



Trans-Rupter II® Transformer Protector Model EX Enhances Transformer Protection at Wind Turbine Generation Stations

Customer Problem

A power generation company in the southwest was faced with a dilemma involving their new 160-MW wind generation facilities, comprised of 262 660-kW wind turbines.

The facilities tie into a 36-mile stretch of 138-kV transmission line that supports several oil and natural gas mining fields. The utility which purchases power from the facilities required that the generation company install breaker failure protection for the interconnecting circuit breakers at the two generation substations, which were in turn protecting the substation's 52.4—87.5 MVA 34.5—138-kV step-up transformers. See Figure 1 as well as Figure 3 on page 2.

S&C Solution

Several options were considered, including high-speed grounding switch and direct transfer-trip switching schemes.

The utility would not accept the grounding switch scheme. The direct faults created by the grounding switches would trip the utility remote breakers ... and consequentially interrupt the entire transmission line. This scheme would also take too long to clear faults because of its sequential operation of the line breakers and the local disconnect switch.

The transfer-trip scheme was rejected as well. Its eight-second operating time would take even longer to clear faults than the grounding switch scheme.

And, further, the direct transfer-trip scheme would require a communication system to integrate with the utility's existing line breaker zone distance relay scheme. This would require installing either fiber-optic cable, a microwave communications system, or wave traps for power line communications. Such equipment would well exceed the generation facilities' budget.

Figure 1. 138-kV Trans-Rupter II Transformer Protector Model EX.



Figure 2. 660-kW wind turbines.



S&C's solution provided the wind farm facility the redundant isolation required by the utility at an economical installed cost.



The generation company ultimately chose the S&C Trans-Rupter II Transformer Protector, Model EX as the back-up transformer protective device for each substation. Each transformer protector was connected to the substation's existing control power supply and a breaker failure relay.

If the interconnecting breaker fails to trip for a fault in the wind farm facility, the associated Trans-Rupter II Transformer Protector is tripped by the substation breaker-failure relays ... providing the redundant isolation required by the utility at an economical installed cost. Because the Trans-Rupter II Transformer Protector provides three-cycle interrupting performance, the transmission line will experience only a slight voltage dip (and possibly a single trip-and-reclose operation by the line circuit breakers).

Results

The Trans-Rupter II Transformer Protector's space-saving design made installation simple. Since commissioning, the transformer protectors have provided excellent performance.

Their non-tracking composite-polymer silicone insulation has provided superior dielectric performance in the dusty mesa environment. And the Trans-Rupter II Transformer Protector's 31.5-kA fault-interrupting rating is more than sufficient to handle future increases in available fault current ... a possibility if generating capacity at the wind facility ever increases.

The generation company installed Trans-Rupter II Transformer Protectors at several other substations to provide circuit breaker back-up protection. The generation company is considering the Trans-Rupter II Transformer Protector as an alternative to substation circuit breakers for future wind-generation substation installations.

Figure 3. Single-line diagram.

