

Abstract

This paper describes the analysis of a 161kV capacitor bank residual overcurrent scheme misoperation. Information available included local relay target indication, a digital fault recording from the local DFR, and system dispatcher logs. The dispatcher logs indicated that a 500kV intertie transformer bank one station away had been briefly energized with one phase on the wrong voltage tap. This occurred simultaneous with the 161kV capacitor bank misoperation. The Mathcad¹ (software by Mathsoft Inc.) environment was used to help determine why the zero sequence voltage supervised residual overcurrent (GE SFC) operated. The analysis and subsequent field-testing point out the vulnerability of this protection scheme to harmonic energy and therefore its misapplication to capacitor bank protection. Six months later this same scheme installed at five different substations (separated by hundreds of miles) operated on harmonic energy produced by a different mechanism, geomagnetically induced current. The MATHCAD files developed for this analysis are included in the appendix of this paper.

Abstract Correction

It was intended that a DFR shot of the Davidson capacitor bank misoperation be analyzed as part of this paper. Subsequent to the completion of this paper it was discovered that the shot in hand was not associated with this misoperation. In lieu of processing the actual shot the same methods (in Mathcad) will be demonstrated on another shot in hopes of being beneficial to some engineer in the future.

¹ Mathcad by Mathsoft, Inc. <http://www.mathcad.com/>