

## Protection System Mis-operations: Fundamental Concepts and Learning from Indian Power Sector

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**Abstract :** Protection system is an essential feature of the electrical system which helps in detection and removal of faults. Protection system consists of many subsystems like relays, circuit breakers, instrument transformers, auxiliary DC system, auxiliary relays etc. Although the fundamental protective and relay operating concepts are similar throughout the world, there are very significant differences in their implementation. These differences arise through different traditions, operating philosophies, experiences and national standards. Protection system mis-operation due to problem in one or more of its subsystem or inadequate knowledge of numerical relay settings and configuration are very common throughout the world. Protection system mis-operation leads to unstable and unreliable grid operation. In this paper we will discuss about the fundamental concepts of protective relaying and the reasons for protection system mis-operation due to one or more of its subsystems. Many real-world case studies of protection system mis-operation from Indian power sector are discussed in detail in this paper.

**Keywords :** auxiliary trip relays, bus zone, check zone, CT saturation, dead zone protection, DC ground faults, DMT, DR, end fault protection, instrument transformer, SOTF, STUB

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