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IEEE Standard for Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations

IEEE Power and Energy Society

Sponsored by the
Nuclear Power Engineering Committee

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USA

IEEE Std 387™-2017
(Revision of
IEEE Std 387-1995)

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Abstract: The criteria for the application and testing of diesel-generator units as Class 1E standby power supplies in nuclear power generating stations are described in this standard.

Keywords: aging classification, auxiliary equipment, capability, controls, design criteria, design features, diesel-generator units, documentation requirements, engine, generator, IEEE 387™, load profile, modifications, operation, periodic testing, pre-operational testing, production testing, protection, qualification requirements, rating, records, reliability program, scope, seismic qualification, site testing, standby power supply, testing requirements, test parameters, type testing

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Introduction

This introduction is not part of IEEE Std 387-2017, IEEE Standard for Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations.

This standard supplements IEEE Std 308™, IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations, in that it amplifies 5.2.4 of that standard (Standby power supplies) concerning requirements for diesel-generator units.[1]

The IEEE has developed this standard to provide the principal design criteria, design features, qualification considerations, and testing requirements for individual diesel-generator units, including auxiliary equipment and controls within the scope of this standard used in the standby power supply of a nuclear facility, which comply with the Nuclear Regulatory Commission's Code of Federal Regulations (10 CFR 50).

This standard presents specific procedures and criteria applicable to qualifying the diesel-generator unit and supplements the criteria described in IEC/IEEE 60780-323™, Nuclear Facilities–Electrical Equipment Important to Safety–Qualification, and IEEE Std 627™, IEEE Standard for Qualification of Equipment Used in Nuclear Facilities.

This revision of the standard provides additional detail in the following areas:

a) Defining specific qualification requirements

b) Clarifying scope and scope diagram

c) Providing requirements for no-load and light-load operation, since extended operation under these conditions may be detrimental to unit performance

d) Expanding factory production testing and site testing criteria

e) Updating specific surveillance requirements

f) Providing acceptable method for reliability program elements (Annex D)

g) Emergency diesel generators with dedicated battery control power system

Industry practice continues to focus on monitoring and trending to facilitate aging and reliability determinations. This standard revision provides guidance for recommended monitoring and reliability program elements as described in 6.5.1 and Annex D, respectively.

This revision eliminated IEEE Std 387-1995 Annex C regarding emergency diesel generator (EDG) monitoring and now refers to ASME OM, Operation and Maintenance of Nuclear Power Plants (Part 16, Performance Testing and Monitoring of Standby Diesel Generator Systems in Light-Water Reactor Power Plants).

This revision innovated that Annex D, diesel-generator unit reliability program elements described are considered an acceptable method to the IEEE. Other technically justifiable diesel-generator unit reliability program elements may be used in lieu of, or in addition to this Annex described program elements.

The qualification requirements delineated in this standard consider aging considerations as potential common mode failure mechanisms. Operating experience is generally available on domestic U.S. nuclear diesel-generator units similar to those covered by this standard, and is useful in establishing the effect of aging mechanisms for those components where the technical state-of-the-art does not allow for techniques such as accelerated aging. The basis for allowing operating experience is supplemented by noting that the application of these diesel-generator units for nuclear service is such that the actual operating time under loaded conditions

[1]Information on references can be found in Clause 2.

is expected to be less than one year continuous service in the life expectancy of the plant. For areas where the state-of-the-art is not as limited, accelerated aging techniques shall be used.

This revision includes the diesel generator output breaker and fuel oil system to be within scope, including updating of Figure 1.

This revision includes changing the endurance and load run from 8 h to 24 h.

Contents

IEEE Standard for Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations

1. Overview

1.1 Scope

This standard defines the criteria for the application and testing of diesel-generator units used as Class 1E standby power supplies in nuclear power generating stations.

Figure 1 shows the boundaries of systems and equipment included in the scope of this standard.

1.2 Purpose

This standard provides the principal design criteria, the design features, testing, and qualification requirements for the individual diesel-generator units that enable them to meet their functional requirements as a part of the standby power supply under the conditions produced by the design basis events cataloged in the plant safety analysis.

1.3 General

1.3.1 Inclusions

The following items are within the scope of this standard:

a) The diesel engine, which includes the following:
   1) The flywheel and coupling (if applicable)
   2) The combustion air system and supply
   3) The starting system
   4) The starting energy system
   5) The fuel oil supply system (e.g., including the day tank, filters, piping, pumps, valves and strainers between the day tank and the engine injection pumps)
   6) The lubricating oil system