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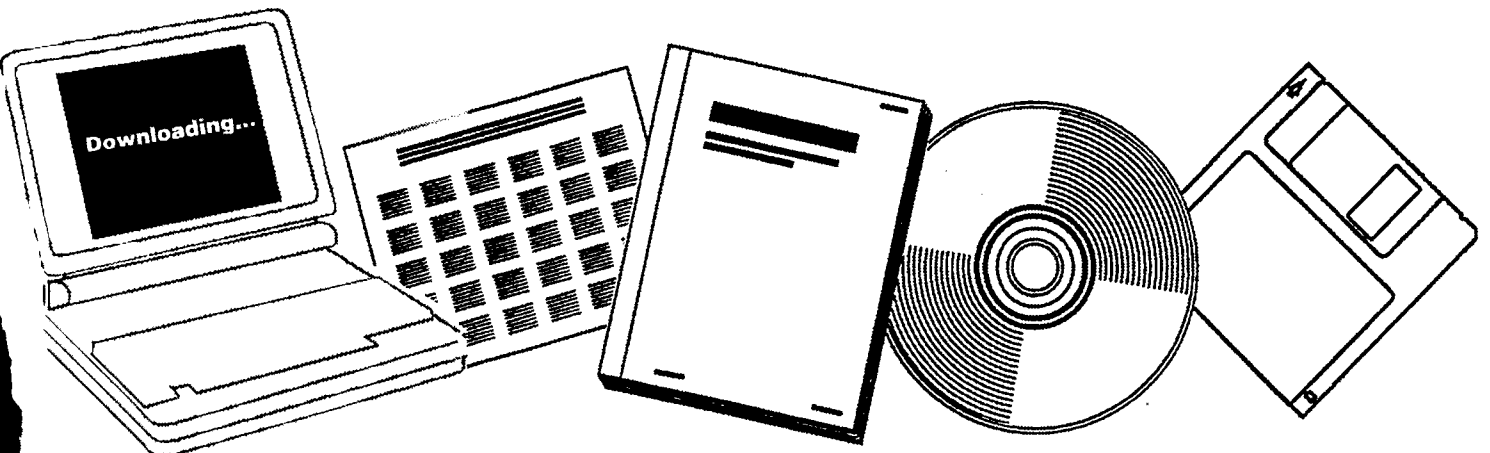
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ASSESSMENT OF TECHNOLOGY FOR THE LIQUEFACTION OF COAL

NATIONAL RESEARCH COUNCIL, WASHINGTON,
D.C. AD HOC PANEL ON LIQUEFACTION OF
COAL

DEC 1977



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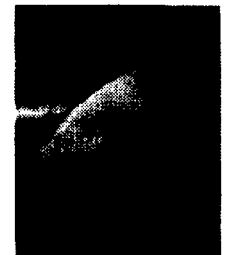
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Assessment of Technology for the Liquefaction of Coal

Prepared by the
Ad Hoc Panel on Liquefaction of Coal
of the
Committee on Processing and Utilization of Fossil Fuels

Commission on Sociotechnical Systems
National Research Council

National Academy of Sciences
Washington, D.C. 1977

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine.

This is a report of a study undertaken by the Ad Hoc Panel on Liquefaction of Coal of the Committee on Processing and Utilization of Fossil Fuels, Commission on Sociotechnical Systems, National Research Council for the National Academy of Sciences in partial execution of work under Contract No. E(49-18)1216 with the U.S. Energy Research and Development Administration.

FOREWORD

Predictions of energy shortages and the realities of recent increases in fuel cost have brought the country to the immediate need to conserve energy and to expand its domestic energy base. The increased extraction and utilization of coal with a minimum impact upon the environment is a major objective of a significant portion of the nation's energy research and development activities.

In response to a 1975 contract with the U.S. Energy Research and Development Administration (ERDA), the National Research Council (NRC) undertook a comprehensive evaluation of the status, technology, and research and development priorities for the major components of the coal processing and utilization system (i.e., coal mining, direct combustion, liquefaction, low-Btu gasification, and advanced power cycles). The objectives of the study are to provide:

1. An assessment of the priorities to be assigned to the components of a process, among processes within a given area, and among areas
2. An outline of research and development needs, supportive research requirements (with particular emphasis on the role of universities), projected time schedules, and development strategies
3. An assessment of environmental impact and technology requirements
4. An assessment of the impact of materials, capital, and manpower requirements

Foreign and domestic extraction and processing methods available or under development were to be considered as were questions related to concepts, alternatives, engineering adequacy, costs, efficiency, applicability, process maturity, and possible rates of installation.

Appointed to oversee the study was the Committee on Processing and Utilization of Fossil Fuels of the NRC Commission on Sociotechnical Systems. Five ad hoc Panels were appointed to assist the Committee

by preparing detailed reports on each topic of interest. The reports issued by these Panels include: *Assessment of Technology for Advanced Power Cycles*, *Coal Mining*, *Assessment of Advanced Technology for Direct Combustion of Coal*, *Assessment of Technology for the Liquefaction of Coal*, and *Assessment of Low-Btu Gasification of Coal*. It is hoped that these reports will provide a sound basis for increased public and governmental understanding of the problems and options of coal processing and utilization and will assist in the national determination of the rate and manner in which this abundant natural resource is used to provide an increasing portion of domestic energy needs.

While this report and the others in the series deal with subjects clearly crucial to the evolution of energy policy and practice, they deal primarily with present and immediately foreseeable coal processing and utilization technology. Also, the Committee and its Panels recognize that their economic comparisons and timing expectations are subject to change as a result of possible developments (e.g., financial, legislative, regulatory, antitrust, international-trade, price-structure, environmental, and as-yet-undisclosed proprietary developments) whose outcomes cannot be predicted confidently. Thus, this series of reports should be read both independently and in light of the very broad, longer term energy assessment forthcoming from the NRC Committee on Nuclear and Alternative Energy Systems.

Walter R. Hibbard, Jr., *Chairman*
Committee on Processing and Utiliza-
tion of Fossil Fuels

PREFACE

Many processes for the improved utilization of coal are being studied here and abroad. This report was prepared by the ad hoc Panel on Liquefaction of Coal to present a summary of its assessment of various processes for the liquefaction of coal.

The Panel's primary objective was to identify and assess methods for producing clean liquids from coal, and the processes investigated are categorized under the following headings: pyrolysis and hydrocarbonization, solvent extraction, catalytic liquefaction, and indirect liquefaction. Particular emphasis was given to determining the development status, environmental effects, and costs for the liquefaction processes. On the basis of these findings recommendations have been made for development procedures.

The Panel's assessment of the present status and future course of technology for coal liquefaction is based in part on presentations by research and industrial organizations. The cooperation received from these organizations is appreciated.

It is hoped this report will stimulate increased governmental and public understanding of the problems of coal utilization and that it will direct attention and assignment of priority to the orderly use of this abundant natural resource.

Cedomir M. Sliepcevich, *Chairman*
Ad Hoc Panel on Liquefaction of Coal

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