Examples of Selectivity in Relay Protection

Overview

The scope of study involves calculating the settings for protective relays to achieve selectivity during faults ocurring in the electrical network for the 13.8 kV and 4.16 kV projects.

Key Takeaways

Selectivity in relay protection ensures that only the faulty section of a power system is disconnected, minimizing the impact on the rest of the network.

Definition and Importance

Selectivity, also known as discrimination, is a fundamental requirement in power system protection. It ensures that only the circuit breaker closest to the fault operates, leaving upstream and parallel sections operational. This prevents unnecessary outages, reduces equipment stress, and maintains system stability.

In medium voltage networks, unselective operation may inconvenience consumers, while in high voltage or national grid systems, it can trigger widespread blackouts by disconnecting multiple generators and feeders unnecessarily. Methods to Achieve SelectivityTime-Graded ProtectionTime grading involves setting relay operating times so that the relay nearest the fault trips first. This can be implemented using: Definite time relays: operate after a fixed time regardless of fault current magnitude.

Inverse time relays: operate faster for higher fault currents, making them suitable for radial networks where fault current varies along the feeder.

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Current-

Graded Protection

Current grading adjusts relay settings based on fault current magnitude, ensuring that downstream relays trip for lower currents while upstream relays respond only to higher currents. Combining time and current grading enhances selectivity, especially in complex networks.

Zone and Backup Coordination

Relays are coordinated in primary and backup zones. The primary relay closest to the fault trips first, while upstream relays act as backups with a time delay. This ensures that if the primary relay fails, the fault is still cleared without affecting the entire system.

Practical Considerations

Relay Settings: Must account for normal load currents, transient phenomena, and fault current levels. For example, medium voltage ground fault relays may be set between 10–40 A, with time delays to avoid false trips during inrush currents.

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C Standards: IEC 60255 and IEC 60947 provide guidelines for relay coordination, defining time-current curves, selectivity criteria, and grading margins to ensure reliable and interoperable protection. Network Type: Radial networks benefit from inverse time relays, while meshed or complex networks may require distance or differential relays for selective operation.

Benefits of Selective Protection

Minimizes outage areas and service interruptions. Protects equipment by isolating only the faulted section. Enhances system stability and reliability.

Reduces operational and maintenance costs by preventing unnecessary trips. In summary, relay selectivity is achieved through careful coordination of time, current, and zone settings, guided by standards and network characteristics. Properly implemented, it ensures fast, reliable, and safe fault isolation while maintaining maximum system availability.

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Article Content

Relay Coordination Study: Selectivity Calculations | EEP

The scope of study involves calculating the settings for protective relays to achieve selectivity during faults ocurring in the electrical network for the 13.8 kV and 4.16 kV projects.

Strategies for Selectivity in Relay Protection Systems

Strategies for selectivity in relay protection systems are approaches used to ensure that only the faulty section of a power system is disconnected during a problem, keeping the rest of the...

Relay Protection: Scheme Design And Coordination

For example, feeder protection in a radial system prioritizes selectivity and coordination, while protection in meshed or looped systems may require directional elements and more complex decision logic.

Selectivity and sensitivity of overcurrent relay protections

The paper discusses the conditions for setting the overcurrent protection and how they determine the sensitivity and selectivity of these protection in medium voltage power grids.

Power System Protective Relays: Principles & Practices

Protective relays and devices have been developed over 100 years ago to provide “lastline”of defense for the electrical systems. They are intended to quickly identify a fault and isolate it so the balance of

Practical Guide to Selective Protection Coordination

Selective coordination refers to the strategic arrangement and setting of protective devices (such as circuit breakers, fuses, and relays) within an electrical system to ensure that only the device closest

Four ways of ensuring proper selectivity in MV/HV electrical ...

Selectivity study of a power system is usually considered as an advanced job for advanced engineers, mostly relay protection engineers. This article will try to get close to a few important

Selectivity, Back Up Protection and Coordination Guide

A guideline for the method of establishing selectivity between devices is provided by a desk study but short-circuit protection and back-up protection of a circuit breaker using an SCPD (Short Circuit

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Achieving Relay Coordination and Selective Short

Relay Coordination & Selective Protection The selected protection principle affects the operating speed of the protection, which has a significant

Four ways of ensuring proper selectivity in MV/HV

The essentials of proper selectivity Selectivity study of a power system is usually considered as an advanced job for advanced engineers, mostly relay

Power System Protection with Digital Overcurrent Relays

One example is the work of the author, Sree Lakshmi Vineetha Bitragunta, a power system protection engineer. Her experience includes system modeling, relay coordination, short

How Does Selectivity Work In Relay Protection Systems?

Ever wondered how power systems prevent widespread outages when faults occur? In this video, we explain the principles behind selectivity in relay protection systems.

Philosophy of a good relay protection settings for machines and ...

Relay protection objectives The objectives of the protection system are: to limit damage to people and to the plant, permit different service conditions, guarantee maximum service continuity for

Basic protection relay knowledge

Selectivity Selectivity is a mandatory requirement for all protection, but the importance of it depends on the application. For example, unselective protection operation during a medium voltage network fault

Power System Selectivity

Power System Selectivity: The Basics Of Protective Coordination By Gary H. Fox, PE, GE Specification Engineer The intent of this article is to provide a brief primer about the essence of coordinating the

Distribution Automation Handbook

The selectivity diagram is a set of specific time/current curves which shows all the time/current curves, that is, the operating characteristics of the relays of the concerned chain of protection relays.

doi: 10.1007/978-3-319-20919-7_3

Perform power system simulations of selected faults and observe how a given protection principle (overcurrent, impedance, and differential) works. Set the relays for a given power system. Verify by

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(PDF) ANALYSIS OF COORDINATION AND SELECTIVITY BETWEEN PROTECTION ...

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