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

IEEE Power and Energy Society

Sponsored by the
Surge Protective Devices Committee

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Abstract: The basic factors and general considerations in selecting the class and means of neutral grounding for synchronous generator systems connected to electrical utility systems are provided in this guide. It also provides the suggested methods and apparatus to be used to achieve the desired grounding. These guidelines apply to both large and small generators found in electrical utility systems. Definitions of grounding terms used in this the guide can be found in IEEE Std C62.92.1™-2000.

Keywords: electric utility systems, IEEE C62.92.2™, mechanical stress in generators, neutral grounding, overvoltages on generator insulation, synchronous generators, unit-connected generation systems

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Introduction

This introduction is not part of IEEE Std C62.92.2-2017, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems, Part II—Synchronous Generator Systems.

This document is one part of a five-part series of guides on the subject of electric utility system neutral grounding practices. 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, distribution systems, and transmission systems.

The first part serves as an introduction to the topic of electric utility system neutral grounding and each of the remaining four parts addresses a specific part of the utility system to serve as a guide for neutral grounding. The five parts are as follows:

a) IEEE Std C62.92.1, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part 1—Introduction.

b) IEEE Std C62.92.2, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part II—Grounding of Synchronous Generator Systems.

c) IEEE Std C62.92.3™, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part III—Generator Auxiliary Systems.

d) IEEE Std C62.92.4™, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part IV—Distribution Systems.

e) IEEE Std C62.92.5™, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part V—Transmission and Subtransmission Systems.

This series of guides is intended for application to three-phase electric utility systems. They provide definitions and considerations that are general to all types of neutral grounding for electrical utility systems as well as the basic considerations of the selection of neutral grounding parameters that will provide for the control of overvoltage and ground-fault current on all parts of the three-phase electric utility system. They are not intended to be used, for example, with the grounding of industrial systems, which are covered in other guides and standards. These guides and standards should be referenced, when appropriate, to gain a complete picture of other grounding practices.

This document has been revised to address comments received as part of the most recent re-affirmation ballot. The most significant changes were to add a discussion of unit-connected generator systems with a breaker at generator voltage and a disclaimer related to industrial generating systems. Many of the comments were editorial in nature and have been addressed.

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 II—Synchronous Generator Systems

1. Overview

1.1. Scope

The scope of this document is to provide the basic factors and general considerations in selecting the class and means of neutral grounding for synchronous generator systems connected to electrical utility systems. It also provides the suggested methods and apparatus to be used to achieve the desired grounding. These guidelines apply to both large and small generators found in electrical utility systems. Definitions of grounding terms used in this the guide can be found in IEEE Std C62.92.1.

1.2 Purpose

The purpose of this guide is to provide the user with insight on the basic factors and general considerations in selecting the class and means of neutral grounding for synchronous generator systems connected to electrical utility systems. It also provides guidance on the selection of particular methods and apparatus to be used to achieve the desired neutral grounding. It is intended that this document serve only as a guide. Statements are necessarily of a general nature and therefore do not take into account the requirements of special situations that can differ considerably from those discussed.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.