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THE

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ENGINEERING

HANDBOOK

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THE

ELECTRIC POWER
ENGINEERING

HANDBOOK

EDITOR-IN-CHIEF
L.L. GRIGSBY

Auburn University
Auburn, Alabama



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Preface

The generation, delivery, and utilization of electric power and energy remain among the most challenging and exciting fields of electrical engineering. The astounding technological developments of our age are highly dependent upon a safe, reliable, and economic supply of electric power. The objective of *The Electric Power Engineering Handbook* is to provide a contemporary overview of this far-reaching field as well as a useful guide and educational resource for its study. It is intended to define electric power engineering by bringing together the core of knowledge from all of the many topics encompassed by the field. The articles are written primarily for the electric power engineering professional who is seeking factual information and secondarily for the professional from other engineering disciplines who wants an overview of the entire field or specific information on one aspect of it.

The book is organized into 15 sections in an attempt to provide comprehensive coverage of the generation, transformation, transmission, distribution, and utilization of electric power and energy as well as the modeling, analysis, planning, design, monitoring, and control of electric power systems. The individual articles within the 15 sections are different from most technical publications. They are not journal type articles nor are they textbook in nature. They are intended to be tutorials or overviews providing ready access to needed information, while at the same time providing sufficient references to more in-depth coverage of the topic. This work is a member of the Electrical Engineering Handbook Series published by CRC Press. Since its inception in 1993, this series has been dedicated to the concept that when readers refer to a handbook on a particular topic they should be able to find what they need to know about the subject at least 80% of the time. That has indeed been the goal of this handbook.

In reading the individual articles of this handbook, I have been most favorably impressed by how well the authors have accomplished the goals that were set. Their contributions are, of course, most key to the success of the work. I gratefully acknowledge their outstanding efforts. Likewise, the expertise and dedication of the editorial board and section editors have been critical in making this handbook possible. To all of them I express my profound thanks. I also wish to thank the personnel at CRC Press who have been involved in the production of this book, with a special word of thanks to Nora Konopka and Ron Powers. Their patience and perseverance have made this task most pleasant.

Leo Grigsby
Editor-in-Chief

Editor-in-Chief



Leonard L. (“Leo”) Grigsby received BSEE and MSEE degrees from Texas Tech University and a Ph.D. from Oklahoma State University. He has taught electrical engineering at Texas Tech, Oklahoma State University, and Virginia Tech. He has been at Auburn University since 1984, first as the Georgia Power Distinguished Professor, later as the Alabama Power Distinguished Professor, and currently as Professor Emeritus of Electrical Engineering. He also spent nine months during 1990 at the University of Tokyo as the Tokyo Electric Power Company Endowed Chair of Electrical Engineering. His teaching interests are in network analysis, control systems, and power engineering.

During his teaching career, Professor Grigsby has received 12 awards for teaching excellence. These include his selection for the university-wide William E. Wine Award for Teaching Excellence at Virginia Tech in 1980, his selection for the ASEE AT&T Award for Teaching Excellence in 1986, the 1988 Edison Electric Institute Power Engineering Educator Award, the 1990–91 Distinguished Graduate Lectureship at Auburn University, the 1995 IEEE Region 3 Joseph M. Beidenbach Outstanding Engineering Educator

Award, and the 1996 Birdsong Superior Teaching Award at Auburn University.

Dr. Grigsby is a Fellow of IEEE. During 1998–99 he was a member of the Board of Directors as Director of Div. VII for power and energy. He has served the Institute in 27 different offices at the chapter, section, region, or national level. For this service, he has received seven distinguished service awards, the IEEE Centennial Medal in 1984, and the Power Engineering Society Meritorious Service Award in 1994.

During his academic career, Professor Grigsby has conducted research in a variety of projects related to the application of network and control theory to modeling, simulation, optimization and control of electric power systems. He has been the major advisor for 35 M.S. and 21 Ph.D. graduates. With his students and colleagues, he has published over 120 technical papers and a textbook on introductory network theory. He is currently Editor for CRC Press for a book series on electric power engineering. In 1993 he was inducted into the Electrical Engineering Academy at Texas Tech University for distinguished contributions to electrical engineering.

