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FOREWORD

This volume contains the papers and addresses presented at the thirty-ninth annual meeting of the American Power Conference held in Chicago on April 18-20, 1977. The Conference is an independent forum open to all persons interested in the generation, transmission, distribution or utilization of power, irrespective of society affiliations. It is sponsored by Illinois Institute of Technology with the cooperation of the universities and societies listed on the opposite page.

In these days of dwindling oil and natural gas supplies, increased attention is being directed toward the use of coal and uranium as primary sources of energy. Extraction and utilization of these fuels in an efficient and environmentally acceptable manner is a high-priority national goal. So, also, is conservation and the development of alternative energy sources. The Conference seeks to play a role in achieving these goals by providing an open forum where all segments of the power industry can meet for full and frank discussion. Academic sponsorship encourages this and permits the freest possible exchange of ideas, ranging from the technical through the economic and into the social aspects of the subject.

Papers presented at the Conference are by invitation. They are selected by committees representing the various fields of activity, chosen from the cooperating universities and societies, industry, and government. Suggestions for papers are always welcome and will be given careful consideration if received by September 15 of the year immediately preceding the Conference.

The sponsors of the Conference wish to thank all those companies and individuals who have contributed toward the success of the meeting. The help of the Division Chairmen, the Session Chairmen and Cochairmen, the University and Society Representatives, the Industry Committee, the Program Committee, the Editorial Committee, and all other committees is gratefully acknowledged. A special debt of gratitude also goes to the Editor and to the many Authors whose contributions appear in the Proceedings. Without their cooperation, the Proceedings could not be published.

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IN MEMORIAM

DANIEL A. SULLIVAN

1897-1977

It is with deep regret that we announce the death of Dan Sullivan, who served as Chairman of the Industry Committee of the American Power Conference for many years. He was one of the earliest supporters of the Midwest Power Conference, from which the American Power Conference evolved, and his efforts contributed greatly to the success of the Conference as you know it today.

In addition, he was a Service Annuitant of Commonwealth Edison Company of Chicago; Vice President, Society of American Military Engineers; Founder and former Executive Director of the Institute for American Strategy; Founder and Past President of the Midwestern Air Pollution Prevention Association; National Coordinator of the Electric Industry's Wartime Aid Program; Former Secretary, Chicago Civil Defense Corps; and Director, National Military Industrial Conferences.

Among the many honors bestowed upon him are: Presidential Medal of Merit, awarded by President Truman for "Outstanding Fidelity and Meritorious Conduct in Aid of the War Effort Against the Common Enemies of the United States and its Allies in World War II;" Honorary Life Member, Society of American Military Engineers; Gold Medal Award, Society of American Military Engineers for Distinguished Service to the Engineering Profession; Meritorious Service Citation, Secretary of the Navy, 1961; Meritorious Service Citation for Outstanding Service to the Army, Secretary of the Army; Commendation for Outstanding Service, U. S. Navy, Bureau of Yards and Docks, June 1947; and a Citation for Directing the Electric Power Wartime Aid Program from Edison Electric Institute.

Through the many contacts he had made over the years, Dan was able to enlist many of the important and interesting speakers who have appeared at our Opening Meetings, Luncheons, and All Engineers Dinners.

He was a longtime personal friend of many who have attended the Conference, as well as to its Officers and Committee members. He will be sorely missed.

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Thirty-Ninth Annual Meeting

The Palmer House

April 18, 19, 20, 1977

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OPENING MEETING

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NUCLEAR SESSIONS

NUCLEAR I—NUCLEAR FUEL CYCLE

Chairman: Floyd Culler, Assistant Laboratory Director, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Cochairman: David J. Rose, Professor of Nuclear Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts

NUCLEAR II—NUCLEAR REGULATORY IMPACT

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Cochairman: Fredric C. Olds, Senior Editor, Power Engineering Magazine, Technical Publishing Company, Barrington, Illinois

NUCLEAR III—NUCLEAR POWER PLANT DESIGN

Chairman: Leonard J. Koch, Vice President, Illinois Power Company, Decatur, Illinois

Cochairman: Ira Bornstein, Nuclear Engineer, Argonne National Laboratory, Argonne, Illinois

NUCLEAR IV—NUCLEAR PLANT RELIABILITY AND AVAILABILITY

Chairman: Sol Burnstein, Vice President, Wisconsin Electric Power Company, Milwaukee

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NUCLEAR V—NUCLEAR PLANT OPERATIONS: REDUCING LIMITATIONS

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MECHANICAL SESSIONS**MECHANICAL I—LARGE TURBINE-GENERATORS**

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Cochairman: Robert C. Spencer, Manager, Mechanical Design Engineering, Large Steam Turbine Department, General Electric Company, Schenectady

MECHANICAL II—FLUE GAS TECHNOLOGY

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WATER TECHNOLOGY SESSIONS

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OPENING MEETING

INVOCATION



THE REVEREND DR. ANSELM H. AMADIO
Chaplain
Illinois Institute of Technology
Chicago

Lord, God, Creator and Father, we appeal to your presence as the all pervading spirit and power inspiring us and all that is; You not only are the source of all being that gave man and woman the stewardship of this planet earth, with all its beauty, resources and riches, but also, as in an ultimate gesture of cosmic humility, assumed flesh and in your prophets walk among us; You shared Your creativity with us who join you in determining the future; Your supreme power is love, and this You also share with us; You have constituted us both as prag-

matists and mystics, without either of which we would not be human.

Thus we see the world and nature and sense with awe the presence and mystery of the spirit and thus more fully realize the humbling moral responsibility we have to conserve, transform and administer the goods of earth through the genius of human science and technology. This we have not always done wisely, modestly, or unselfishly.

Now, at this critical stage of world and human development, with its crucial need for energy, may we, through the thoughts and interaction of this Conference, grow more sensitively aware of our awesome responsibility to strive, as toward a living ideal, to care for and share our common endowment with all persons and races. Only thus will the gifts of Your creation be enjoyed justly and equitably by Your human family everywhere, so that

Earth might be fair, and all men good
and wise.

Age after age, their tragic empires rise,
Built while they dream, and in that
dreaming weep;

Would man but wake from out his
haunted sleep,

Earth might be fair, and all men glad
and wise *

Amen.

*From the Hymn, "Turn Back, O Man,
Forswear Thy Foolish Ways."