

Analysis of Electrical Power Transmission System in the State of Goa (India)

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Abstract:

The reliability of any power transmission system is critical for ensuring uninterrupted supply and maintaining grid stability. It is essential to know power flow and fault levels in the system for safe and stable operations under normal and contingency conditions. This paper presents a case study carried out for determination of power flow, fault analysis and relay coordination on all 220 kV buses and 110 kV buses of Goa state electricity network. The study is performed using Electrical Transient Analyzer Program (ETAP), widely accepted power system analysis software to model and simulate network behaviour accurately. Seven major EHV stations, namely at Thivim, Amona, Ponda, Xeldem, Cuncolim, Kadamba and Verna were modelled to understand load flow and fault analysis in the network for different loading scenarios. The load flow analysis ensures bus voltages and line losses remain within acceptable limits as prescribed by the Indian Electricity Grid Code (IEGC). Comprehensive fault analysis is done for three-phase and single line-to-ground to determine fault current levels at various nodes. These results are important for evaluating switchgear rating requirements and verifying adequacy of existing equipment. The analysis carried out facilitates proper coordination of relay settings, which is necessary for selective fault detection and rapid isolation of faulty sections. This coordinated protection scheme enhances system reliability, minimizes outage areas and maintains overall stability of the Goa power grid during disturbances. This power flow or load-flow studies can be utilized for planning future expansion of Goa state network with integration of renewables in the system.

Keywords:

Power flow, fault analysis, system stability, relay coordination.