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Legal and Institutional Impediments to Geothermal Energy Resource Development A Bibliography

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Introduction

This bibliography contains 485 references to literature on the subject of legal and institutional constraints to the development and use of geothermal energy resources. In addition to government-sponsored reports, journal articles, and books, the bibliography includes specific state and Federal laws and regulations, court cases of interest, and conference proceedings.

References are arranged in inverse chronological order and are made up of complete bibliographic citations. These are followed by an abstract or a listing of subject descriptors used to describe the subject content of each reference.

Four indexes are provided: Corporate, Personal Author, Subject, and Report Number. Each index is introduced by text that describes its content and format.

The citations in this bibliography are also included in DOE's Energy Data Base, and may be recalled using DOE's on-line computer retrieval system RECON.

CONTENTS

ABSTRACTS

1 INSTITUTIONAL AND ENVIRONMENTAL ASPECTS OF GEOTHERMAL ENERGY DEVELOPMENT. Citron, O.R. (Jet Propulsion Lab., Pasadena, CA). Nucl. Technol.; 34: 38-42(Jun 1977).

The increasing interest in exploiting the variety of geothermal resources has prompted an examination of the institutional barriers to their introduction for commercial use. A significant effort was undertaken by the Jet Propulsion Laboratory as a part of a national study to identify existing constraints to geothermal development and possible remedial actions. These aspects included legislative and legal parameters plus environmental, social, and economic considerations.

2 GEOTHERMAL ENERGY DEVELOPMENT. Rowley, J.C. (University of California, Los Alamos, N. M.). Phys. Today; 30: No. 1, 36-45(Jan 1977).

Research needed to hasten the use of the little-tapped but extensive heat energy of the Earth includes devising sensors to operate in the hot, corrosive underground environment and improving surface geophysical measurements.

3 COSTS OF GEOTHERMAL ENERGY DEVELOPMENT. FINAL REPORT, JANUARY 1977. Larson, T. Riverside, CA; Dry Lands Research Inst. (1977). 63p.

Main updated material from earlier July 1976 paper includes additional sources of cost information in the tables; portions concerning County Property Taxes; and Risks and Returns on Investment. Both optimistic and pessimistic projections of capital and operating costs necessary to develop and maintain a 200 MW geothermal field and power plant in Imperial Valley for 20 to 30 years are examined. (PCS)

4 REGULATORY, PLANNING AND POLICY ASPECTS OF GEOTHERMAL ENERGY DEVELOPMENT IN IMPERIAL COUNTY, CALIFORNIA. Buck, J.V.; Gluck, D.; Hagman, D.; Krier, J.; Thompson, S. Riverside, CA; Dry Lands Research Inst. (1977). vp.

Political and legal aspects of various possible county regulations that could apply to geothermal development are reviewed. (PCS)

5 ECONOMIC IMPACT OF GEOTHERMAL ENERGY DEVELOPMENT. Rose, A. Riverside, CA; Dry Lands Research Inst. (1977). 103p.

While this investigation is basically a case study for the Imperial Valley, many of the results are applicable to geothermal development elsewhere and to development of other new energy sources, solar and tidal power, which all share common characteristics. Thirteen major economic indicators are analyzed for direct, secondary economic and demographic effects are given for the primary development scenario which calls for 4500 MW of electric generating capacity, in Imperial County by the year 2020. Impacts on agriculture; income distribution; employment; occupational variety; fiscal impact and potential costs for pollution abatement or control. A summary of policy recommendations are given for local control over each socio-economic variable. (PCS)

6 EFFECTS OF GEOTHERMAL DEVELOPMENT ON THE AGRICULTURAL RESOURCES OF THE IMPERIAL VALLEY. Johnson, C. Riverside, CA; Dry Lands Research Inst. (1977). 27p.

The agricultural resources are mapped for each of four KGRA's in the Imperial Valley. The maps show crops, land ownership, and irrigation canals. It is concluded that no more than 3.36% of the land is needed for geothermal development and that careful planning could reduce this figure to less than 1%. (MHR)

7 OPINION ABOUT GEOTHERMAL DEVELOPMENT IN IMPERIAL COUNTY, CALIFORNIA, 1976. FINAL REPORT. Butler, E.W.; Pick, J.B. Riverside, CA; Dry Lands Research Inst. (1977). 67p.

The results of a public opinion survey on geothermal development are presented. It was concluded that nine out of ten persons surveyed were in favor of it. There was clear agreement that geothermal development should be strictly regulated. However, only a small minority of the Imperial County population feels that they have a very good understanding of geothermal development. The methodology, questionnaire, and statistical results for each question are given. (MHR)

8 POPULATION ANALYSIS RELATIVE TO GEOTHERMAL ENERGY DEVELOPMENT, IMPERIAL COUNTY, CALIFORNIA. Pick, J.B.; Jung, T.H.; Butler, E. Riverside, CA; Dry Lands Research Inst. (1977). 118p.

The following topics are covered: general demography, economic effects on migration, energy capacity and consumption, population and economic statistics for Imperial County, 1950--1970, regional socioeconomic comparisons, discriminant analysis of geothermal areas, Spanish American population of Imperial County, regional employment implications for geothermal energy development, population projections and transferability of methods and results. (MHR)

9 GEOTHERMAL RESOURCES DEVELOPMENT INSTITUTE CONFERENCE, SALT LAKE CITY, UTAH, JANUARY 27--28, 1977. Boulder, CO; Rocky Mountain Mineral

Law Foundation (1977). vp.
Fourteen papers and a bibliography are presented. Separate abstracts were prepared for each. (MHR)

10 INTRODUCTION AND LEGAL OVERVIEW OF GEOTHERMAL RESOURCES. Root, T.E. (Energy Fuels Corp., Denver). pp 6p, Paper 1 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
A brief introduction to the papers to follow is presented. (MHR)

11 TECHNICAL OVERVIEW OF GEOTHERMAL RESOURCES. Austin, C.F. (Naval Weapons Center, China Lake, CA). pp 15p, Paper 2 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
A geothermal deposit is defined as an accumulation of heat within the crust of the earth. Those geologic processes that first of all provide heat and more specifically accumulate that heat into a localized and concentrated deposit are described. (MHR)

12 GEOTHERMAL LEASING PRACTICES. Kitchen, G.J. (AMAX, Inc., Denver). pp 38p, Paper 3 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
A general overview of the resource is presented to the extent the subject bears on leasing practices. Some legal and practical problems involved in developing the resource are discussed. Finally, a hypothetical land situation is described and some suggestions are made for leasing geothermal resources on the described premises. (MHR)

13 GEOTHERMAL RESOURCES JOINT VENTURES. Schlauch, P.J. (Dawson, Nagel, Sherman, and Howard, Denver). pp 23p, Paper 4 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
An attempt is made to identify and analyze the more important of the differences between joint ventures in oil and gas and those in geothermal resources. Matters which should receive special attention in structuring a geothermal resource joint venture are discussed. (MHR)

14 ROLE OF MUNICIPALITIES IN GEOTHERMAL RESOURCE DEVELOPMENT. Kramer, W.K.; Hammer, M. (O'Melveny and Meyers, Los Angeles). pp 29p, Paper 5 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
Those provisions of California law affecting municipal utilities interest in geothermal exploration, development, and exploitation are explored. The various problems encountered by the City of Burbank and the Northern California Power Agency are used as illustrations. The impact of self-imposed limitations in the form of outstanding bond covenants and other contractual obligations are considered. (MHR)

15 GEOTHERMAL RESOURCES: WATER AND OTHER CONFLICTS ENCOUNTERED BY THE DEVELOPER. AN ALTERNATIVE ENERGY SOURCE WHICH IS ''GATHERING STEAM''. Vranesh, G.; Musick, J.D. Jr. (Vranesh and Musick, Boulder, CO). pp 66p, Paper 6 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
Geothermal resources are described briefly. Various environmental, legal, and technical obstacles are reviewed. Federal and state legislation and case law are outlined which might affect geothermal development if the resource is treated as either mineral or water. The treatment of geothermal resources in one jurisdiction, Colorado, is summarized, and possible legal solutions necessary to meet a goal of fuel sufficiency which is prudently accountable both environmentally and technologically are summarized. (MHR)

