

Effect of Charging Current on Protection of Transmission Line Cables

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Abstract: High and extra high voltage transmission lines draw a charging current proportional to the line voltage, frequency, and capacitance value between line and earth. The charging current also increases with line length. If differential relays for line current don't compensate for this charging current, they will interpret it as differential current that can cause the implemented differential protection scheme to malfunction. Line current differential relays offer charging current compensation techniques for safe transmission line protection. When the system contains long transmission overhead lines or underground cables, the effects of the charging current must be taken into account. Normal system operation and system transients both may be affected by it. In the steady state, the charging currents can be almost equal in each phase because of the symmetry of the line impedances. As a result, the zero and negative sequence components will be minimum, which is advantageous when using relays that operate using sequence components. But, the charging current value will deviate from steady-state values during line energization, internal faults, and external faults for transmission lines. This paper shows how to calculate charging current and determine whether compensation is recommended for a protected transmission line for different scenarios..

Keywords: high voltage transmission.