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IEEE Recommended Practice for the

Design of Reliable Industrial and Commercial Power Systems

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IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems

Sponsor

Power Systems Reliability Subcommittee
of the
Power Systems Engineering Committee
of the
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Abstract: The fundamentals of reliability analysis as it applies to the planning and design of industrial and commercial electric power distribution systems are presented. Included are basic concepts of reliability analysis by probability methods, fundamentals of power system reliability evaluation, economic evaluation of reliability, cost of power outage data, equipment reliability data, and examples of reliability analysis. Emergency and standby power, electrical preventive maintenance, and evaluating and improving reliability of the existing plant are also addressed. The presentation is self-contained and should enable trade-off studies during the design of industrial and commercial power systems. Design, installation, maintenance practices for electrical power and grounding (including both power-related and signal-related noise control) of sensitive electronic processing equipment used in commercial and industrial applications are presented.
Keywords: designing reliable industrial and commercial power systems, equipment reliability data, industrial and commercial power systems reliability analysis, reliability analysis

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The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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Introduction

This introduction is not part of IEEE Std 493-2007, IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems.

The objective of this recommended practice is to present the fundamentals of reliability analysis applied to the planning and design of industrial and commercial electric power distribution systems. The intended audience for this material is primarily consulting engineers and plant engineers, and technicians. 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. The lack of credible data concerning equipment reliability and the cost of power outages has hindered engineers in making such studies. This revision of IEEE Std 493™ overcomes these obstacles by providing extensive mechanical and electrical equipment reliability data; complete U.S. Army Corp of Engineers Power Reliability Enhancement Program (PREP) database, recent cost of power outage data, data collection procedures for maintenance and equipment failures, 7 × 24 continuous power analysis, and voltage sag analysis are presented. Detailed examples of reliability analysis of various industrial distribution system operating configurations are presented. The authors of this book have attempted to provide sufficient information so that reliability analyses can be performed on industrial and commercial power systems without requiring cross-references to other texts.

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Participants

The following members of the Gold Book Working Group of the Power Systems Reliability Subcommittee contributed to these chapters:

D. O. Koval, *Chair*
Robert G. Arno, *Vice Chair*

Chapter 1: Introduction—**D. O. Koval,** *Chair*

Chapter 2: Basic concepts of reliability—**Brian Roczen,** *Chair*

Chapter 3: Planning and design—**D. O. Koval,** *Chair*

Chapter 4: Evaluating and improving the reliability of an existing electrical system—**Tim Coyle,** *Chair*

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Chapter 7: Voltage sag analysis—**William E. Brumsickle,** *Chair*

Chapter 8: 7 × 24 continuous power facilities—**Robert J. Schuerger,** *Chair*

Chapter 9: Reliability and maintainability verification—**D. O. Koval,** *Chair*

Chapter 10: Summary of equipment reliability data—**Robert G. Arno,** *Chair*

Chapter 11: Data collection—**Robert G. Arno,** *Chair*

Other members of the working group who contributed to the development of the 2007 version of this recommended practice are as follows:

William F. Braun, Jr.	Peter Gross	Charles R. Heising
Ali A. Chowdhury	Peyton S. Hale, Jr.	Kelly O'Donnell

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1.1 Objectives and scope

The objective of this book is to present the fundamentals of reliability analysis applied to the planning and design of industrial and commercial electric power distribution systems. The intended audience for this material is primarily consulting engineers and plant electrical engineers and technicians.

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 power distribution systems as well as to have the ability to make quantitative "cost-versus-reliability" trade-off studies. The lack of credible data concerning equipment reliability and the cost of power outages has hindered engineers in making such studies. This revision of IEEE Std 493™ overcomes these obstacles.

The authors of this book have attempted to provide sufficient information so that reliability analyses can be performed on industrial and commercial power systems without requiring cross-references to other texts. Included are the following:

- Basic concepts of reliability analysis by probability methods
- Fundamentals of power system reliability evaluation
- Economic evaluation of reliability
- Recent cost of power outage data
- **New** extensive mechanical and electrical equipment reliability data—Complete U.S. Army Corp of Engineers Power Reliability Enhancement Program (PREP) database
- Examples of reliability analysis of various industrial distribution system operating configurations
- 7 × 24 continuous power
- Voltage sag analysis