16 WATER CONFLICTS FROM THE VIEWPOINT OF A REGULATOR. Hansen, D.C. pp 9p, Paper 7 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
Maps are given showing known geothermal resource areas and areas which are prospectively valuable in the western states. From the view-point of a regulator the biggest hurdle for geothermal development to overcome is the large quantity of water that will be consumptively evaporated into the atmosphere in the generation of electricity. Current estimates for the amount of water consumed is 48 acre-feet/year/MW. Water rights need to be protected but on the other hand geothermal development cannot be based on a presumption of interference. (MHR)

17 UNITIZATION FOR GEOTHERMAL RESOURCES: UNITED WE SAVE. Goldstein, D.B. (Homestake Mining Co., San Francisco). pp 40p, Paper 8 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
The following subjects are discussed: a reservoir model, unitization applied to the geothermal model, maximizing total energy recovery through unitized operations, maximizing the economic use of recovered geothermal energy, prevention of the drilling of unnecessary wells, the need for drilling units, protection of ''correlative rights'', allocation of unit production, ''stand-by'' wells, injection, rights-of-way, statutory law applicable to geothermal unitization in California, practical obstacles to voluntary unitization, and the need for compulsory geothermal unitization. (MHRR)

18 FEDERAL ROLE IN GEOTHERMAL RESOURCE DEVELOPMENT. Stephens, R.C. (Energy Research and Development Administration, Washington, DC). pp 11p, Paper 9 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
The components of the Federal program mandated by PL 93-410 include specifically:

(1) Resource Inventory and Assessment, (2) Research and Development, (3) Demonstration, (4) Scientific and Technical Education, and (5) Loan Guaranties. Included in the goals of the research and development effort were social, legal, and economic studies for the development of policy conducive to commercial geothermal development. ERDA has taken the lead role in policy development. This aspect is discussed in some detail, following a brief description of the program areas. Areas covered include: institutional development, Federal land management, Federal taxation, the Geothermal Loan Guaranty Program, State and Local Government, and Federal Incentives. (MHR)

19 CONSTRAINTS ON GEOTHERMAL DEVELOPMENT: TAX AND BEYOND. McNamara, J.J. (Univ. of Southern California, Los Angeles). pp 18p, Paper 10 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
Difficulties with tax policies, energy policy, and various constraints as they relate to energy, especially geothermal energy are reviewed. (MHR)

20 INCOME TAXATION OF GEOTHERMAL RESOURCES. Maxfield, P.C. (Univ. of Wyoming, Laramie). pp 51p, Paper 12 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
It is proposed to outline as precisely as possible the state of the law with regard to this resource. Because the federal income tax laws relating to mineral exploration and development to a great extent turn at least indirectly on the specific depletion laws applicable to the various forms of geothermal energy, and the type of depletion allowable, i.e. statutory (percentage) and/or cost, it appears necessary to eschew herein a transactional type of approach which would proceed from acquisition to exploration, to development, to operation, to disposition in favor of the keystone questions, i.e. the allowability of depletion vel non and the type(s) of depletion allowable. These other subjects are examined primarily in so far as there are tax problems peculiar to the fledgling geothermal industry or in so far as there is uncertainty as to applicability of otherwise settled law. (MHR)

21 GEOTHERMAL SALES CONTRACTS. Snyder, S.A. (Union Oil Co. of California, Los Angeles). pp 37p, Paper 13 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
The sixteen sections in the first geothermal steam sales contract between Magma Power Company and Thermal Power Company and Pacific Gas and Electric Company are listed and discussed briefly. The legal developments between contracts are mentioned. A checklist is given of matters that must be considered in negotiating a sales contract for geothermal energy: restrictions contained in seller's title, consideration of problems involving the lease term, the problem of "other minerals" produced with the geothermal fluids, water law, other lease clauses that must be considered in the negotiations of a sales contract, the royalty problem, conditions precedent to the effectiveness of a contract, rights committed to the contract, taxes, price and measurement, equipment for conversion of the geothermal energy to electricity, surface rights, effluent disposal, right to terminate, renegotiation on changed conditions, assignments, indemnities and insurance, settlement of disputes, applicable law, and confidentiality. (MHR)

22 ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT. Tarlock A.D.; Waller, R.L. (Indiana Univ., Bloomington, IN). pp 12p, Paper 14 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
Geothermal exploration can be divided into the exploration, test drilling, production testing, field development, and power generation stages. The major expected physical adverse environmental impacts which can be expected during each of these five major stages are discussed. Next, the regulations applicable to each of the four potential conflicts (land use, water, air, and noise) are surveyed. (MHR)

23 OVERVIEW OF THE CALIFORNIA PERMITTING PROCESS. Trower, E.D. (Western Law Dept., Denver). pp 27p, Paper 15 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
During the more than fifteen years that it has lived with geothermal power production, California has developed, and continues to develop, a sophisticated geothermal regulatory structure. An overview is presented of that structure giving special emphasis to the exploration permitting process. The newly enacted Napa County Geothermal Ordinance is a focal point for discussion of the substantial powers which California has delegated to local units of state government. (MHR)

24 SUMMARY AND CONCLUDING REMARKS. Olpin, D. (O'Melveny and Meyers, Los Angeles). pp 1 of Geothermal Resources Development Institute. Boulder, CO; Rocky Mountain Mineral Law Foundation (1977).
From Conference on geothermal development; Salt Lake City, UT, USA (27 Jan 1977).
A geothermal bibliography is presented that is primarily composed of legal items. (MHR)

25 1977 GUIDEBOOK TO CALIFORNIA TAXES WITH SPECIAL EMPHASIS ON RELATIONSHIP TO FEDERAL TAXES. Bock, R.S. Chicago; Commerce Clearing House, Inc. (1977). 462p. $7.00.
This book is designed to be a quick reference work on California State taxes. With this in mind, the amount of detail is kept to a minimum by assuming that the reader has some knowledge of Federal taxes that are generally similar to the major California taxes (or that he has access to the wealth of information about Federal taxes that is readily available). The book explains the four major California taxes (personal income tax, tax on corporate income, inheritance tax, and gift tax), whenever possible, in terms of the comparable Federal taxes. Differences between the two laws are pointed out, and cross-references make it possible to trace from a given provision in one law to a comparable provision in the other. Special attention is given to subjects peculiar to the California law. In addition to the major State taxes, the book provides general information about

other taxes levied by the State. Property taxes are also discussed briefly, because of their statewide impact, although they are imposed by local governmental units.

26 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 6: PIPELINES AND SURFACE PRODUCTION FACILITIES. Washington, DC; Geological Survey (1977). 7p.

This Order (effective January 1, 1977) is established pursuant to the authority prescribed in 30CFR270.11. The design, operation, and testing of all pipelines and surface facilities will be conducted in accordance with the provisions of this Order. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30CFR270.48. References in this Order to approvals, determinations, or requirements are to those given or made by the Area Geothermal Supervisor or his delegated representative. The design of all pipelines and surface facilities, including but not limited to, production, injection, and waste water disposal systems, shall be submitted with the Application for Permit to Drill or on a Sundry Notice to the Supervisor for approval prior to construction. In addition, a Plan of Operation with contents and approval according to 30CFR270.34, shall be required when surface of environmental disturbances are anticipated beyond those covered by a previously approved Plan of Operation. Guidelines for design and construction, applying for construction of pipelines and related surface facilities, and the completion report are given.

27 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 7: PRODUCTION AND ROYALTY MEASUREMENT, EQUIPMENT, AND TESTING PROCEDURES. Washington, DC; Geological Survey (1977). 7p.

This Order (effective Januray 1, 1977) is established pursuant to the authority prescribed in 30CFR270.11 and 270.12 and in accordance with 30CFR270.60, 270.64, 270.74, and 270.75. All geothermal production and the resulting produced energy (electricity) or byproducts, and leasehold operational utilization thereof, shall be measured and monitored in accordance with the provisions of this Order. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30CFR270.48. References in this Order to approvals, determinations, or requirements are to those given or made by the Area Geothermal Supervisor or his delegated representatives. Metering, commingling production, common storage, meter testing and maintenance, and application for meter installation criteria are furnished.