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Contributors

Rambabu Adapa

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BC Hydro
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Laboratory
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Niskayuna, New York

Richard Dudley

Trench Ltd.
Scarborough, Ontario, Canada

M.E. El-Hawary

Dalhousie University
Halifax, Nova Scotia, Canada

Ahmed Elneweihi

BC Hydro
Burnaby, British Columbia,
Canada

James W. Evans

Detroit Edison Company
Detroit, Michigan

Richard G. Farmer

Arizona State University
Tempe, Arizona

James W. Feltes

Power Technologies
Schenectady, New York

Shelia Frasier

Southern Engineering
Atlanta, Georgia

Rulon Fronk

Fronk Consulting
Cerritos, California

Dudley L. Galloway

ABB Power T & D Company
Jefferson City, Missouri

**Michael G.
Giesselmann**

Texas Tech University
Lubbock, Texas

Jay C. Giri

ALSTOM ESCA Corporation
Bellevue, Washington

L.L. Grigsby

Auburn University
Auburn, Alabama

Charles A. Gross

Auburn University
Auburn, Alabama

John V. Grubbs

Alabama Power Company
Birmingham, Alabama

James H. Gurney

BC Hydro
Burnaby, British Columbia,
Canada

Nouredine Hadjsaid

Institut National Polytechnique
de Grenoble (INPG)
France

S.M. Halpin

Mississippi State University
Mississippi State, Mississippi

Andrew Hanson

ABB Power T & D Company
Raleigh, North Carolina

James H. Harlow

Harlow Engineering Associates
Largo, Florida

David L. Harris

Waukesha Electric Systems
Waukesha, Wisconsin

Tim A. Haskew

The University of Alabama
Tuscaloosa, Alabama

Robert Haas

Haas Engineering
Villa Hills, Kentucky

J.F. Hauer

Pacific Northwest National
Laboratory
Richland, Washington

Ted Hauptert

TJ/H2b Analytical Services
Sacramento, California

William R. Henning

Waukesha Electric Systems
Waukesha, Wisconsin

Felimón Hernandez

Arizona Public Service Company
Phoenix, Arizona

Philip J. Hopkinson

Square D Company
Monroe, North Carolina

Stan H. Horowitz

Consultant
Columbus, Ohio

Gary L. Johnson

Kansas State University
Manhattan, Kansas

Anthony J. Jonnatti

Loci Engineering
Palm Harbor, Florida

Gerhard Juette

Siemens
Munich, Germany

Danny Julian

ABB Power T & D Company
Raleigh, North Carolina

Tonia Jurbin

BC Hydro
Burnaby, British Columbia,
Canada

John G. Kappenman

Metatech Corporation
Duluth, Minnesota

George G. Karady

Arizona State University
Tempe, Arizona

Richard P. Keil

Dayton Power & Light Company
Dayton, Ohio

John R. Kennedy

Georgia Power Company
Atlanta, Georgia

William H. Kersting

New Mexico State University
Las Cruces, New Mexico

Tibor Kertesz

Hydro One Networks, Inc.
Toronto, Ontario, Canada

Alireza Khotanzad

Southern Methodist University
Dallas, Texas

Prabha Kundur

Powertech Labs, Inc.
Surrey, British Columbia,
Canada

Stephen R. Lambert

Shawnee Power Consulting, LLC
Williamsburg, Virginia

Einar Larsen

GE Power Systems
Schenectady, New York

W.H. Litzemberger

Bonneville Power
Administration
Portland, Oregon

Andre Lux

ABB Power T&D Company
Raleigh, North Carolina

Yakout Mansour

BC Hydro
Burnaby, British Columbia,
Canada

**Juan A. Martinez-
Velasco**

Universitat Politecnica de
Catalunya
Barcelona, Spain

John D. McDonald

