

Article Overview

Relay protection systems are designed to detect faults and isolate affected sections, but the Kinshasa outage highlights challenges in extreme weather and aging infrastructure.

Overview of the Incident

On May 13, 2026, a lightning strike caused a high-voltage power cable to snap in Kinshasa, leading to 26 fatalities and multiple injuries, as the cable fell on houses and a market . This event triggered a major power outage, affecting a large portion of the city due to the disconnection of the faulted line. The incident underscores the vulnerability of the Congolese power grid, which suffers from outdated infrastructure and insufficient adherence to urban planning regulations .

Role of Relay Protection

Protective relays are intelligent devices that monitor electrical quantities such as current, voltage, and frequency to detect abnormal conditions like short circuits, overloads, or voltage imbalances . When a fault occurs, relays initiate the tripping of circuit breakers to isolate the affected section, preventing damage to equipment and minimizing the impact on the rest of the network . In high-voltage networks, selectivity is critical: only the breakers closest to the fault should trip to avoid a system-wide blackout .

Challenges in the Congo Outage

The Kinshasa outage illustrates several challenges for relay protection:

- o Extreme weather conditions: Lightning strikes can cause sudden high-current faults that may exceed relay settings or response times .
- o Aging infrastructure: Old cables and poorly maintained lines increase the likelihood of mechanical failure, complicating fault isolation .
- o Coordination issues: Inadequate relay coordination can lead to multiple breakers tripping unnecessarily, potentially causing wider outages .

Strategies for Improved Protection

Modern approaches to relay protection, especially under extreme conditions, include:

- o Intelligent numerical relays: Microprocessor-based relays provide fast, accurate fault detection and event recording, improving system reliability .

Relay Protection During the Congo Power Outage

- o Multi-level differential and directional schemes: These strategies enhance selectivity and ensure only the faulted section is disconnected .
- o Adaptive settings for extreme weather: Adjusting relay thresholds and response times during storms or high-risk periods can prevent unnecessary tripping .
- o Regular maintenance and infrastructure upgrades: Replacing aging cables and ensuring proper urban planning under high-voltage lines reduces the risk of accidents .

Conclusion

The Congo power outage demonstrates the critical importance of relay protection systems in safeguarding both human life and electrical infrastructure. While relays are designed to isolate faults quickly, their effectiveness depends on proper coordination, modern technology, and resilient infrastructure. Implementing intelligent relay strategies and upgrading the grid can significantly reduce the impact of extreme events like lightning strikes, preventing both widespread outages and casualties .

Introduction to Protective Relaying What are Protective Relays, or Protection Relays? Protective relays are used in industrial power

Protective relays are essential in power systems to detect faults, isolate problem areas, and prevent widespread

Developing and applying intelligent relay protection systems has become an important way to improve the safety and reliability of

Learn how protective relays detect faults, trip breakers, coordinate protection zones, and protect feeders,

The protective relay market in Congo is growing in line with the expansion of the energy and utilities sectors. As the country's power

Focusing on directional overcurrent relays, the study examines optimization-based methods for tuning key relay

Effective relay protection in HV/MV substations requires a thorough approach encompassing calculations, precise

Introduction to relay protection Protection is the branch of electric power engineering

Protection Relay Testing Protection relays play a key role in modern energy systems. Therefore, they must

Relay Protection During the Congo Power Outage

The objective of the protection coordination study is to verify that all protective equipment in the system such as relays, breakers,

Protective relaying systems stand guard over the power grid, watching for faults and disturbances, and making

Avoid devastating outages and maintain business continuity with a power outage

Regular testing and maintenance of protection relays are essential to verify their proper operation, detect faults, and

This chapter first introduces the basic theories of power system relay protection, summarizes the functions and basic requirements of

Protective relays in power systems In this technical article, protective relays are categorized depending on the

Primary Protection Relays: These relays are the first line of defense and are installed to protect specific equipment or sections of the

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