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UMR-MEC Conference on Energy / UMR-DNR Conference on Energy

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13 Oct 1977

## Front Matter

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### Recommended Citation

University of Missouri--Rolla, "Front Matter" (1977). *UMR-MEC Conference on Energy / UMR-DNR Conference on Energy*. 251.

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**Fourth Annual**

**UMR-DNR  
CONFERENCE ON ENERGY**

**Theme: Energy Crisis-  
Where Do We go From Here?**

**October 11-13, 1977**

**Volume 4**

**Missouri Department of Natural Resources  
American Petroleum Institute  
Ingersoll-Rand Company  
United States Metals Refining Company  
University of Missouri - Rolla  
College of Arts & Sciences  
School of Mines and Metallurgy  
School of Engineering  
Extension Division**

**Edited by  
Dr. J. Derald Morgan  
Emerson Electric Professor of Electrical Engineering  
University of Missouri - Rolla**

# **The Fourth Annual UMR-DNR CONFERENCE ON ENERGY**

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American Geophysical Union  
American Nuclear Society  
American Public Works Association  
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**Conference Director  
Dr. J. Derald Morgan  
Emerson Electric Professor of Electrical Engineering  
Electrical Engineering Department  
University of Missouri - Rolla**

## FOREWARD

This volume is a collection of papers selected from the papers presented at the Fourth Annual UMR-DNR Conference on Energy held at the University of Missouri-Rolla on the dates of October 11-13, 1977.

Guided by the President's goal of energy independence by 1980, the UMR-DNR Conference on Energy organized in 1974 with the purpose of providing social scientists, scientists and engineers a means for rapid communication of their most recent research results in the field of energy and to offer solutions to the energy related problems of local government, business, industry and the general public.

Since that time, there has been considerable difference of opinion regarding the meaning of energy independence, and even greater differences as to how the goal of independence should be achieved. To some, energy independence is a condition in which the U.S. receives no energy through imports and produces all of its energy domestically. To others, energy independence is a condition in which the U.S. imports some energy to meet its requirements, but only to acceptable levels of political and economic vulnerability.

Concerned citizens throughout our country, aware of the nation's critical dependence on its energy resources, are actively working on solutions to our energy supply and in the development of new alternatives to traditional energy systems and patterns of energy utilization. At every level -- from trying to lower energy consumption to the development of sophisti-

cated alternative resources -- concerned researchers are doing what they can to help our nation achieve energy self-reliance and stability.

Papers covering the work of many of the nation's outstanding researchers are contained in this volume. The definition of independence, the criteria for availability, the technical methods and advancements for meeting the goal of energy independence and the choice of an energy strategy are central to the choice of a U.S. energy strategy and the theme for this year's conference, "Energy Crisis - Where Do We Go From Here."

Striving for an exchange of ideas on the energy problem, the UMR-DNR Conference on Energy is sponsored annually by the University of Missouri-Rolla and the State of Missouri's Department of Natural Resources with the cooperation of the professional societies listed on the previous page. Much of the conference support is provided through the program of company registrations and company sponsorships. This year's participants in the company sponsorship and registration program are listed on the previous page.

Papers presented at the conference are of two categories: (1) those that are presented by invitation and (2) those selected from papers submitted in response to an open call for papers. Papers are selected by a committee of experts from the University of Missouri-Rolla and the Missouri Department of Natural Resources in the various fields emphasized in the

conference. Suggestions for papers are always welcome if received by April 15 in the year of the conference.

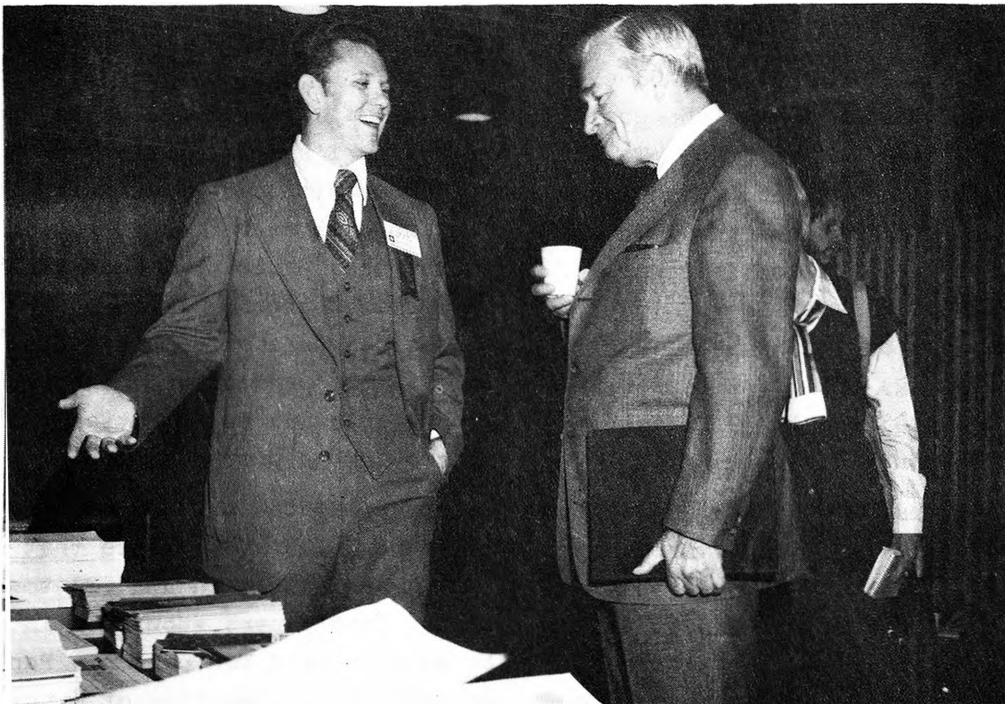
The meeting is open to all persons interested in energy resources, its extraction, its environmental effects and in economics and policies related to energy resources and processes. The Conference provides a forum for social scientists, scientists, and engineers in universities, industry, business or government to meet and exchange ideas between themselves and the general public. Academic sponsorship is intended to provide the freest possible discussion ranging from the most technical detail through the economic questions and to the social and political aspects of the subject of energy.

The sponsors of the Conference and the Director, in particular, thank the companies and individuals contributing to

the success of the Conference. The help of the Session Chairmen, Co-Chairmen and the Organizing Committee is gratefully acknowledged. A special note of recognition goes to the many authors whose contributions appear in this tome. With their efforts, the success of the Conference was assured, as well as the value of the printed proceedings.

Through the continued research efforts of these and other outstanding social scientists, scientists, engineers and public servants, I am confident that our nation will meet the challenges and achieve its goal of energy independence in the 1980's.

J. Derald Morgan  
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Rolla, Missouri



Dr. J. Derald Morgan, Conference Director, discussing the Conference activities with Commissioner Kennedy, United States Nuclear Regulatory Commission.