

# Combigrid®

Base course reinforcement  
for a wind farm

Project name  
Sălbatica Wind Farm, Romania

Client  
G.E.S. - Global Energy Service

Project developer  
Enel Green Power

Products  
Combigrid® 30/30 Q1 GRK 4 C



 Naue



Romania's Dobrogea region near Tulcea is one of the best places in Europe for the construction and operation of a wind farm. Its open lands possess some of the continent's most dependable, strong winds. In Phases I and II of Sălbatica, 70 2-MW turbines were constructed. The annual production of the site (85.5 million kWh/year) has been enough to power 29,000 homes.

Equally important is the site's reduced carbon footprint. Sălbatica's turbines produce power that, if produced by traditional means, release 48,000 metric tons of CO<sub>2</sub> per year. In the construction of Phase II, 35 2-MW Moline Gamesa G 90 turbines were to be added. The construction logistics involved in this construction are not simple. The towers are 100m high and built of 5 segments that weigh roughly 50 tons each.

For every wind turbine eight transport stages are needed: 5 for the tower segments, 1 for the blades, 1 for the nacelle, and 1 for the propeller axle. Erecting them requires heavy cranes. 750t Liebherr cranes were used, assisted by auxiliary cranes of 150, 200 and 500 tons. Without the aid of reinforcement, just getting the materials and equipment to the proper places on site would be a significant challenge. Site access roads are subject to tremendous loads and must be properly designed and supported.

The existing resilient modulus at the roadway excavation level was 40 - 50MPa. This would not be sufficient to support the designed loads. Approximately 40km of access roads were to be constructed and each turbine would require its own crane hardstanding. Roughly 80 truckloads of crushed stone were delivered each day, and each truck carried 25 to 30 tons of aggregate.

The roads needed to resist 10,000 traffic cycles, and all of the oversized transports meant that additional loads of 65 to 95 tons per truck were regularly on site. Furthermore, the foundations of the wind turbines required another 20 to 80 truck loads of concrete per day. To maximise access, road performance, and survivability, engineers specified the installation of 168,000m<sup>2</sup> of Combigrid® reinforcement geogrids in Phase II.

Combigrid® is a unique reinforcement product that delivers four key geosynthetic functions in one composite material. Naue's patented manufacturing techniques combine the reinforcement strength of a geogrid (Secugrid®) with the filtration, separation and drainage of a nonwoven, needle-punched geotextile (Secutex®). The result is a robust, long-term reinforcement material that significantly improves soil bearing capacity while preventing any mixing of fines that might destabilise heavily-loaded roads.

The placement of a 200mm crushed stone (0 to 45mm) over Combigrid® produced a modulus of 90 - 130MPa. The placement of a second 20cm crushed stone layer (0 to 63mm) obtained a modulus of 130 - 170MPa – more than safe for this design.

The 4.75m wide Combigrid® rolls also made construction more convenient. Greater coverage per roll and easy installation meant a more efficient, more economical process. Less down-time, quicker access. The use of Combigrid® saved time and money and guaranteed immediate and long-term safety and quality.