

Forward to the Basics: Selected Topics in Distribution Protection

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Abstract

Modern relays allow for the application of protection elements that historically were not used. These new elements can provide improved protection for the power system. However, protection engineers may be unfamiliar with the behavior of these elements and may make settings choices that lead to unintended consequences. At the same time, engineers must continue to properly employ good settings practices long established for more traditional elements.

Through analysis of event reports recorded by relays, this paper presents several examples of settings that led to unintended operation of distribution protection, including transformer delta-winding residual overcurrent protection, transformer high-voltage phase overcurrent protection, and others. The nature of the unintended operations will be explored, and methods for calculating more secure settings will be discussed.

Discussion Points

1. Modern relays offer many protection choices, and protection engineers may not be familiar with how some elements behave. This can lead to settings choices that produce misoperations.
2. With increasing capabilities comes increasing complexity. In some cases, the need to follow long-standing basic rules of protection seems to have been forgotten, perhaps due to the number of choices that protection engineers must now make.
3. This paper will review real events to demonstrate some things to consider when setting these elements and will present recommendations to improve the settings to avoid unintended operations.