28 MULTISECTOR ANALYSIS OF THE IMPACT OF GEOTHERMAL DEVELOPMENT ON THE ECONOMY OF IMPERIAL COUNTY, CALIFORNIA. Lofting, E.M. Riverside, CA; Dry Lands Research Inst. (1977). 78p.

An 85 sector input--output model for Imperial County was developed for 1972. The model was based on secondary data sources and modified national technical coefficients using the SLQ technique. Type I and type II income, employment, and value added multipliers were developed for each sector. Projections of economic activity were made for the 1975--2020 period based on population projections which (I) assumed no geothermal development in the county and (III) assumed geothermal development and relatively rapid population growth. Agricultural development was assumed to grow to 1.8 times its present level in both cases. For the Series I projection per capita income in 1972 constant dollars will remain essentially constant, while in the Series III projection it is estimated to increase from $4500 to $7100 per year. In both cases the employment to population ratio can be expected to remain relatively constant. Geothermal development is projected to add $700 million per year to the personal income of Imperial County by the year 2020. The linear programming analysis reveals that achieving projected growth in agricultural output will require an improvement in water use efficiency of at least 35%. When compared to alternative policies, such as attempting to maximize gross county product, employment maximizing policies may not result in significant increases in employment.

29 GEOGRAPHICAL ENVIRONMENTAL ANALYSIS. FINAL REPORT. Pasqualetti, M.J. Riverside, CA; Dry Lands Research Inst. (1977). 177p.

Interim conclusions concerning potential environmental impact from geothermal resource development in the Imperial Valley are made. Environmental effects from the initial phases of geothermal development will be minimal; however, no method of prediction can substitute for actual operation experience. Policy alternatives and recommendations for dealing with the environmental impact are discussed. (PCS)

30 GUIDELINES RELATIVE TO PIPELINES AND SURFACE PRODUCTION EQUIPMENT AND TO PRODUCTION AND ROYALTY MEASUREMENT, EQUIPMENT, AND TESTING PROCEDURES (ORDER NOS. 6 AND 7). Radlinski, W.A. Fed. Regist. (Wash., D.C.); 41: No. 236, 53498-53499(7 Dec 1976). (30CFR270).

These orders list significant modifications made in the draft orders (42 Fed. Reg. 100: 20901-02) providing guidelines relative to Pipelines and Surface Production Equipment and to Production and Royalty Measurement, Equipment and Testing Procedures for geothermal resources operations in the central and western regions. (PCS)

31 LEGAL ISSUES IN THE DEVELOPMENT OF GEOPRESSURED GEOTHERMAL RESOURCES OF TEXAS AND LOUISIANA GULF COAST (SUMMARY). Elmer, D.B. (Univ. of Texas, Austin). Geotherm. Energy Mag.; 4: No. 9, 13-19, 22-25, 27-28, 30-33, 35-38(Sep 1976).

Two major topics, legal scholarship and legal support, are covered. Scholarship is distinguished from support by concentration on abstract analyses of issues, which include resource definition, ownership, taxation, and multistate reservoirs. Support is based entirely on those legal tasks called up by the technical work scheduled in the areas of resource assessment, advanced research and technology, institutional and environmental and resource utilization. The definitions contained in the statutes of the thirteen western states, Texas, and Louisiana are presented. (MHR)

32 INDIANS CAUTIOUS ON DEVELOPMENT. Energy Dig. (Wash., D.C.); 6: No. 10, 597(20 Aug 1976).

The stresses and strains that would result from the mining of fossil and nuclear fuels on Indian reservations in the western U. S. cannot be conveyed in environmental impact statements, according to Ronald G. Faich, director of the Navajo Research and Statistics Center at Window Rock, Arizona. There are 22 Indian tribes with valuable energy resources. In the U.S., Indian lands contain more than half the known coal reserves on public domain and 33 percent of all

proven reserves west of the Mississippi. More than three-fourths of the Navajo tribe's revenues do come from its energy leasing program. Indians currently have two geothermal, 13,583 petroleum, 380 uranium, and 11 coal leases. Some tribes desire to mine, refine, and sell their own resources. Federal agencies are helping with financial, technical, and legal guidance. (MCW)

33 HEARING ON THE OWNERSHIP OF GEOTHERMAL STEAM UNDERLYING GEYSERS. GEOTHERMAL KINETICS INC., PLAINTIFF, VS UNION OIL COMPANY OF CALIFORNIA, DEFENDANTS, MAY 28, 1976. Geyser; 3: No. 11, vp(12 Aug 1976).

The question before the court (Superior Court of the State of California) was whether the geothermal steam system belongs to the owner of the mineral rights or the surface rights. This case involved conflicting claims to the geothermal steam system which underlies 408 acres of essentially unimproved mountain property lying south of Big Sulfur Creek in an area known as ''The Geysers'' in Sonoma County, California. A history of the land and mineral rights transfers since 1925 is reviewed. The Federal government and California recognize a geothermal system as being an energy resource. It was concluded at the hearing that the energy produced is a direct product of the molten minerals and gases within the resource. The water which transports the energy to the surface is a conveyor belt, nothing more. The total resource has all of the basic characteristics of those resources which the courts have classified as minerals on many occasions in many jurisdictions. The water condensed from the resource is not necessary for or beneficial to the use of the land. The surface owner wants the energy which the water carries, not the water itself. It is for these reasons that the court held that the plaintiff is the owner and entitled to the possession and control of all the geothermal steam and power and geothermal resources in and under the subject property by virtue of its leasehold interest. (MCW)

34 LEASE OF FEDERAL GEOTHERMAL ENERGY: ROCKY ROAD (ABSTRACT). Stark, D. (Bureau of Land Management, Billings, MT). Am. Assoc. Pet. Geol. Bull.; 60: No. 8, 1410(Aug 1976).

From 25. annual meeting of AAPG--SEPM Rocky Mountain Sections; Billings, MT, USA (28 Mar 1976).

LAND LEASING;GEOTHERMAL RESOURCES;GOVERNMENT POLICIES;PUBLIC LANDS

35 (SAN--1077-4, pp XIII.1-XIII.10) DEFINITION OF AN INSTITUTIONAL STRUCTURE. Cady, D.P.; Jeskey, J.C. 13 Jul 1976.

Susanville Geothermal Energy Project. Workshop proceedings final technical report.

The rationale and procedures used in selecting and structuring the candidate SGEP administrative vehicle are described. The institutional structure is bounded not only by legal considerations but is more stringently constrained by fundamental needs of the community. Criteria and considerations for the planning of local ordinances have also been included.

36 (SAN--1077-4, pp I.1-I.6) SUSANVILLE GEOTHERMAL ENERGY PROJECT OVERVIEW. Longyear, A.B. 13 Jul 1976.

Susanville Geothermal Energy Project. Workshop proceedings final technical report.

The Susanville Geothermal Energy Project (SGEP) has produced engineering procedures and economic modeling tools as aids for communities in planning for the development and use of geothermal energy. These tools have been developed based upon the needs and characteristics of Susanville, California, and eight other communities in six states. The rationale for structuring of institutional and financial vehicles has been included. Project and financial planning for a community geothermal utility system for industrial, commercial and residential users is offered as a guide to other communities.

37 (SAN--1077-4, pp II.1-II.16) SUSANVILLE PROJECT REQUIREMENTS. Edson, D.A. (VTN Consolidated, Inc., Irvine, CA). 13 Jul 1976.

Susanville Geothermal Energy Project. Workshop proceedings final technical report.

The Susanville Geothermal Energy Project Study Area may be characterized as a typical small U.S. east slope community as to its socio-economic base. Its economy is heavily dependent on forest products, agriculture and ranching and government employment at all levels. Employment is highly seasonal with unemployment figures as high as 24 percent. Its remoteness from major markets, compounded by inadequate rail and air service represent potential growth barriers. Present energy sources are expensive and unreliable. Conversely, these very factors tend to enhance the desirability of a broad based use of geothermal energy, if this resource can be properly developed and controlled. The availability of trained labor, favorable planning and governmental attitudes and attractiveness of the area are positive assets. Preliminary investigation has indicated that Agribusiness, discussed in another paper, Forest Products, Space Heating, and possibly Power Generation, may be potential areas of geothermal development.

