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Topics:  
Coal gasification  
Coal liquefaction  
Combined-cycle power plants  
Synthetic fuels—fuel gas  
Tar sands  
Gas turbines

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**PROCEEDINGS**

# Proceedings: Conference on Coal Gasification Systems and Synthetic Fuels for Power Generation

**Volume 1:  
Sections 1-22**

Prepared by  
Electric Power Research Institute  
Palo Alto, California

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# R E P O R T S U M M A R Y

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SUBJECTS	Gasification power plants / Advanced combustion turbines / Coal-derived liquids / Coal-derived gas	
TOPICS	Coal gasification Coal liquefaction Combined-cycle power plants	Synthetic fuels—fuel gas Tar sands Gas turbines
AUDIENCE	Generation planners / Fuels engineers	

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## **Proceedings: Conference on Coal Gasification Systems and Synthetic Fuels for Power Generation** Volumes 1 and 2

The international effort to develop synthetic fuels and advanced power systems for the commercial generation of electric power from coal, oil shale, and tar sands has been an outstanding technical success. This conference highlighted the work that brought new fuels and power generation systems to reality.

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BACKGROUND	In 1980, EPRI and the Jülich Nuclear Research Center, on behalf of the Federal Republic of Germany's Federal Ministry for Research and Technology, cosponsored a conference on the status of technology for producing clean gaseous and liquid fuels from coal and shale oil (EPRI report WS-79-238). At that time, U.S. interest in such technologies was high because of the rapidly escalating petroleum prices caused by the OPEC oil embargo. Since then, the United States has curtailed its development program for liquid fuels. However, other countries have continued both synthetic fuels and coal gasification programs, and development of large-scale coal gasification systems has continued at a brisk pace.
OBJECTIVES	To provide an international forum for discussing the state of the art in commercial coal gasification and in synthetic fuels technology for power generation and to provide direction for further development.
APPROACH	The second conference on coal gasification and synthetic fuels for power generation—attended by approximately 350 representatives of the electric power industry and the synthetic fuel development community, as well as administrators of government energy policies—was held in San Francisco, April 14–18, 1985. In formal and workshop sessions, participants reviewed papers and reports on advances in coal gasification processes, synthetic fuels technologies, and combustion turbines in the United States, the Federal Republic of Germany, Japan, Canada, New Zealand, and Switzerland.
RESULTS	This two-volume report contains the 40 papers and reports presented at the conference. Focusing on commercial and demonstration plants that are in operation or under construction, these papers provide a comprehensive

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review of the progress that has been made in coal gasification and synthetic fuels technology during the last 5 years. Topics range from the role alternative energy plays in generating electric power to specific production processes. These include ammonia by coal gasification, integrated-gasification-combined-cycle power production, pressurized entrained-flow gasification, and direct and indirect production of liquid fuels from coal.

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EPRI PERSPECTIVE

Advanced power systems are reaching mature status, with modules of commercial plants now producing electric power or fuels and chemicals. The effort of some countries to develop liquid fuels from coal, shale oil, and tar sands has provided the technology for commercial plants that, it is hoped, will supplement supplies of petroleum and natural gas in the 1990s. However, further development of such fuels must be accompanied by marked changes in U.S. energy policies and by bold action by petroleum companies.

The development of large-scale coal gasification systems, on the other hand, is lively and competitive. Data from pioneer demonstration plants show that these systems, which have the potential to solve environmental problems and to achieve modest increments in system generation capacity, are efficient and reliable. These new electric power generation systems offer many opportunities for plant modifications and improvements and for new products—opportunities that are now being realized and that will be optimized and refined over the next decade.

For some technologies, the progression from laboratory invention to commercial reality has taken 20 years. Ultimately, however, synthetic fuels and coal gasification systems will provide alternative methods for utilizing coal, shale oil, and tar sands for power generation. This conference provided a forum for charting further progress and promoting international cooperation.

