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IEEE 3006 STANDARDS:
POWER SYSTEMS RELIABILITY

IEEE Std 3006.5™-2014

Recommended Practice for the
Use of Probability Methods for
Conducting a Reliability Analysis of
Industrial and Commercial Power
Systems



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IEEE Recommended Practice for the Use of Probability Methods for Conducting a Reliability Analysis of Industrial and Commercial Power Systems

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Abstract: Described in this recommended practice are ways for using probability methods to conduct a reliability analysis of industrial and commercial power systems. It is likely to be of greatest value to the power-oriented engineer with limited experience in the area of reliability. It can also be an aid to all engineers responsible for the electrical design of industrial and commercial power systems.

Keywords: availability, common cause failure, IEEE 3006.5™, reliability, reliability analysis, time to failure data

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Introduction

This introduction is not part of IEEE Std 3006.5™-2014, IEEE Recommended Practice for the Use of Probability Methods for Conducting a Reliability Analysis of Industrial and Commercial Power Systems.

IEEE 3000 Standards Collection®

This recommended practice was developed by the Technical Books Coordinating Committee of the Industrial and Commercial Power Systems Department of the Industry Applications Society as part of a project to repackage the popular IEEE Color Books®. The goal of this project is to speed up the revision process, eliminate duplicate material, and facilitate use of modern publishing and distribution technologies.

When this project is completed, the technical material in the thirteen IEEE Color Books will be included in a series of new standards—the most significant of which will be a new standard, IEEE Std 3000™, Recommended Practice for the Engineering of Industrial and Commercial Power Systems. The new standard will cover the fundamentals of planning, design, analysis, construction, installation, startup, operation, and maintenance of electrical systems in industrial and commercial facilities. Approximately 60 additional dot standards, organized into the following categories, will provide in-depth treatment of many of the topics introduced by IEEE Std 3000™:

- Power Systems Design (3001 series)
- Power Systems Analysis (3002 series)
- Power Systems Grounding and Bonding (3003 series)
- Protection and Coordination (3004 series)
- Emergency, Standby Power, and Energy Management Systems (3005 series)
- Power Systems Reliability (3006 series)
- Power Systems Maintenance, Operations, and Safety (3007 series)

In many cases, the material in a dot standard comes from a particular chapter of a particular IEEE Color Book. In other cases, material from several IEEE Color Books has been combined into a new dot standard.

The material in this recommended practice largely comes from Chapter 2 of IEEE Std 493™ (*IEEE Gold Book*).

IEEE Std 3006.5™

This recommended practice provides the theoretical background to perform basic reliability analysis. Some basic concepts of probability theory are discussed, as these are essential to the understanding and development of quantitative reliability. The objective of this recommended practice is to provide the basic theoretical background for the reliability analysis used in the planning and design of industrial and commercial electric power distribution systems.

The design of reliable industrial and commercial power distribution systems is important because of the high cost associated with power outages. It is necessary to consider the cost of power outages when making design decisions for new and existing power distribution systems as well as to have the ability to make quantitative cost-versus-reliability trade-off studies. This recommended practice may be considered as a prerequisite to all other Power Systems Reliability dot standards (3006 series).

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1. Overview

1.1 Scope

This recommended practice describes how to use probability methods for conducting a reliability analysis of industrial and commercial power systems. It is likely to be of greatest value to the power-oriented engineer with limited experience in the area of reliability. It can also be an aid to all engineers responsible for the electrical design of industrial and commercial power systems.

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.