

Project Reference

Rahman 400/110kV SSs for connection of up to 4 Windparks

Romania has a big on-shore wind power potential of an estimated 14 GW in the sparsely populated south-eastern Dobrogea region with the counties of Constanta and Tulcea, close to the Black Sea. Investors have made connection requests of 17GW although Transelectrica has only permitted around 2200MW so far. A consortium led by the Austrian transmission operator Verbund including Land Power from Italy and Beta from Romania has realized a 400kV and 110kV station for the connection of up to 4 wind parks. ABB Srl has partnered with the global ABB Engineering Center in Switzerland to support the customer with the supply of a complete SCADA and protection control package including a unique reactive power regulation controller to handle the fluctuating wind power.

Project

The new 400kV station, ultimately owned and operated by Transelectrica, has been connected to the international transmission line between Dobruja (Bulgaria) and Issacea (Romania). It is also the connection point for the wind parks. The 110kV station, owned by the investors' consortium, feeds the wind parks' power via three 250MVA transformers to the 400kV station. Those wind parks can feed up to 700MW into Transelectrica's 400kV transmission network. In order to handle the fluctuating wind power, Transelectrica requires reactive energy contribution for voltage stabilization.

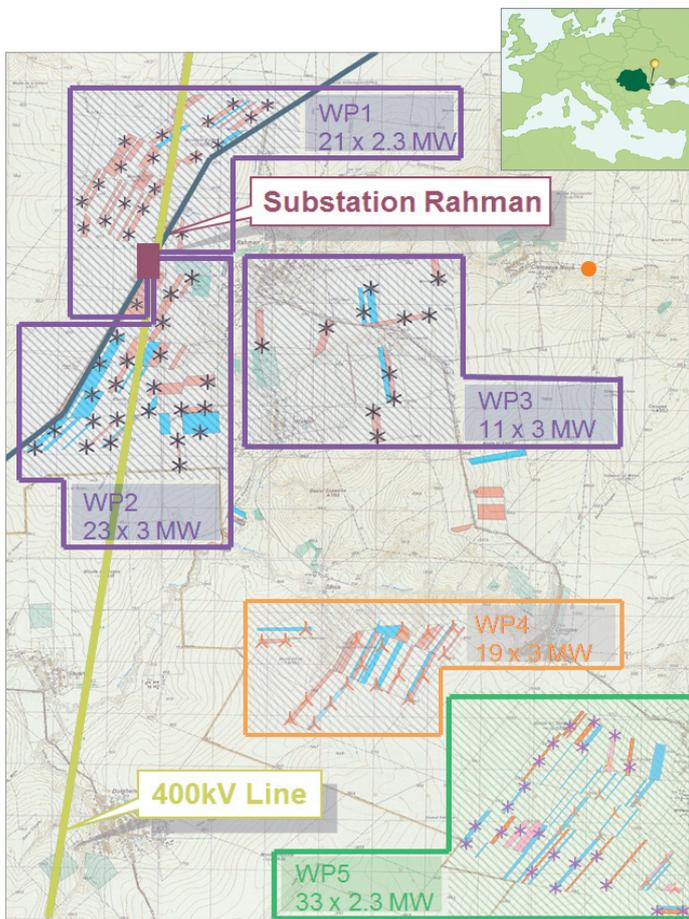
The Investors consortium contracted ABB Srl from Romania to build and supply the two Substations (400kV and 110kV) on a turn-key basis. ABB Srl has partnered with the global Engineering Center in Switzerland to supply the complete Substation Automation and Control & Protection System for both substations. Commissioning this system was executed jointly by the parties. After commissioning in very difficult



weather conditions (the access road was closed several times for up to one week, due to heavy snow fall), in May 2012 ABB and its partners successfully energized both stations connecting the first wind park to the network.

