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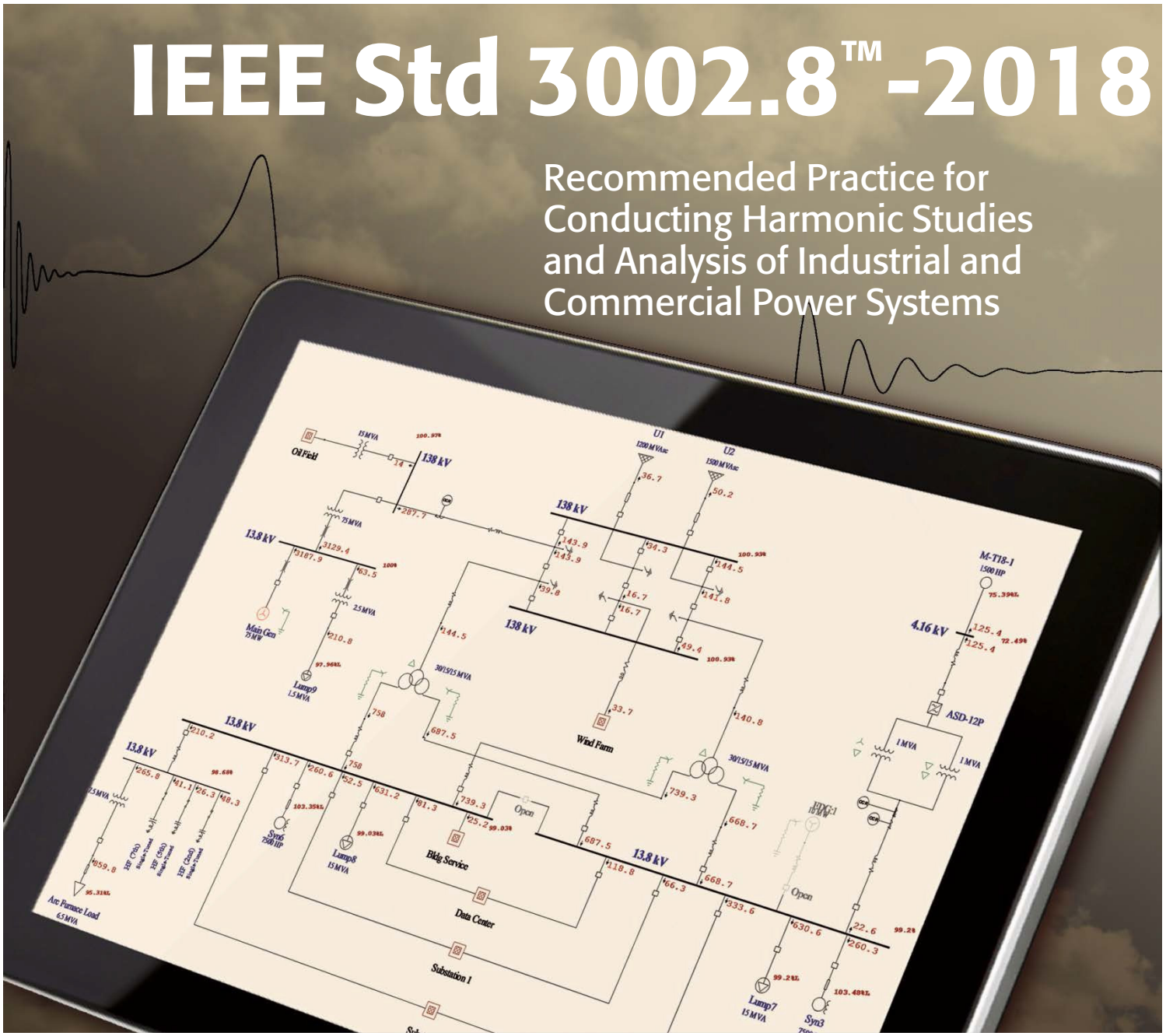
IEEE Std 3002.8™-2018

Recommended Practice for Conducting Harmonic Studies and Analysis of Industrial and Commercial Power Systems



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IEEE Recommended Practice for Conducting Harmonic Studies and Analysis of Industrial and Commercial Power Systems

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Abstract: Harmonic studies and analysis of industrial and commercial power systems are described. The basic concepts involved in such studies are described first. This is followed by a discussion of how to determine the need for a harmonic study, how to assemble the required data, how to recognize potential problems, and how to implement corrective measures.

Keywords: commercial power system, harmonics, harmonic analysis, harmonic analysis methods, harmonic analysis tools, harmonic distortion, harmonic filters, harmonic frequency scan, harmonic impedance, harmonic limits, harmonic load flow, harmonic mitigation, harmonic power flow study, harmonic sources, harmonic studies, IEEE 3002.8™, industrial and commercial power systems, industrial power system, interharmonics, resonance, system modeling

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Introduction

This introduction is not part of IEEE Std 3002.8™-2018, IEEE Recommended Practice for Conducting Harmonic Studies and Analysis of Industrial and Commercial Power Systems.

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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 included in the 13 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™, IEEE 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)

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— Power Systems Reliability (3006 series)

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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.

IEEE Std 3002.8™

The material in this recommended practice originally comes from Chapter 10 of the *IEEE Brown Book*™, IEEE Std 399™-1997, Recommended Practice for Industrial and Commercial Power Systems Analysis but includes major modifications based on the latest technological advancements.

This publication provides a recommended practice for conducting harmonic studies and analysis of power systems in commercial and industrial facilities. It is likely to be of greatest value to the power-oriented engineer with limited commercial or industrial plant experience. It can also be an aid to all engineers responsible for the electrical design of commercial and industrial facilities. However, it is not intended as a replacement for the many excellent engineering texts and handbooks commonly in use, nor is it detailed enough to be a design manual. It should be considered a guide and general reference on analysis of commercial and industrial facilities.

Topics of this standard are organized in the following sequence:

a) Harmonic-analysis objectives

b) Harmonic-analysis methodologies and applicable standards

c) System and component models for use in computer simulations for harmonic analysis

d) Data required for computer simulations

e) Common data collection and preparation procedures

f) Importance of model and data validation

g) Typical harmonic-analysis study scenarios, solution parameters, and results and reports interpretation

h) Preferred features for harmonic-analysis tools

i) Illustration examples

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1. Overview

1.1 Scope

This recommended practice describes how to conduct harmonic studies and analysis of industrial and commercial power systems. The basic concepts are described first. This is followed by a discussion of how to determine the need for a harmonic-analysis study, how to assemble the required data, how to recognize potential problems, and how to implement corrective measures.

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.

CIGRE Working Group 36, 05, "Harmonics—characteristic parameters, methods of study, estimates of existing values in the network," Electra, no. 77, pp. 35-54, 1981.[1]

IEC/TR 61000-3-6, Electromagnetic compatibility (EMC)—Part 3-6: Limits—Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems.[2]

IEEE Power Engineering Society, "Tutorial on harmonics modeling and simulation," Publication No. 98TP125-0. Piscataway, NJ: Institute of Electrical and Electronics Engineers, 1998.[3,4]

IEEE Power Engineering Society Transmission and Distribution Committee Task Force on Harmonics Modeling and Simulation, "Test systems for harmonic modeling and simulation," IEEE Transactions on Power Delivery, vol. 14, no. 2, pp. 579-587, April 1999, http:// dx .doi .org/ 10 .1109/ 61.754106.

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