СЕКЦІЯ XI.
ЕНЕРГЕТИКА ТА ЕНЕРГЕТИЧНЕ МАШИНОБУДУВАННЯ

SWITCHING CONTROL AND ITS IMPACT ON THE STABILITY OF ELECTRIC POWER SYSTEMS

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Switching management is a key aspect of modern electrical power systems, as it affects their reliability and stability. Let's delve into an important aspect of power transmission, encompassing various facets of switchgear management. The seamless and effective supply of electrical energy to consumers hinges on understanding this concept and its impact on system operations.

Switching management is a technique in electrical engineering used to control processes during the connection and disconnection of electrical lines, devices, or systems. Its primary goal is to prevent or mitigate the adverse effects of switching operations, such as switching surges and aperiodic currents.

Research has shown that the utilization of switching management can prevent the occurrence of aperiodic current components and limit switching surges when three-phase cable lines are energized. This is crucial for ensuring the reliability of electrical power systems since switching surges can damage equipment and disrupt the normal functioning of the system.

Key elements of switching management include:

Switching Delay (Closing and Opening Delay): This may involve delaying the time it takes to connect (or disconnect) connected equipment or lines to the power source. Delay helps reduce the steepness of voltage and current changes during switching [1, 2].

Phase Synchronization: In the case of three-phase systems, it can be crucial to synchronize phases when energizing three-phase lines or equipment. This helps maintain balance in currents and voltages within the system [3, 4].

Parameter Analysis and Control: Various sensors and monitoring systems are used to measure current, voltage, and other parameters to ensure control over switching processes and system reliability [5].

Control of Relays and Switches: It is essential to have the ability to control relays, switches, and other electrical devices to carry out necessary switching operations in accordance with calculations and requirements [6].

Logic and Control Algorithms: Software algorithms and logical circuits are used to make decisions regarding switching operations based on measurements and calculations [7].

The primary goal of switching management is to ensure equipment safety, reduce the impact of switching surges, prevent the occurrence of aperiodic currents, and maintain the stable operation of electrical systems. Switching management can be especially critical in high-voltage systems and critical applications where reliability and safety are paramount [8].

Switching management is a crucial aspect of power system management and control, especially when energizing three-phase cable lines. The discussed aspect can be applied to enhance the reliability and safety of the system, making it an integral component of modern electrical engineering practices [9, 10].

The methods presented allow for the selection of optimal conditions for controlled switching, which can be applied in the design and development of switching nodes. Using controlled switching to mitigate unwanted transient electrical processes during planned transitions is of significant importance.

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