

Project Description

Located in Atchison County, Missouri, the Rock Creek Wind project consists of one hundred fifty (150) Vestas V110 turbines, each rated at 2,000 kW for a total wind project size of 300 MW. The project Point of Interconnection (POI) is a new station on the TMO Nebraska City – Mullin Creek – Sibley 345kV transmission circuit. This new station is approximately fifty-eight (58) miles from Nebraska City Substation on the Nebraska City – Mullin Creek line segment and is located in Holt County, Missouri. The performance of the medium voltage (MV) gas-insulated switchgear (GIS) circuit breakers in the Rock Creek Wind project was requested to be evaluated.



Need

EPE evaluated the Transient Recovery Voltage (TRV) and the Rate of Rise of Recovery Voltage (RRRV) and compared it against the GIS TRV/RRRV capability.

EPE utilized the PSS E model of the Rock Creek wind project provided by Ulteig, to build the PSCAD™/EMTDCTM model for this study. EPE performed various fault cases to assess the TRV/RRRV of the MV GIS circuit breakers, feeder circuit breakers as well as the switched shunt circuit breakers. A three-phase symmetric fault was applied at the terminal of the MV GIS circuit breaker both for an upstream, grid side, and downstream, project side, fault.

Results

In conclusion, the MV GIS circuit breakers that were installed at the Rock Creek wind project are not able to withstand the RRRV following a three-phase symmetrical fault on the 34.5 kV bus bar whether the inductive shunts or the capacitive shunts are engaged irrespective of the short circuit level from the grid and irrespective of the grounding grid resistance. A 350 nF surge capacitance, per phase, installed on the medium voltage side of the MPT for MV GIS circuit breakers were found adequate to clear any fault downstream without the risk of a restrike. The feeder breakers were found capable of clearing any fault within their protection zone. Additionally, a suggestion was made to use the HV circuit breakers to clear medium voltage faults until the surge capacitance is installed. The HV circuit breakers TRV reports were found adequate made electronically available to EPE, indicated that the HV circuit breakers will be able to clear the faults at the MV (34.5 kV) side without difficulty for any practical grounding grid resistance.