KEMA Consulting
Norcross, Georgia

Shirish P. Mehta

Waukesha Electric Systems
Waukesha, Wisconsin

Christopher J. Melhorn

EPRI PEAC Corporation
Knoxville, Tennessee

Hyde M. Merrill

Merrill Energy, LLC
Schenectady, New York

Roger A. Messenger

Florida Atlantic University
Boca Raton, Florida

William A. Mittelstadt

Bonneville Power Administration
Portland, Oregon

Harold Moore

H. Moore & Associates
Niceville, Florida

Kip Morrison

Powertech Labs Inc.
Surrey, British Columbia,
Canada

Dan Mulkey

Pacific Gas & Electric Co.
Petaluma, California

Randy Mullikin
Kuhlman Electric Corp.
Versailles, Kentucky

Paul I. Nippes
Magnetic Product and Services,
Inc.
Holmdel, New Jersey

Robert S. Nowell
Georgia Power Company
Atlanta, Georgia

Carlos V. Núñez-Noriega
Glendale Community College
Glendale, Arizona

Alan Oswalt
Waukesha Electric Systems
Waukesha, Wisconsin

John Paserba
Mitsubishi Electric Power
Products Inc.
Warrendale, Pennsylvania

Paulette A. Payne
Potomac Electric Power Company
Washington, DC

Dan D. Perco
Perco Transformer Engineering
Stoney Creek, Ontario, Canada

Joe C. Pohlman
Consultant
Pittsburgh, Pennsylvania

William W. Price
GE Power Systems
Schenectady, New York

Jeewan Puri
Square D Company
Monroe, North Carolina

Saifur Rahman
Virginia Tech
Falls Church, Virginia

Kaushik Rajashekara
Delphi Automotive Systems
Kokomo, Indiana

N. Dag Reppen
Niskayuna Power Consultants,
LLC
Niskayuna, New York

Manuel Reta-Hernández
Arizona State University
Tempe, Arizona

Charles W. Richter
ALSTOM ESCA Corporation
Bellevue, Washington

Francisco de la Rosa
DLR Electric Power Reliability
Houston, Texas

Anne-Marie Sahazizian
Hydro One Networks, Inc.
Toronto, Ontario, Canada

Juan Sanchez-Gasca
GE Power Systems
Schenectady, New York

Peter W. Sauer
University of Illinois
Urbana, Illinois

Leo J. Savio
ADAPT Corporation
Kennett Square, Pennsylvania

Kenneth H. Sebra
Baltimore Gas & Electric
Company
Baltimore, Maryland

Douglas B. Seely
Pacific Engineering Corporation
Portland, Oregon

Michael Sharp
Trench Ltd.
Scarborough, Ontario, Canada

Gerald B. Sheblé
Iowa State University
Ames, Iowa

Raymond R. Shoultz
University of Texas at Arlington
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H. Jin Sim
Waukesha Electric Systems
Goldsboro, North Carolina

James H. Sosinski
Consumers Energy
Jackson, Mississippi

K. Neil Stanton
Stanton Associates
Bellevue, Washington

Robert P. Stewart
BC Hydro
Burnaby, British Columbia,
Canada

C.M. Mike Stine
Raychem Corporation
Menlo Park, California

Mahesh M. Swamy
Yaskawa Electric America
Waukegan, Illinois

Glenn W. Swift
APT Power Technologies
Winnipeg, Manitoba, Canada

Larry D. Swift
University of Texas at Arlington
Arlington, Texas

Carson W. Taylor
Carson Taylor Seminars
Portland, Oregon

Rao S. Thallam
Salt River Project
Phoenix, Arizona

James S. Thorp
Cornell University
Ithaca, New York

Ridley Thrash
Southwire Company
Carrollton, Georgia

Robert F. Tillman, Jr.
Alabama Power Company
Birmingham, Alabama

Giao N. Trinh, Jr.
Log-In
Boucherville, Quebec, Canada

Vijay Vittal
Iowa State University
Ames, Iowa

Loren B. Wagenaar
America Electric Power
Pickerington, Ohio

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