38 (SAN--1077-4, pp XII.1-XII.34) SOCIO-ECONOMIC MODEL. Gardner, R.J.; Whitney, W.H. (Williams-Kuebelbeck and Associates, Inc., Marina del Rey, CA). 13 Jul 1976.

Susanville Geothermal Energy Project. Workshop proceedings final technical report.

The Socio-Economic Model has been designed to enable the user communities to project the community-wide impacts of proposed industrial enterprises related to the utilization of the geothermal resource. The Model has been prepared in a handbook format to facilitate its use.

39 (SAN--1077-4, pp XVI.1-XVI.14) CHARACTERISTICS OF NINE COMMUNITIES CONSIDERING GEOTHERMAL UTILIZATION. Longyear, A.B. 13 Jul 1976.

Susanville Geothermal Energy Project. Workshop proceedings final technical report.

The Utilization Panel, composed of Replicable Communities, was formed as a means of expediting the transfer of technology from the SGEP to other communities. Panel member communities were selected on the basis of having characteristics different than those of Susanville. These differences were used to assure that the engineering and economic modeling procedures would be developed having a wide range in application. A Newsletter has been published quarterly to further disseminate project results. An industrial geothermal laboratory has been evaluated and formation steps initiated.

40 (SAN--1077-4) Uncl SUSANVILLE GEOTHERMAL ENERGY PROJECT. WORKSHOP PROCEEDINGS FINAL TECHNICAL REPORT. Longyear,

A.B. (Energy Research and Development Administration, Washington, D.C. (USA). Div. of Geothermal Energy). 13 Jul 1976. Contract E(04-3)-1077. 249p. Dep. NTIS $8.00.
Separate abstracts were prepared for the 16 papers presented in ERA; 10 are included in EAPA. (WHK)

41 (SAN--1077-4, pp XVII.1-XVII.9)
SUSANVILLE GEOTHERMAL UTILITY SYSTEM.
Longyear, A.B. 13 Jul 1976.
Susanville Geothermal Energy Project. Workshop proceedings final technical report.
Program planning has been conducted in support of the SGEP for the current phase and for a plan for a community geothermal utility system. The rationale behind the planning has been included for use by others. Planning is detailed for the financing (including application for an ERDA guarantee) for the first thermal unit of the Susanville Geothermal Utility System (SGUS).

42 (NP--21355) Uncl MINING AND MINERALS POLICY: 1976 BICENTENNIAL EDITION. (Department of the Interior, Washington, D.C. (USA)). Jul 1976. 135p. GPO.
The report is organized into three basic parts. The first part, the Executive Summary, provides a brief description of the major topics and lists the issues and recommendations. The report then is divided into two sections. Section I, Summary, is comprised of three chapters: Increased Energy Security; Metals and Nonmetallic Minerals; and Trends and Events. Section II, Issues in Energy and Minerals Policy, is comprised of seven chapters: Federal Leasing; The Federal Role in Reducing the Fiscal Impacts of Energy Development; Availability of Federal Lands for Mineral Exploration and Development; Environmental Issues and the Mineral Industry; Developments in International Minerals Trade and Investment; Ocean Mining; and The Development of New Tools for Energy and Minerals Policy Analysis. (MCW)

43 (TID--3354-R1) Uncl GEOTHERMAL RESOURCES: EXPLORATION AND EXPLOITATION. A BIBLIOGRAPHY. (Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Technical Information Center). Jul 1976. 636p. Dep. NTIS $16.25.
This comprehensive bibliography contains 5476 citations of foreign and domestic research reports, journal articles, patents, conference proceedings, and books concerned with the exploration and exploitation of geothermal resources. The coverage dates back as far as useful references could be obtained and extends through June 1976. References are arranged in broad subject categories and are made up of complete bibliographic citations. These are followed by a listing of subject descriptors used to describe the subject content of each reference. Four indexes are included: Corporate, Personal Author, Subject, and Report Number. Also included is a list of journals from which articles were selected. (LBS)

44 (JPL--5040-25(Rev.A)(App.)) Uncl GEOTHERMAL ENERGY IN CALIFORNIA: STATUS REPORT. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 30 Jun 1976. vp. Energy Resources Conservation and Development Commission.
The potential for electric energy from geothermal resources in California is currently estimated to be equivalent to the output from 14 to 21 large (1000 MW) central station power plants. In addition, since over 30 California cities are located near potential geothermal resources, the non-electric applications of geothermal heat (industrial, agriculture, space heating, etc.) could be enormous. Therefore, the full-scale utilization of geothermal resources would have a major impact upon the energy picture of the state. This report presents a summary of the existing status of geothermal energy development in the state of California as of the early part of 1976. The report provides data on the extent of the resource base of the state and the present outlook for its utilization. It identifies the existing local, state, and federal laws, rules and regulations governing geothermal energy development and the responsibilities of each of the regulatory agencies involved. It also presents the differences in the development requirements among several counties and between California and its neighboring states. Finally, it describes on-going and planned activities in resource assessment and exploration, utilization, and research and development. Separate abstracts are prepared for ERDA Energy Research Abstracts (ERA) for Sections II--VI and the three Appendixes.

45 (JPL--5040-25(Rev.A)(App.), pp 3.1-3.25)
PRESENT PLANS FOR UTILIZATION OF GEOTHERMAL ENERGY. 30 Jun 1976.
Geothermal energy in California: status report.
The current outlook for the utilization of the hydrothermal resources is presented. The plans of the utilities for adding new generating capacity over the next 20 years and the role of geothermal energy in those plans are included. The data on electrical utilization was gathered from interviews with those utilities that have been identified as active or interested in geothermal energy. Nonelectric application of geothermal energy in the state is limited primarily to the Susanville area, where ERDA is supporting a study on the total use of geothermal resources, and the Imperial Valley, where the Bureau of Reclamation is conducting desalination research. As a result the data on nonelectric utilization was drawn from previous JPL interviews and analyses augmented by the data on current research and development activities of the Federal Government.

46 (JPL--5040-25(Rev.A)(App.), pp 6.1-6.14)
RESEARCH AND DEVELOPMENT. 30 Jun 1976.
Geothermal energy in California: status report.
The research and development activities under way in the nation that could be of assistance to geothermal development activities in the state are presented. The Federal government has a large and increasing budget to support geothermal energy development in the nation. The geothermal research and development activities of many of the state's educational institutions are supported by this program. The Federal Government programs as well as those of the California Energy Resources Conservation and Development Commission, the State Lands Commission, and the Electric Power Research Institute are summarized.

47 (JPL--5040-25(Rev.A)(App.), pp 4.1-4.34)
GEOTHERMAL RESOURCE DEVELOPMENT PROCESS. 30 Jun 1976.
Geothermal energy in California: status report.
A description is given of the development and approval process governing geothermal development in the state. An overview of the

development process in California on federal, state, and private lands is presented, and the involved agencies and their roles and responsibilities in that process are described. The key differences between the development in California and neighboring states are identified. Estimated development timelines are presented as are flowcharts depicting administrative processing time requirements. The results indicate that, on federal land in California, development of an electric power plant is estimated to require 9 years from the time the decision is made to explore to the time power would be on-line. For a nonelectrical application on federal land, the estimated time frame would be 5 years. Corresponding results for private and state lands are estimated to be approximately 8 years for an electric power plant and approximately 4 years for a nonelectric application. The primary reason for the shorter estimated development time on nonfederal land is that less time would be required for leasing land and less time would be required for the Environmental Impact Report process than for the Environmental Impact Statement process (when required under California Environmental Quality Act and National Environmental Protection Act).

48 (JPL--5040-25(Rev.A)(App.), pp A.1-A.108) APPENDIX A: GOVERNANCE OF GEOTHERMAL ENERGY DEVELOPMENT. 30 Jun 1976.

Geothermal energy in California: status report.

Geothermal development in California requires a number of government permits and approvals by local, state, and federal agencies. The procedural details by which governmental agencies implement the regulatory framework of their respective jurisdictions (i.e., state, federal, or county) are presented in this appendix. Since the involvement of some public agencies is related to (but not totally dependent upon) the ownership of the land under which the resource is located, a brief discussion of resource ownership litigation precedes the discussion of public agency roles.

49 (JPL--5040-25(Rev.A)(App.), pp B.1-B.11) APPENDIX B: ADMINISTRATIVE REQUIREMENTS FOR DEVELOPMENT OF GEOTHERMAL RESOURCES. Lyons, T. 30 Jun 1976.

