35kV busbar grounding protection

Article Overview

A 35kV busbar is typically grounded through a neutral point connection, often using an arc suppression coil (Petersen coil) to limit fault current and detect single-phase-to-ground faults.

Neutral Grounding Approaches

For 35kV distribution busbars, the neutral point can be grounded in several ways:

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Solid (metallic) grounding: The neutral is directly connected to ground, resulting in high fault currents during a ground fault. This method allows fast fault detection but can stress equipment. In a solid ground fault, the faulted phase voltage drops to zero, while the other two phase-to-ground voltages rise by ?3 times, and the busbar issues a grounding alarm .

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Resonant grounding using an arc suppression coil: A Petersen coil is connected between the neutral and ground to compensate for the capacitive current of the system. This limits the ground fault current to a low value, reducing equipment stress and arc flash hazards. The coil carries a current equal to the compensation current corresponding to its tap setting, and a "busbar grounding" signal is generated when a displacement voltage occurs .

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Low-resistance grounding: A resistor is inserted between the neutral and ground to limit fault current to a safe level while allowing sufficient current for protective relays to operate. This method is less common in 35kV distribution systems but may be used in specific industrial applications .

Fault Detection and Protection

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Voltage transformers (VTs) monitor phase-to-ground voltages. During a single-phase-to-ground fault, the VT indicator for the faulted phase dims, while the other two brighten, and the 3V0 output can be used to detect the fault .

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Relay protection schemes include overcurrent-based interlocking, differential protection, and high-impedance or percentage differential protection. These relays detect abnormal currents or voltage displacements and trigger alarms or circuit breaker operations .

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SCADA integration allows remote monitoring and trial switching to isolate the faulted line while maintaining service to healthy sections. Critical users are notified before switching, and the arc suppression coil is monitored to prevent overheating .

Operational Considerations

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When a ground fault occurs, the busbar may issue a grounding alarm. Operators inspect the substation equipment, check the arc suppression coil current and temperature, and identify the faulted line using small-current fault line selectors or visual inspection .

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Faulted equipment should be isolated promptly, typically within 2 hours, to prevent escalation into phase-to-phase faults and to protect the arc suppression coil .

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In systems with parallel busbars, busbar switches can be opened or closed to decouple sections and identify the fault location based on voltage changes .

Summary

The 35kV busbar grounding method primarily relies on connecting the neutral to ground, often through an arc suppression coil to limit fault current and facilitate detection. Protective relays, VTs, and SCADA systems work together to monitor, detect, and isolate ground faults efficiently, ensuring system stability and safety while minimizing equipment damage and arc flash hazards .

Grounding Busbars & Supports Protect your people and equipment during fault and transient conditions with nVent ERICO

Discover the Ultimate Solution for Medium Voltage Surge Protection - YF POWER"s Cutting-Edge 35KV

Content and types of busbar systems A busbar system usually contains couple of busbar holders, busbars,

The 21.1/36.6 kV three-phase rating bushing should not be used with 21.1 kV single-phase rated loadbreak elbow connectors or

The protection arrangement for an electrical system should cover the whole system against all possible faults. Line protection

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The Chardon 900A 15/25 kV & 35 kV Grounded Standoff Bushings comply with the latest IEEE/ANSI 386

Due to the vast number of substations at the distribution level and increased costs of differential busbar protection,

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Harger offers a comprehensive grounding and bonding product line with grounding busbars, conductors, mechanical grounding

The main purpose of using neutral resistor grounding for the 35 kV substation system is to limit system overvoltage

GE Multilin provides protective relays that support all busbar protection techniques, including overcurrent, high-impedance

Grounding bars and terminal grounding bars: Multi-tap bars that centralize earth bonding within enclosures, simplifying grounding

IEC Standard for Busbar Clearance explained with IEC 61439 requirements, minimum

Single-Phase-to-Ground Fault: The substation and SCADA system will issue signals such as "35kV busbar grounding" or "Arc

Frame-ground protection systems have been in service for many years, mainly related with smaller busbar protection configurations

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