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Title of Abstract:

Comparison between high impedance and low impedance bus differential protection

Authors:

Dr. Juergen Holbach, Siemens PT&D Address: Siemens Rd, Wendell 27951, NC Phone: 919 365 2175 E-mail: juergen.holbach@siemens.com

Speaker, Company (if known)

Abstract (not to exceed 300 words)

High impedance bus differential relays are used on most of the busses in North America. The popularity can be explained by the good performance of this scheme in relation to CT saturation and the low cost, if used on a simple bus system. However with the introduction of numerical relays and their low burden for CT's as well as their ability of measuring several feeder currents, a low impedance bus differential principle could be applied on simple busses also. In addition, the availability of fiber optic communication inside of the substation allows the use of a decentralized bus system in which the CT values become transmitted via communication to a centralized unit versus having CT wires running to the control house. Low impedance bus differential protection systems have many positive attributes. Common advantages of all low impedance bus protection schemes is, the ability to be able to use CT's of different ratios on respective branch inputs and the fact that the same CT used for the bus protection can be shared with the feeder protection relay. The question needs to be discussed what selection criteria needs to be evaluated for the selection of the appropriate principle. The paper will give an overview on both principles and explain the difference in building and evaluating of the differential current. In detail the effect of CT saturation during an external and internal fault becomes discussed for both schemes and CT requirements are defined. Some advanced numerical techniques employed in low impedance bus differential relays to recognize CT saturation on heavy through-faults and avoid false tripping are presented. Common guidelines for setting both principles will be reviewed and explained in detail and some examples will be shown. Also discussed will be the influence of the complexity of the bus system on the selection. Benefits and disadvantages of both systems will be compared. The comparison will also include the difference during the installation, commissioning, service and the maintenance phase of the different systems. The evaluation will be done from a point of view of an engineer as well as from an accountant.

Dr. Juergen Holbach
Siemens PT&D
919 365 2175
E-mail: juergen.holbach@siemens.com