application takes advantages of the Microsoft Azure cloud capabilities.

- **Turbine** availability
- **Energy produced** & lost
- **Revenues gained** & lost
- **Operating costs** generated
- **Interactive** graphs & tables
- **Optimal strategy** identification



All data is stored in cloud databases. The use of Microsoft Azure ensures high availability and data security. The data security aspect is particularly important for RWE due to the sensitivity of the data processed by the tool. The application is accessible only by authorized users and only within the internal corporate network. By storing data in Azure cloud, data owners have control over the geographic location of the data, which allows for compliance with the company's internal policies.

ConnectPoint, together with RWE, built and validated the simulation model using the Microsoft Azure cloud platform. By using Azure computing resources, the application can scale automatically to match current demand - the number of simulations running simultaneously - which is variable over time. This allows RWE to optimize the costs incurred by using these resources. As a result, a cloud application accessible through a browser was created, which saves analysts many hours of work and has made it possible to conveniently and quickly analyse a number of operational strategies and understand their impact on different KPIs.

ConnectPoint is supporting RWE to integrate Data science methods in the decision making process used for Asset operation's commercial optimization.

About ConnectPoint

ConnectPoint is a software and IT company that supports the process of digitalisation in the industrial, energy and public utility sectors. It specialises in the integration of IT/OT and IoT, combining industry knowledge with expertise in OT, Big Data, GIS, Business Intelligence and Machine Learning. The company develops systems that enable effective collaboration between operations, IT, and business.