Geothermal energy in California: status report.

Development of geothermal resources hinges, on close coordination and cooperation between two bodies: first the individual or entity with a will to invest money by engaging men and equipment for discovery and development, and second the government agency with jurisdiction over the resource itself or the activity on the surface above. This paper is written to help the reader understand the second body by viewing the numerous agencies to be dealt with, the public purposes they serve, and the requirements they impose upon the first body. Statutes and rules pertaining to the state of Oregon are used since they are a fair representation of what would be encountered in other states. Only those requirements which reveal the agency's main area of concern are expressly mentioned.

50 (LBL--5204) Uncl PUBLIC OPINION IN COBB VALLEY CONCERNING GEOTHERMAL DEVELOPMENT IN LAKE COUNTY, CALIFORNIA. Vollintine, L.; Weres, O. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1976. Contract W-7405-Eng-48. 44p. Dep. NTIS $4.00.

In the Spring of 1975 the Friends of Cobb, a local environmental group, polled the registered voters of the Cobb Valley precinct, Lake County, California, about their opinions regarding the development of geothermal energy in Lake County. Sixty-five percent of those polled responded, and an analysis of their responses indicates the following: (1) The people of the Cobb Valley (which lies directly in the path of geothermal development) are rather less pleased with the prospect than a previous poll has shown the people of Lake County as a whole to be. As measured by an index of general support for development, one-third of the Cobb people are for development, one-third are against, and the remaining third are undecided or have mixed feelings. (Countywide, nearly two-thirds support development.) (2) Support for and opposition to geothermal development correlate most highly with the perception of environmental impacts, the expectation of economic benefits in the form of increased job opportunities and tax revenues, and size of land holdings. (3) Among those who own more than ten acres of land, the willingness to lease land for geothermal development correlates most highly with the perception of environmental impacts.

51 (NP--21256) Uncl SUMMER LAKE BASIN GEOTHERMAL LEASING: ENVIRONMENTAL ANALYSIS RECORD. Broili, C.; Cannon, W.; Depaoli, E.; Doughty, L.; Hammersmark, M.; Hill, D.; Schlagel, M. (Bureau of Land Management, Lakeview, Oreg. (USA). Lakeview District). Jun 1976. 176p. Bureau of Land Management, Lakeview, OR.

The impact of proposed geothermal resource leasing on National Resource lands in a portion of the Lakeview B.L.M. District is analyzed. Included are: a description of proposed action, a description of the existing environment, an analysis of proposed action and alternatives, possible mitigating or enhancing measures, recommendations for mitigation, residual impacts, relationship between short-term use and long-term productivity, and irreversible and irretrievable commitments. (MHR)

52 (NTIS/PS--76/0462) Uncl GEOTHERMAL ENERGY. VOLUME I. 1964--APRIL 1975 (CITATIONS FROM THE NTIS DATA BASE). REPORT FOR 1964--APR 1975. Smith, M.F. (National Technical Information Service, Springfield, Va. (USA)). Jun 1976. 153p. NTIS $25.00.

All aspects of geothermal energy are covered including development, prospecting, technology, and corrosion problems. This updated bibliography contains 148 abstracts.

53 (NTIS/PS--76/0465) Uncl GEOTHERMAL ENERGY. VOLUME 2. 1975--APRIL 1976 (CITATIONS FROM THE ENGINEERING INDEX DATA BASE). REPORT FOR 1975--APR 1976. Smith, M.F. (National Technical Information Service, Springfield, Va. (USA)). Jun 1976. 174p. NTIS $25.00.

These citations of geothermal worldwide research are mainly concerned with geothermal energy assessment, prospecting, geology, and well drilling. Studies on heating, refrigeration, electric power generation, and steam heating are also included along with reports on Government policies, environmental impacts, and engineering. (Contains 169 abstracts)

54 GEOTHERMAL ENERGY AS AN 'ALTERNATIVE' SOURCE. Garnish, J.D. (Atomic Energy Research Establishment, Harwell, Eng.). Energy Policy; 4: No. 2, 130-143(Jun 1976).

Geothermal energy is receiving increasing

attention, with over sixty countries now looking seriously at the possibility of its exploitation. Although, for most parts of the world, a nonrenewable resource, new techniques such as pressure fracturing of rocks, could very considerably extend the resource base. Geothermal energy offers promise of becoming a very important complementary source in many parts of the world, providing heat up to about 250°C and releasing premium fuels for applications requiring higher temperatures or transportability. (editor's summary)

55 REPLY FROM THE FEDERAL GOVERNMENT CONCERNING NEW PRIMARY ENERGY SOURCES. Laermann, K.H.; Blank, B.; Haenschke, F.; Lohmar, U.; Meinecke, R.; Scheffler, H.; Schluckebier, G.; Stahl, E.; Wendt, M.; Wolfram, E. (Deutscher Bundestag, Bonn (F.R. Germany)). Bundesrat - Drucksache; No. 7; 5313, 1-12(Jun 1976). (In German).

A safe energy supply is of central importance for all national economies, and in particular for industrialized countries like the FRG. In view of this special importance, energy policies have a high priority within the overall policies. The Federal government has taken account of this fact in the energy program of September 1973 and its first continuation in the autumn of 1974, and it has thus presented a modern overall concept from the view of energy policies. In connection with this program, energy research ranks very high because in the long run it offers important possibilities for the energy supply of the FRG. Coal, the only source of energy in the FRG which is available in abundance, stands well to the fore of the program. Within the framework of this program, research and development activities have been initiated for utilizing the regenerative primary energies sun, wind, geothermal energy, and fresh and salt water energy. The utilization of these kinds of energy, belonging predominantly to the group of primary energy carriers with a limited capacity is, generally speaking, more in the environmental interest than the utilization of those kinds of energy which are dependent on resources; in the former cases no additional energy is brought onto the earth's surface, but available natural energy generation is used. (tr-auth)

56 ENERGY ECONOMICS. Liberman, L.M. Am. Gas Assoc. Mon.; 58: No. 6, 4-7, 32(Jun 1976). From A.G.A. marketing conference; Boston, MA (16 Mar 1976).

The history of natural gas and its development restrictions said to be due to governmental regulation are considered. The Supreme Court's Phillips Decision in June 1954 which ruled that the FPC had both the jurisdiction and responsibility for regulation of the wellhead price of natural gas, is discussed. The Phillips Decision determined that Congress meant only to exempt the physical act of production and gathering from regulation but not the sales that resulted from that act. Natural gas wellhead price became seriously underpriced and discoveries declined continuously after the early 1960s. Passage of the 1967 Air Quality Control Act caused a decline in the use of coal in industry since natural gas was cheaper. The natural gas industry could not meet demand, fuel oil refining had declined, and coal development had decreased. An economic comparison is made of Btus in the forms of OPEC and old and new U. S. oil, natural gas, and coal. It is concluded that if a long-range supply of petroleum products are to be forthcoming, coal reserves will have to be liquefied and gasified. (MCW)

57 REPLY BY THE FEDERAL GOVERNMENT TO A QUESTION CONCERNING NEW PRIMARY ENERGY SOURCES RAISED IN THE BUNDESTAG. Matthoefer, H. (Bundesministerium fuer Forschung und Technologie, Bonn (F.R. Germany)). Bundesrat - Drucksache; No. 7;5313, 1-11(Jun 1976). (In German).

A question raised in the Bundestag concerning new primary energy sources was answered by the Federal Minister for Science and Technology in his letter dated June 2, 1976; the letter called attention to the Federal Government's energy program of September 1973 which, instead of promoting research almost exclusively on the nuclear sector as used to be the case, aims at a purposeful and comprehensive promotion by the state of non-nuclear energy research as well in the FRG. Solar energy seems to have the best chance in the FRG of being utilized in an industrial way, applying low-temperature collectors to recover heat for heating and hot water preparation; 28 million DM have been invested so far. Despite the fact that the technical potential of wind power in the FRG would cover almost 75% of the present electricity demand, only plants with a small kW range are being developed at the moment as the question of energy storage is still open; 0.3 million DM have been granted so far. The utilization of geothermal power can only be of interest for the FRG on the basis of the hot-dry-rock method; drilling work is carried out in the Eifel district investigating geothermal gradients: 1.25 million DM have been granted so far. In 1976 the projects mentioned above have been allotted research funds amounting to 20 million DM. Energy from running/tidal waters is utilized in the FRG to 90% so far, but this only accounts for 6.7% of the gross electricity generation. Therefore, its importance for the energy supply of the FRG will decrease when the energy demand increases.

