The "Kafireas" wind farm built by TERNA ENERGY on the vacation island of Euboea is the largest in Greece to date. The mountainous terrain made construction and on-site operations a challenge. © TERNA ENERGY

A vacation island under power

SPPC ensures grid stability at Greece's largest wind power project

TERNA ENERGY is pursuing ambitious goals in Greece: An increase from today's 1.1 GW of installed capacity from renewable energies to 6 GW by 2029. 17 newly constructed wind farms on the vacation island of Euboea will cover part of this capacity. In future, 330 MW will be transported from there to the mainland via an undersea cable. Bachmann's Smart Power Plant Controller (SPPC) will ensure the required grid stability.

The “Kafireas” wind farm built by TERNA ENERGY is the largest in Greece to date. It comprises a total of 101 wind turbines from Vestas and Enercon, which feed into the grid via three transformer stations. These convert the voltage from 33 to 150 kV and are connected in a star topology. The energy is transported to the mainland in Lavrio near Athens via a 72 km long submarine cable.

To ensure smooth operation in the future, the plant operator wanted to be involved in the implementation and configuration of the grid control solution right from the start: “We do a lot ourselves – from project planning based on many years of wind measurements, environmental studies and licensing to the construction and maintenance of the plants. We support our projects throughout their entire life cycle,” says Dimitrios Karadimos, electrical project engineer at TERNA ENERGY, introducing the plant operator.

Clear decision for the SPPC

TERNA ENERGY opted for the Smart Power Plant Controller (SPPC) from Bachmann for the measurement, control, and protection of the grid. For Dimitrios Karadimos, there was no question about the choice: “From the very first day of working together, we realized that Bachmann was offering a solution that would allow us to have a decisive influence on the process and the outcome of the project. It‘s not a black box that entails future costs every time a small change is made.” The project engineer is convinced that a solution with these advantages is extremely difficult to find in the wind sector.

The positive retrofit experience that Dimitrios Karadimos has had with Bachmann systems in the past, as well as the fact that Vestas also relies on Bachmann hardware for the plant controllers used, have reinforced the decision.

The Smart Power Plant Controller is equipped with reliable and proven hardware and certified controller software. Several hundred energy control systems have been installed worldwide.

User and access management includes a multi-level security concept based on IEC 62443. The Smart Power Plant Controller uses hybrid EZA controllers that are suitable for any type of topology, cascading and communication interfaces. It also supports various energy control functions (active and reactive power control, voltage control) and offers the most common, country-specific grid codes, making it ready for a wide range of users around the world.

Electricity from three plants is combined

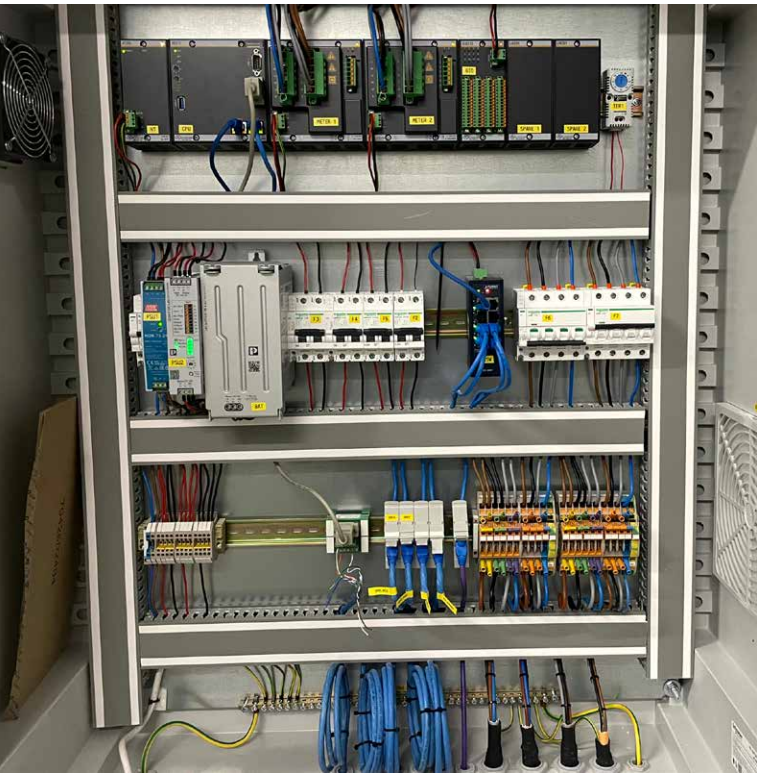
Each of the three substations on the second largest Greek island of Euboea was equipped with a Smart Power Plant Controller, which regulates the wind farms connected to it. A special feature of this project is the distributed grid measurement at the main supply station in Evangelismos. The two other turbines in Omalies and Stavros do not have a direct grid connection. They

