

# Introduction to protection system and its elements

Power system protection is the process of making the production, transmission, and consumption of electrical energy as safe as possible from the effects of failures and events that place the power system at risk. It is cost prohibitive to make power systems 100 percent safe or 100 percent reliable.

Risk assessments are necessary for determining acceptable levels of danger from injury or cost resulting from damage. Protective relays are electronic or electromechanical devices that are designed to protect equipment and limit injury caused by electrical failures. Unless otherwise noted, the generic term relay will be synonymous with the term protective relay throughout this text.

Relays are only one part of power system protection, because protection practices must be designed into all aspects of power system facilities. Protective relays cannot prevent faults; they can only limit the damage caused by faults.

A fault is any condition that causes abnormal operation for the power system or equipment serving the power system. Faults include but are not limited to: short- or low-impedance circuits, open circuits, power swings, overvoltages, elevated temperature, off-nominal frequency operation

Power system protection must determine from measurements of currents and/or voltages whether the power system is operating correctly. Three elements are critical for protective relays to be effective: measurements, data processing, and control.