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PROJECT

TCO-83-933

EPRI Project Manager: Seymour B. Alpert  
Advanced Power Systems Division

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## ABSTRACT

This report is the Proceedings of the Conference on Coal Gasification and Synthetic Fuels for Power Generation, held April 14-18, 1985. The conference was cosponsored by the Julich Nuclear Research Center on behalf of the Federal Republic of Germany's Ministry for Research and Technology and EPRI. The papers represent the work of organizations in the United States, the Federal Republic of Germany, Great Britain, New Zealand, Japan, and Canada. Perspectives written by representatives of the utility industry and by administrators of energy programs are also included.

## PREFACE

This Conference on Coal Gasification and Synthetic Fuels for Power Generation, held at The Westin St. Francis Hotel, San Francisco, April 14-18, 1985 focused on the status of technology, the production of synthetic fuels, and the emergence of advanced power systems for the commercial generation of electric power from coal, oil shale, and tar sands. It is the second conference cosponsored by the Jülich Nuclear Research Center, on behalf of the Federal Republic of Germany's Federal Ministry for Research and Technology, and EPRI. Delegates to the conference were representatives of the electric power industry and the synthetic fuel development community and administrators of energy policy. Attendees from foreign countries were welcomed as colleagues in an international effort that has been an outstanding technical success. This achievement would not have been possible without the efforts of scientific and engineering personnel in industry and government laboratories. These workers not only provide the technical basis for sound engineering but also administer large-scale pioneer plants that have brought many new systems to reality.

The previous conference, held in the fall of 1980, had a sense of urgency to it because, after an unforeseen supply interruption, the Arab embargo rapidly escalated oil prices. Since then, the thrust of development work on liquid fuels from coal and tar sands has apparently moved from the United States to the Federal Republic of Germany, Japan, Canada, and other countries. These foreign programs have provided bases for commercial plants that it is hoped, will supplement supplies of petroleum and natural gas in the 1990s. Despite the technological advances, competitive liquid fuels from coal, shale oil, and tar sands for power generation will not be available unless marked changes are made in U.S. policy and bold initiatives are taken by petroleum companies.

In contrast, large-scale coal gasification systems represent a lively and competitive technological arena, with a number of successful applications both in the United States and abroad. These systems offer competitive modular installations that have the potential to solve environmental problems and that can be installed quickly with modest increments in system generation capacity. On the basis of the data that are emerging from pioneer demonstration plants, these systems are

efficient and reliable. The new electric power generation systems offer many opportunities for modifications, improvements, and new products. These opportunities that are now being realized will be optimized and refined over the next decade. The cost and risks associated with such endeavors are high, and not all of the technologies previously reported have been developed.

For some technologies, the progression from laboratory invention to commercial reality has taken 20 years. When completed, this work will produce new technological bases and provide alternative routes for utilizing coal, shale oil, and tar sands instead of petroleum and natural gas. New systems will help clean our environment of polluting constituents and offer new opportunities for innovative management. We hope this conference will provide a forum for further progress and international cooperation.

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Technical Director  
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## ACKNOWLEDGMENTS

The contributions of my colleagues who chaired sessions at the conference is acknowledged. The session chairmen included:

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H. Lebowitz, EPRI	

Ms. Brooke Eldredge was primarily responsible for meeting arrangements with Ms. Ellen Lanum of EPRI's Conference and Travel Department. Ms. Marie Barber was responsible for the technical papers and preparing them for publication in these volumes.

At the conference two individuals, one from the United States, and the second from the Federal Republic of Germany, were recognized for their outstanding contributions in providing the technology base for Texaco Coal Gasification at their respective organizations.

These two individuals have unique and special leadership talents that make them outstanding recipients of the Achievement Awards.

It is with respect and appreciation that these proceedings are dedicated to:

Warren G. Schlinger  
Texaco Montebello Research Laboratories  
Montebello, California

and

Joseph Hibbel  
Ruhrchemie, A.G.  
Oberhausen - Holten  
Federal Republic of Germany

The citations follow.

ACHIEVEMENT AWARD 1985

In Recognition of the Pioneering and Innovative Contributions  
in Research and Development that  
Provided the Basis for Commercial Application  
of Texaco Coal Gasification

WARREN G. SCHLINGER

and the Texaco Montebello Research Laboratories  
at Montebello, California

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JOSEPH HIBBEL

and the Ruhrchemie A.G./Ruhrkohle A.G. Development Center  
at Oberhausen-Holtien  
Federal Republic of Germany

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