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IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems, Part III—Generator Auxiliary Systems

IEEE Power and Energy Society

Sponsored by the
Surge Protective Devices Committee

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Abstract: Basic factors and general considerations in selecting the class and means of neutral grounding for electrical generating plant auxiliary power systems are given in this guide. Apparatus to be used to achieve the desired grounding are suggested, and methods to specify the grounding devices are given. Sensitivity and selectivity of equipment ground-fault protection as affected by selection of the neutral grounding device are discussed, with examples.
Keywords: electrical generating plants, electrical utility systems, generator auxiliary systems, ground-fault protection, grounding, IEEE C62.92.3™, neutral grounding

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Introduction

This introduction is not part of IEEE Std C62.92.3-2012, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems, Part III—Generator Auxiliary Systems.

This guide is a part of a series of standards on neutral grounding in electrical utility systems. When the series was first approved and published, it replaced IEEE Std 143™-1954, IEEE Guide for Ground-Fault Neutralizers, Grounding of Synchronous Generator Systems, and Neutral Grounding of Transmission Systems. In this series of documents, individual considerations and practices have been given to the grounding of synchronous generator systems, generator-station auxiliary systems, and distribution systems.

IEEE Std 143™-1954 is a revision of AIEE No. 954, October 1954, which was a compilation of the following three AIEE Transaction papers:

— AIEE Committee Guide Report, "Application of Ground-Fault Neutralizers," *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 183-190, April 1953.

— AIEE Committee Report, "Application Guide for the Grounding of Synchronous Generator Systems," *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 517-530, June 1953.

— AIEE Committee Report, "Application Guide on Methods of Neutral Grounding of Transmission Systems," *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 663-668, August, 1953.

The contents of Part I through PartV of the revision of IEEE Std 143™-1954 are based on the foregoing documents but are amplified and updated with new material from the IEEE tutorial course "Surge Protection in Power Systems" (79EH0144-6-PWR) and other sources.

In Part I through Part V of this series, emphasis is on power system grounding practices as contrasted with the grounding, for example, of industrial systems, which is covered in other guides and standards. These guides and standards should be referenced, when appropriate, to gain a full picture of other grounding practices.

It is impossible to give recognition to all those who have contributed to the technology and practices of grounding of power systems, since work involving the preparation of this guide has been in progress for more than 30 years. However, the assistance of members, past and present, of the Neutral Grounding Devices Subcommittee of the Surge-Protective Devices Committee, and other similar groups with comparable purposes, should be acknowledged.

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IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems, Part III—Generator Auxiliary Systems

1. Overview

1.1 Scope

The scope of this project is to summarize the general considerations in grounding of generating station auxiliary power systems, the factors to be considered in selecting between the appropriate grounding classes, and specifying equipment ratings. This guide applies to both medium-voltage (1 kV-15 kV) and low-voltage (less than 1 kV) auxiliary power systems. The intent of this guide is to discuss grounding methods which may be used to limit equipment damage. The emphasis is on reliability and availability of auxiliary power system service, achieved through control of ground-fault currents and transient overvoltages.

1.2 Purpose

The purpose of this guide is to present some basic considerations for the selection of neutral grounding parameters that will provide for the control of ground-fault currents and overvoltage on auxiliary systems of electrical utility three-phase generators. The purpose of this revision is to update 5.3 with current