IEEE Guide for Recommended Electrical Clearances and Insulation Levels in Air-Insulated Electrical Power Substations

IEEE Power Engineering Society

Sponsored by the
Substations Committee

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Abstract: This guide, covering three-phase ac systems from 1 kV to 800 kV, provides recommended electrical operating and safety clearances and insulation levels in air-insulated electric supply substations; addresses insulation coordination procedures; provides design procedures for the selection and coordination of the insulation levels within the station as they relate to substation clearances; and addresses how reduced clearances in high-voltage ac substations will allow for compact bus arrangements and substation voltage uprating applications.

Keywords: basic lightning impulse insulation level (BIL), basic switching impulse insulation level (BSL), clearances, insulation coordination, insulation levels, substation

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Introduction

This introduction is not part of IEEE Std 1427-2006, IEEE Guide for Recommended Electrical Clearances and Insulation Levels in Air Insulated Electrical Power Substations.

This guide was revised by members of Working Group D1—Recommended Minimum Clearances in Substation and is under the sponsorship of the Transmission and Distribution Substations Subcommittee of the IEEE/PESCS, Substations Committee.

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1. Overview

1.1 Scope

This guide, covering three-phase ac systems from 1 kV to 800 kV, provides recommended electrical operating and safety clearances and insulation levels in air-insulated electric supply substations; addresses insulation coordination procedures; provides design procedures for the selection and coordination of the insulation levels within the station as they relate to substation clearances; and addresses how reduced clearances in high-voltage ac substations will allow for compact bus arrangements and substation voltage uprating applications.

This guide addresses insulation coordination procedures, including the choice of insulation levels and arrester specification, in limited detail and only as relevant to clearance requirements. Detailed and expanded coverage of insulation coordination procedures is provided in other ANSI and IEEE guides and standards (see Clause 2).

This guide focuses on open-air bus assemblies and configurations and excludes apparatus clearances (i.e., bushing clearances for transformers, and breakers). Detailed coverage of apparatus clearances is provided in other applicable guides and standards.

1.2 Purpose

Proper electrical clearances are necessary for the design, construction, and operation of electric supply substations. This document develops guidelines for the application of recommended electrical clearances and insulation levels in air-insulated substations. The recommended clearances incorporate both design/operating clearances and safety clearances.