58 GEOTHERMAL ENERGY RESEARCH, DEVELOPMENT, DEMONSTRATION, AND PRODUCTION; FEDERAL GUARANTEES ON LOANS. Seamans, R.C. Jr. Fed. Regist. (Wash., D.C.); 41: No. 103, 21433-21440(26 May 1976). (10CFR790).

On October 28, 1975, the Energy Research and Development Administration published a proposed regulation concerned with enabling lenders to obtain Federal guarantees on loans to qualified borrowers for purposes related to the commercial development of practical means to produce electric power and other forms of useful energy from geothermal resources in an environmentally acceptable manner. The objectives of the Federal geothermal loan guaranty program are: (a) to encourage and assist the private and public sectors to accelerate development of geothermal resources with environmentally acceptable processes by enabling the Administrator of the Energy Research and Development Administration, in the exercise of reasonable judgment, to minimize a lender's financial risk that is associated with the introduction of new geothermal resources and technology; and, (b) to develop normal borrower-lender relationships which will in time encourage the flow of credit so as to assist in the development of geothermal resources without the need for Federal assistance. The regulation became effective June 25, 1976. (MCW)

59 (UCRL--52000-76-5, pp 21-26) IMPERIAL VALLEY ENVIRONMENTAL PROJECT. May 1976. Energy and technology review.

ERDA has designated LLL to head up a two-year environmental study that should allow

government, power-company officials, and other interested parties to assess the impact of geothermal development on California's Imperial Valley. The study, funded at $2.4 million for FY 1977, will involve some 40 LLL investigators, 25 university contractors, and several state and local governmental agencies. Work on the project is now under way. Major research areas of this coordinated study include air and water quality, effects on the ecosystem, subsidence and induced seismicity, health effects, and socioeconomic impacts. The study will include an integrated assessment to facilitate decision-making.

60 EX-ASSISTANT ADMINISTRATOR LOOKS BACK ON ERDA'S 1ST YEAR...AND AHEAD TO 2ND. Energy Res. Rep.; 2: No. 5, 7-11(May 1976).

This interview with Dr. Teem, former assistant administrator of solar, geothermal, and advanced energy systems, was conducted March 18 and updated April 5, 1976. Among other things Dr. Teem revealed that, after three months of ERDA's existence, 60 percent of the incoming mail concerned solar energy. After discussing government actions regarding solar energy--budgets, technology, and progress--Dr. Teem then comments on other programs formerly under his leadership--geothermal, controlled thermonuclear fusion, and high-energy physics. He feels the potential for geothermal is surprisingly good. In answer to another query, he does not feel that a Department of Energy and Natural Resources is needed at this time. (MCW)

61 PACIFIC NORTHWEST GEOTHERMAL: REVIEW AND OUTLOOK. Youngquist, W. Geotherm. Energy Mag.; 4: No. 5, 28-31(May 1976).

A review is given of some of the more significant geothermal exploratory developments this past year in Idaho, Oregon, and Washington. The critical role of the U. S. Government in development of these geothermal resources is described. (MOW)

62 GREIDER GEOTHERMAL STATEMENT, BASED ON TESTIMONY PRESENTED TO LT. GOV. DYMALLY COMMITTEE. Greider, B. Geotherm. Energy Mag.; 4: No. 4, 27-29, 31-34, 36-37(Apr 1976).

Factors that contribute to the delay of geothermal development by utilities are discussed. These include: the increasingly complex regulations on the Geysers field; low quality and sizes of hot water resources; economics of financing geothermal exploration; professional experience; and lack of faith in the technology of conversion of hot water into electricity. Key issues that must be resolved before geothermal development can significantly penetrate the electricity generation industry are presented. It is pointed out that legislation to stimulate development of California's geothermal resources should be based on consideration of the following items: streamlined controls which allow geothermal exploration and development to proceed under a minimum of effective regulation; reasonable tax provisions encouraging exploration, research, development, and production of geothermal energy; and suitable economic incentives for utility companies that will encourage early commitment to construct generating plants. (LBS)

63 FEA: PRICES HOLD KEY TO ENERGY FUTURE. Oil Gas J.; 74: No. 11, 60-61(15 Mar 1976).

The Federal Energy Administration paints a bleak picture of the U.S. energy outlook unless oil and gas prices are deregulated, OCS development is pursued, and strong government support is provided for alternate fuels. This is the main thrust of the agency's new National Energy Outlook, an update of its November 1974 Project Independence report. The new forecast makes little mention of 1980 goals, when energy independence originally was to be the target, but does refer often to the outlook for 1990. If oil and gas prices continue to be regulated at low levels, oil imports, now averaging about 6 million b/d, could rise to 13.5 million b/d, the report projects. With intensely accelerated production of both onshore and offshore sources under free-market pricing and increased conservation efforts, imports could drop as low as 1-2 million b/d by 1985. FEA, however, feels this is highly unlikely. Its actual forecast is that even with current world prices, oil and gas price decontrol, and present OCS production plans, imports will drop only slightly in 1985 to 5.9 million b/d. FEA has trimmed its expectations for nuclear power's contribution to future energy needs. And it now says new technologies such as solar, geothermal, and synthetic fuels will contribute only 1 percent by 1985 and will have major contributions only after 1990--if force fed by the Government. (from Introduction)

64 (CONF-760205--, pp 120-143) OTHER ENERGY SOURCES. Postma, H. (Oak Ridge National Lab., TN). Mar 1976.

From WATTec symposium for public awareness on energy; Knoxville, Tennessee, United States of America (USA) (27 Feb 1976).

Energy awareness.

Solar energy, geothermal energy, and fusion energy sources are discussed with answers provided for the following questions: how large is the resource; what is the state of the technology; what are the engineering problems; how economical is it now or can it ever be; what are institutional, legal, and political problems; what are the environmental effects; is it acceptable; and how long will it take to be economical and to make a reasonable impact. Recoverable domestic energy resources in the U.S. are reviewed, and the ''historical'' time span to change energy sources is cited. Topics discussed on solar energy include direct applications, solar electric generation, terrestrial and marine biomass production, and wave and tidal energy. The categories covered in the discussion on geothermal energy include dry steam systems at the Geysers; hot water; geopressured systems; hot dry rock systems; and heat that could be derived from normal thermal gradients and magma. The two approaches that are being taken to develop fusion energy--magnetic confinement and laser fusion--are discussed briefly. A brief discussion is included on solid-waste conversion to fuel or to be directly burned. The basic problem in U.S. energy policy is how to get from 1976 to the days of solar, geothermal, or solid-waste utilization for energy. (MCW)

65 (LBL--4447) Uncl PUBLIC OPINION CONCERNING GEOTHERMAL DEVELOPMENT IN LAKE COUNTY, CALIFORNIA. Vollintine, L.; Weres, O. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Mar 1976. Contract W-7405-Eng-48. 55p. Dep. NTIS $4.50.

A random sample of 2500 of the registered voters of Lake County, California, were polled about their opinions regarding the prospect of the development of geothermal energy in Lake County. The results of a secondary analysis of their responses are presented. The main conclusions are: (1) A large majority of the respondents are in favor of geothermal development provided that it is suitably

regulated to minimize negative environmental impacts. (2) The main determinants of the respondents' approval or disapproval of geothermal development are their expectations concerning the environmental impacts of geothermal development and the economic benefits of development for the county. Essentially all respondents who do not perceive negative environmental impacts support development, and the expectation of increased job opportunities and/or tax revenues is a nearly absolute prerequisite for support of development. (3) Pro- and anti-geothermal bias have strong effects upon the formation of opinions about leasing and the perception of environmental impacts. (4) Purely demographic characteristics of the respondents, such as employment status and years of residence in the county, have only limited effects upon their attitudes toward geothermal development except in the southern portion of the county, where longer term residents and those who live in the county for reasons of employment are more in favor of development.