Power is fed into the grid from the main supply station in Evangelismos via a submarine cable. The entire energy from all three substations converges here on a double busbar.

are brought together on the busbar in the Evangelismos substation, and the energy is fed into the grid from there. “In order to correctly determine the energy that comes from the wind farms fed directly into Evangelismos, we could not measure at the grid connection point. Otherwise we would have taken the grid sizes of the other two farms into account,” recalls Marius Kaspar, SPPC project manager at Bachmann, recalling the challenges during the planning phase. The certified EZA controller therefore measures the outgoing feeders of the two transformers in the substation in Evangelismos separately using two GMP232 modules and aggregates the determined variables.

Three-step plan

TERNA ENERGY decided to carry out commissioning in three stages, gradually gaining more independence. The controller in Evangelismos was commissioned together with Bachmann experts on site. At the same time, the TERNA specialists were trained on the systems used and efficient implementation processes. “The personal exchange was very helpful. It helped everyone involved to better understand the plant and the systems,” says Dimitrios Karadimos with certainty. At the Omalies station, Bachmann provided remote support for the commissioning



The Smart Power Plant Controller (SPPC) from Bachmann ensures the required grid stability at the largest wind farm in Greece to date.

carried out by TERNA ENERGY. The third controller in Stavros was then commissioned completely autonomously by the operator, with Bachmann only providing selective assistance.

Certified company

Thanks to the VDE-AR-N 4110 and 4120-certified Smart Power Plant Controller, TERNA ENERGY operates the plant park in compliance with the applicable grid connection regulations for electricity generators. “In Greece, the grid operator prescribes German standards. It was easy for Bachmann to understand the requirements and provide us with the necessary documents. That was the deciding factor,” explains the project engineer.

Thanks to the Smart Power Plant Controller, TERNA ENERGY was also able to dispense with a static reactive power compensator for reactive power control. The long submarine cable places a heavy electrical load on the Evangelismos substation. With the Bachmann solution, TERNA ENERGY is nevertheless able to ensure an undisturbed energy flow and stable grid operation. The reactive power can be precisely regulated and the voltage within the TERNA grid can be controlled with the necessary accuracy.

Simple implementation, simple operation

It is generally important for plant operators to be able to quickly understand and easily operate the systems used. This is where the Smart Power Plant Controller comes up trumps: “With the user-friendly interface, we can operate the different technologies of the many wind farms on Euboea in a completely standardized way,” says Dimitrios Karadimos.

TERNA ENERGY also places great value on being able to monitor the wind turbines precisely. To achieve this, the company relies on a higher-level data acquisition system. “Thanks to the many protocols supported by Bachmann, it is ensured that all systems speak the same language. This made it easy to implement the Smart Power Plant Controller in our overall system,” says the engineer happily.

A back up future

TERNA ENERGY always uses the latest technology for its projects. An in-house IT department backs up the highest possible cyber security of the critical infrastructure. “Bachmann‘s solutions offer many security features that we are happy to use.” The entire system is protected via TLS. In addition to encrypted access, a user management system has also been set up. All commands and parameters are logged precisely on the system for 18 months. This means that an exact analysis can be carried out even if the connection from the SCADA system to the controllers is temporarily interrupted.

High goals

All tests with the grid operator were completed by the end of 2023 and the 330 MW have been available to the grid ever since. TERNA ENERGY already has big plans for the future, including with other renewable energy sources. In addition to photovoltaic systems, these also include pumped storage projects. And a convinced Dimitrios Karadimos says: “I don‘t think we‘ve seen the last of our colleagues from Bachmann here.”

FIND OUT MORE:

Smart Power Plant Controller (SPPC)

CONTACT

Michael Backhaus
Manager Business Unit Renewables

P: +49 2381 9568420
info@bachmann.info