How to handle TV disconnection relay protection

Article Overview

TV (voltage transformer) disconnection can cause relay protection malfunctions, but proper coordination with distance protection and backup schemes ensures system reliability.

Impact of TV Disconnection on Relay Protection

When a voltage transformer (TV) disconnects, the secondary voltage signal becomes abnormal, which can lead to incorrect relay operation or misoperation of automatic devices. For example, in a 110 kV substation, a TV disconnection caused the relay to trip a circuit breaker unnecessarily, while other substations did not detect a fault, indicating a false operation of the protection system . Such events can compromise system stability and selectivity, potentially affecting large portions of the network if not properly managed .

Protection Criteria and Alarm Settings

Different protection devices implement TV disconnection detection with specific criteria:

o RCS985: Triggers a 10-second delay alarm if positive sequence voltage drops below 30 V or negative sequence voltage exceeds 8 V .
o BP2B: Compares generator terminal voltages from two TV sets; a 0.2-second delay alarm is triggered if differences exceed thresholds .
o RCS931 and CSC103/125A: Use three-phase voltage sums and phase-specific thresholds to issue alarms with delays ranging from 1.25 to 12 seconds . These alarms do not necessarily trip the line immediately but provide a warning to operators, allowing coordination with distance or differential protection.

Coordination with Distance Protection

To prevent unnecessary tripping, TV disconnection is often used as an auxiliary input to distance protection logic. When the line is healthy, the protection outlet can be blocked to avoid false trips . Simulation studies using PSCAD/EMTDC have shown that integrating TV disconnection logic with distance protection improves reliability and prevents misoperation . Modern IEDs like REL670 provide flexible distance protection for transmission lines, allowing independent zone settings and communication with remote ends to maintain selectivity even during TV disconnection .

Backup and Redundant Protection

For high-voltage networks, backup protection ensures that even if a primary relay is affected by TV disconnection, the fault can still be cleared. For example, in a 110 kV network, primary protection disconnects

faults within 0.1 seconds, while backup protection operates within 0.5 seconds, ensuring reliability and selectivity . Redundant schemes, such as duplicated protection devices or backup protection in adjacent substations, further enhance system security.

Practical Recommendations
o Implement TV disconnection detection alarms with appropriate delay settings to avoid false trips.
o Coordinate TV disconnection logic with distance or differential protection to block unnecessary operations.
o Use simulation tools to verify protection logic under TV disconnection scenarios.
o Maintain backup protection and redundant schemes to ensure fault clearance even if a TV is disconnected.
o Regularly test and monitor protection devices to ensure correct operation under abnormal conditions. By following these practices, power systems can maintain stability, selectivity, and reliability even in the event of TV disconnection.

A protection relay is a crucial component of electrical systems that safeguard infrastructure, employees, and

A fast and selective arc fault mitigation for air-insulated LV & MV switchgear and Relion protection and control relays and sensor

Protective relays are arguably the least understood component of medium voltage (MV) circuit protection. In fact, somebelieve that

Preface This course is one of a series of five courses on the design of relaying and system protection programs for electric utilities.

The protective relays act only after an abnormal or intolerable condition has occurred, with sufficient indication to

Traditionally, protective relays were electromechanical devices utilizing induction disk, coils, contacts, and solenoid elements to

Twitch.tv: How to Enable Disconnect Protection Twitch.tv, the leading live streaming platform primarily focused on

BP2B TV Disconnection: When the generator terminal voltages from two sets of TV differ by more than 5V for phase-to

But electronic circuits need protection from negative transients that occur when turning off of an inductive load. An input-side TVS

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Learn everything you need to know about protective relays, the essential devices used to

The most important requisite of the protective relay is reliability since they supervise the circuit for a long time before a

Introduction Relay systems protect high-voltage equipment and transmission lines to ensure safe, stable systems. Although failure of

Abstract: Protective relays and devices have been developed over 100 years ago to provide "last line" of defense for the electrical

Protective relays are vital for safeguarding power systems, ensuring protection against faults and abnormalities. This

In the transmission line model of this simulation, the protection device needs to have a TV disconnection check function, but when a

ection DC Coils: The most effective protection against transients from a DC coil is. a flyback diode. A flyback diode can reduce the

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