66 (MTR--7137) Uncl GEOTHERMAL ENERGY RESOURCE UTILIZATION PROGRAM PLANNING. Grover, F.T. (Mitre Corp., McLean, Va. (USA)). Mar 1976. Contract E(11-1)-2693. 44p. (COO/2693--76/1). Dep. NTIS $4.00.

ERDA's basic strategy for creating alternative energy supplies is to conduct a program of research, development, and demonstration of energy technology which induces and aids private exploitation of, in this case, geothermal energy resources (commercialization). So that the existence of (user) choice is demonstrated, and as a means of channelizing efforts for the mitigation of the nation's gathering crisis in energy supply, specific commercialization goals have been set by ERDA. A procedure is described for planning the achievement of the commercialization goals established for geothermal energy resources. It has been prepared for the consideration of the Office of Resource Utilization, of ERDA's Division of Geothermal Energy.

67 (NP--21229) Uncl GEOTHERMAL RESOURCES, PRESENT AND FUTURE DEMAND FOR POWER AND LEGISLATION IN THE STATE OF WYOMING. PUBLIC INFORMATION SERIES 1. Decker, E.R. (Wyoming Geological Survey, Laramie (USA)). Mar 1976. 24p. Wyoming Geological Survey, Laramie $0.50.

Data on thermal springs and wells in Wyoming, exclusive of Yellowstone Park, are summarized. The presentation includes a map showing general spring and well locations outside the Park and lands in Wyoming that have been classified as being prospectively of geothermal value. Locations and geothermal data on the springs and wells are tabulated and a short table of chemical analyses of spring waters is also presented. Although thermal data constitute most of the material presented, the present and future demands for electrical energy in Wyoming are also summarized, and state legislation pertaining to exploration near thermal springs is reviewed. A list of state and federal agencies is included so that interested parties may obtain copies of pertinent legislation and information on the status of land.

68 (TID--27034) Uncl ENVIRONMENTAL ASSESSMENT OF PROPOSED GEOTHERMAL WELL TESTING IN THE TIGRE LAGOON OIL FIELD, VERMILION PARISH, LOUISIANA. (Energy Research and Development Administration, Washington, D.C. (USA). Div. of Geothermal Energy; Coastal Environments, Inc., Baton Rouge, La. (USA)). Mar 1976. 97p. Dep. NTIS $5.00.

An environmental assessment is made of the proposed testing of two geopressured, geothermal aquifers in central coastal Louisiana. On the basis of an analysis of the environmental setting, subsurface characteristics, and the proposed action, potential environmental impacts are determined and evaluated together with potential conflicts with federal, state, and local programs. (LBS)

69 GEOTHERMAL ENERGY: AN INDUSTRY APPRAISAL. Olson, H.J.; Dolan, W.M. Min. Congr. J.; 62: No. 3, 18-21(Mar 1976).

Some deterrents to the rapid development of geothermal energy by industry are discussed. It is pointed out that those groups in the business of pursuing subsurface resources will be motivated to rapidly develop a geothermal industry if: (1) realistic definitions of known geothermal resource areas (KGRAs) are provided; (2) the agency prerogative concerning creation of KGRAs are severely restricted; (3) non-competitive leases are promptly issued; (4) escrow provisions or other arrangements are implemented, permitting geothermal leases to be issued on the Federal mineral estate; (5) acreage limitations per state are substantially increased; (6) tax legislation, specifically for geothermal, is enacted that provides for intangible drilling cost deductions, depletion allowances or equivalents; and accelerated write-offs; (7) the already legislated guaranteed loan program is implemented with expeditions processing requirements; and (8) environmental compliance procedures are streamlined. (LBS)

70 ROLE OF THE STATE LANDS DIVISION IN DEVELOPING GEOTHERMAL RESOURCES IN CALIFORNIA. Northrop, W.F. Geotherm. Energy Mag.; 4: No. 3, 13-14(Mar 1976).

The State Lands Commission has jurisdiction over approximately one half million acres of land of geothermal potential. The Commission issues prospecting permits and leases for the exploration and development of geothermal resources under provisions of the Public Resources Code, the California Administrative Code, and the Geothermal Resources Act of 1967. Certain details of these provisions are discussed. Pending legislation, Senate Bill 517, will make some major provisions in the law dealing with the exploration, development, and utilization of geothermal resources. If the bill is approved, the prospecting permit procedure will be eliminated and all State leases will be issued by competitive public bid. Other aspects of the pending legislation are discussed. (LBS)

71 OBSERVATIONS ON FEDERAL ENERGY RESEARCH AND DEVELOPMENT, DECEMBER 1974. Weinberg, A.M.; Burwell, C.C. (Federal Energy Administration, Washington, DC). Energy (Oxford); 1: No. 1, 3-9(Mar 1976).

Much of our country's present stance in energy R and D is an embodiment of the recommendations presented in the Dixy Lee Ray report, ''The Nation's Energy Future.'' Since that report appeared, the Energy Research and Development Administration was established, and the Project Independence Blueprint was completed. To what extent does the passage of a year change the priorities or the scale of energy research and development which was outlined in NEF. This memorandum recommends a few specific R and D programs and related institutional changes that ought to be undertaken in response to events that have

occurred since November 1973. (Ed. note: although this "observations" report was completed in December 1974--and was originally intended only as an internal memo--it was published here because of its historical value and because the subject continues to be timely.)

72 BOOM TOWNS MAY HINDER ENERGY RESOURCE DEVELOPMENT. Gilmore, J.S. (Univ. of Denver Research Inst.). Science; 191: No. 4227, 535-540(13 Feb 1976).

The development of a community in an area where an energy source is being developed can be a frustrating situation for local and state governments charged with protecting the health, safety, and welfare of their populations. Pistol Shot, USA, is selected as an imaginary typical western community about to be impacted by the development of coal, oil shale, uranium, or geothermal resources. Pistol Shot is 100 miles from a town of as many as 10,000 or 15,000 people; it is more than 200 miles from a metropolitan area. It is dependent on its own resources, is a county seat in a sparsely settled ranching country, although there was some mining in the past. Its population in 1970 was 1200. Accelerated development of energy will cause the community to be unable to furnish services and facilities needed to acommodate the population growth. When this happens, productivity declines, projects overrun time and cost schedules, and operating outputs fall behind. The state will be needed to help in management growth. Until each state can modify its laws, taxes, and its constitution, substantial Federal government help will be needed. Current ways of doing things also need to be modified by the energy industry, local governments, and the mass media. (MCW)

73 (NP--21008) Uncl PROPOSED ENERGY RESEARCH AND DEVELOPMENT PROGRAM: FISCAL YEAR 1976/77. CALIFORNIA ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION. (California Energy Resources Conservation and Development Commission, Sacramento (USA)). Feb 1976. 187p. (RD--76-1). TIC.

California's proposed 1976/1977 energy research and development program is a practical, integrated effort designed to be of significant benefit to California over the near and long term. It is aimed at finding, developing, and facilitating the widespread use of economically attractive, alternative energy systems having minimal adverse environmental impact. The results of this program will expand the energy options available to Californians. It will enhance personal, local, and State level control over the energy future. Further it will facilitate innovative, constructive responses on the part of Californians to the rapidly changing nature of the energy problem. ... In particular, this program concentrates on new conservation techniques and alternative energy sources, especially solar and geothermal energy. In addition new options for the siting of the State's energy facilities will be further developed. However, new technologies are only one aspect of what is needed to resolve State energy problems. An equally important aspect involves ensuring the broad application of these new techniques in all regions of California, and the task of promoting rapid market penetration of worthwhile new technologies will be designed into each program and project from the start. The proposed program has been divided into seven program areas: Solar Energy; Geothermal Energy; Conservation and Efficiency; Inter-Program Projects; Fuels; Transportation; and Utility Systems. (from Overview and Summary)

74 (NP--21381) Uncl SOME ISSUES REGARDING REGULATORY POLICY, POLITICAL PARTICIPATION, AND SOCIAL IMPLICATIONS OF GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY. Green, P.S.; Steinberger, M.F. (California Univ., Riverside (USA). Center for Social and Behavioral Science Research). Feb 1976. 62p. Univ. of California, Riverside.