Solution

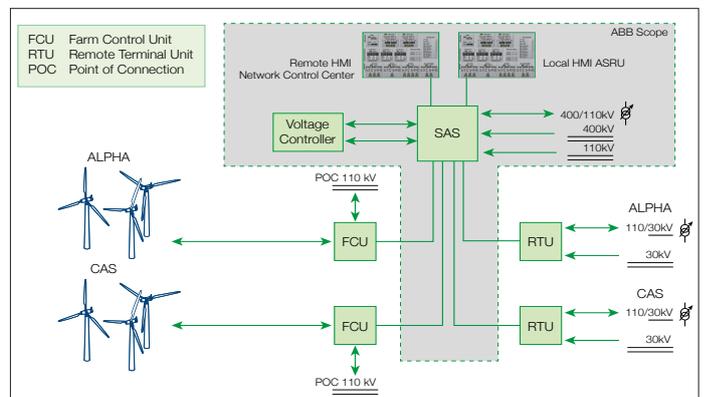
ABB Switzerland delivered two separate modern fully redundant SA systems based on IEC61850 located in each of the two substations. The unique data mirroring functionality allows the two systems to securely exchange data without the need for additional signal mapping. This complex SA system guarantees clear separation of responsibility and data between the two end users (Transelectrica for 400kV and Investors Consortium for 110kV) and realizes a complex authority concept involving several different geographically separated operator computers. On the 400kV station a complete redundancy was realized down to the bay level, with two fully redundant bay controllers per bay duplicating the functionality up to the process level.



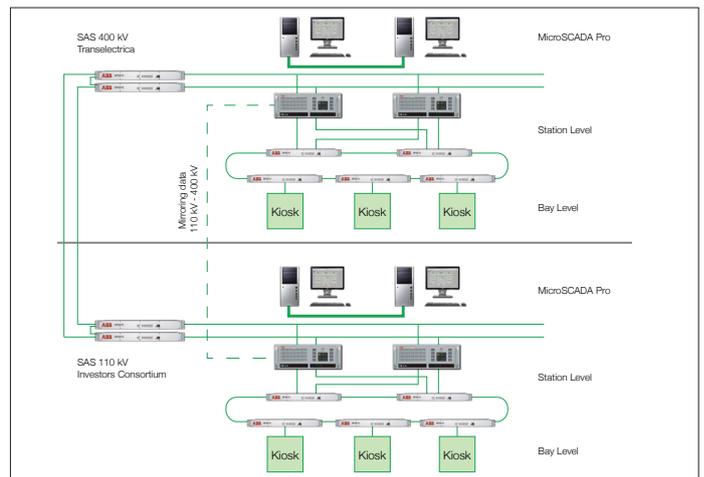
Situation of the wind farms

To deal with the instabilities introduced by fluctuating wind power to the 400kV grid, Transelectrica requires wind parks to contribute to voltage stabilization with reactive energy. Transelectrica's grid code requirement is unique in Europe. To be able to realize this requirement in the required short delivery time of 9 months, ABB Switzerland joined forces with an external partner which had already successfully implemented this requirement in other projects in Romania. The partners jointly realized a Smart Automatic Voltage Regulator (SAVR). ABB Switzerland, with its proven system integrator capabilities, took over the task of integrating communication and control of the various geographically separated systems and devices from different suppliers.

Our partner implemented the control algorithm regulating the voltage in a three-step process. In the first step, voltage is regulated by controlling the reactive power from the wind parks. In the case where this is not sufficient, regulation of the tap changers on 110/33kV transformer stations starts. If this is still not sufficient, tap changers on the 400/110kV transformers start. The tap changer functionality was integrated into ABB's RET670 protection relay. Optimization and certification of the entire SAVR system by an external institute has been successfully accomplished in August 2012. This is a very delicate matter, as dynamic behavior can not only build up between the components under control, but also with voltage control systems running at other wind parks.



SAVR data exchange



Mirroring and communication of the two SAS Systems

Scope of Supply

Equipment	Function
2 x SAS690	Redundant SAS System MicroSCADA Pro
REB500	Distributed Busbar Protection
REC670	Redundant Bay Controller
REL670	Line Protection
RED670	Differential Protection
AFS670	ABB Industrial Ethernet Switches
SAVR	Smart Automatic Voltage Regulator System

Customer benefits

Verbund received a professional solution from ABB, customized to its special requirements. The on-time delivery of the equipment allowed a timely certification and connection permission to be obtained from Transelectrica.

For more information please contact:

ABB Switzerland Ltd

Power Systems

Bruggerstrasse 72
 CH-5400 Baden, Switzerland
 Phone: +41 58 585 77 44
 Fax: +41 58 585 55 77
 E-Mail: substation.automation@ch.abb.com

www.abb.com/substationautomation