The early stages of geothermal resource development in the Imperial Valley have been characterized by an emphasis on the technological expertise of private developers and government officials. Government officials have created a complex array of Federal, state and county regulations to monitor the development. Local control is under the jurisdiction of the Imperial County government. The County has as its responsibility the protection of the general welfare of its residents, including any potentially adverse social, economic, or environmental impacts caused by geothermal resource development. Private developers and government officials are interested in the resources as a source of water desalination and electric power generation. An assessment of the interests and concerns of the public was made early in the development stage. In view of all these interests, it is essential in a democratic society that the various interests be identified so government can be representative of, and responsive to, those interests. Therefore, the four issues discussed in the paper are: (1) regulatory problems faced by local government officials in determining the course of development; (2) the social and political context in which the development is taking place; (3) the potential of geothermal development as perceived by community leaders and local government officials; and (4) the desirability of expanding citizen participation in geothermal decision-makingduring a period in which, as public opinion polls indicated, many citizens feel separated from government actions which may significantly affect their lives. Recommendations for regulations of geothermal resources and recommendations for improving public input into geothermal regulation are summarized in depth. (MCW)

75 LEGAL ASPECTS OF THE UTILIZATION OF GEOTHERMAL HEAT. Heller, W. Erdoel Kohle, Erdgas, Petrochem.; 29: No. 2, 83-84(Feb 1976). (In German).

At present, there are still no special legal regulations by the Bund or the Laender. For exploration, prospecting and mining there are only the mining laws and the law issued by the Laender pertaining to water supplies and waterways, both of which also apply to all other 'minerals'. In contrast, Iceland, New Zealand and the USA have special legal provisions.

76 GEOTHERMAL ENERGY: AN INDUSTRY APPRAISAL. Olson, H.J.; Dolan, W.M. (AMAX Exploration, Inc., Denver). Geotherm. Energy Mag.; 4: No. 1, 12-18(Jan 1976).

A brief examination of the geothermal industry includes the following: the nature of the geothermal resource; prospecting concerns; production practice; marketing aspects; environmental concerns; geothermal's probable abundance; applicable land, legal and institutional considerations; and investment and revenue timing compared to mining. It is concluded that if certain legal provisions are promptly made, geothermal will provide the nation with important amounts of energy by

1990, will be acknowledged as one of the cleanest and most desirable sources of energy, and will be compatible with other land uses. (LBS)

77 ALTERNATIVE ENERGY SOURCES FOR THE UK. Dawson, J.K. (Atomic Energy Research Establishment, Harwell, Eng.). Atom (London); No. 231, 11-20(Jan 1976).

The Energy Technology Support Unit augments the technical and scientific resources available to the Chief Scientist of the Department of Energy to assist in chosing the energy R and D strategy for the UK. This paper examines the contribution of alternative, renewable energy sources for the UK 25 years or more from now. Over the past 25 years the UK energy demand has been rising steadily at an average about 1.8 percent per year, supply being contributed by petroleum, coal, natural gas, nuclear, and hydro - with a total coal equivalent of 331 million tons. Projections for the next 25 years vary from 550 to 650 mtce. Details of conversion of solar, geothermal, wind, tidal, and wave energies are discussed. They are grouped according to whether they would be used primarily to produce heat or electricity. The production of secondary fuels such as ethanol or methane from solar energy is an additional option mentioned, but is not discussed in detail here. A scenario is presented showing the contribution that each of these sources might be able to make in the year 2000, providing a vigorous development and exploitation program results in approximate economic parity with other energy sources. Results indicate the total contribution will be about 6 to 8 percent of the overall energy demand 25 years hence. Solar and wave energy contributions could have the potential to grow to higher contributions if the biological routes to the recovery and storage of solar energy are included. (MCW)

78 ENERGY POLITICS OF FRANCE. Ornano, M.M. Tech. Mod.; 68: No. 1, 11-12(Jan 1976). (In French).

FRANCE;ENERGY POLICY;ENERGY SOURCES; ECONOMICS;ENERGY CONSUMPTION;TAXES;NUCLEAR ENERGY;SOLAR ENERGY;GEOTHERMAL ENERGY; HYDROELECTRIC POWER

79 (CONF-760222--P1, pp 47-72) LEGAL, INSTITUTIONAL, AND ENVIRONMENTAL. 1976.

From 2. geopressured geothermal energy conference; Austin, Texas, United States of America (USA) (23 Feb 1976).

Proceedings of second geopressured geothermal energy conference. Volume I. Summary and future projections.

This report is divided into two major sections, Legal Scholarship and Legal Support. Scholarship is distinguished from support by concentration on abstract analyses of issues which include resource definition, ownership, taxation, and multistate reservoirs. Support is based entirely on those legal tasks called up by the technical work scheduled in the areas of Resource Assessment, Advanced Research and Technology, Institutional and Environmental, and Resource Utilization.

80 (CONF-760222--P5) Uncl PROCEEDINGS OF SECOND GEOPRESSURED GEOTHERMAL ENERGY CONFERENCE, AUSTIN, TEXAS, FEBRUARY 23--25, 1976. VOLUME V. LEGAL, INSTITUTIONAL, AND ENVIRONMENTAL. Vanston, J.H.; Elmer, D.B.; Gustavson, T.C.; Kreitler, C.W.; Letlow, K.; Lopreato, S.C.; Meriwether, M.; Ramsey, P.; Rogers, K.E.; Williamson, J.K. (Texas Univ., Austin (USA). Center for Energy Studies). 1976. Contract E(40-1)-4900. 415p. Dep. NTIS $11.00.

From 2. geopressured geothermal energy conference; Austin, Texas, United States of America (USA) (23 Feb 1976).

Three separate abstracts were prepared for Volume V of the Proceedings of the Conference. Sections are entitled: Legal Issues in the Development of Geopressured--Geothermal Resources of Texas and Louisiana Gulf Coast; The Development of Geothermal Energy in the Gulf Coast; Socio-economic, Demographic, and Political Considerations; and Geothermal Resources of the Texas Gulf Coast--Environmental Concerns arising from the Production and Disposal of Geothermal waters. (MCW)

81 (CONF-760222--P5, pp vp, Part 1) LEGAL ISSUES IN THE DEVELOPMENT OF GEOPRESSURED-GEOTHERMAL RESOURCES OF TEXAS AND LOUISIANA GULF COAST. Elmer, D.B.; Rogers, K. 1976.

From 2. geopressured geothermal energy conference; Austin, Texas, United States of America (USA) (23 Feb 1976).

Proceedings of second geopressured geothermal energy conference. Volume V. Legal, institutional, and environmental.

The legal issues are discussed in two areas: legal scholarship and legal support. Scholarship is distinguished from support by concentration on abstract analyses of issue that include resource definition, ownership, taxation, and multistate reservoirs. Support is based entirely on those legal tasks called up by the technical work schedule in the areas of Resource Assessment, Advanced Research and Technology, Institutional and Environmental, and Resonance Utilization. The legal section will, in the future, make recommendations and implement procedures designed to assist in the rapid and orderly development of the resource. The PERT (Program Evaluation Review Techniques) chart for sequencing of legal scholarship and support tasks is included. An oral presentation on geothermal resources in Texas, a resource model for the resource utilization section, and some excerpts from legislation pertaining to geothermal energy are provided in an Appendix. (MCW)

82 (CONF-760222--P5, pp vp, Part 2) DEVELOPMENT OF GEOTHERMAL ENERGY IN THE GULF COAST: SOCIO-ECONOMIC, DEMOGRAPHIC, AND POLITICAL CONSIDERATIONS. Letlow, K.; Lopreato, S.C.; Meriwether, M.; Ramsey, P.; Williamson, J.K. 1976.

From 2. geopressured geothermal energy conference; Austin, Texas, United States of America (USA) (23 Feb 1976).

Proceedings of second geopressured geothermal energy conference. Volume V. Legal, institutional, and environmental.

The institutional aspect of the study attempts to identify possible effects of geothermal research, development, and utilization on the area and its inhabitants in three chapters. Chapters I and II address key socio-economic and demographic variables. The initial chapter provides an overview of the area where the resource is located. Major data are presented that can be used to establish a baseline description of the region for comparison over time and to delineate crucial area for future study with regard to geothermal development. The chapter highlights some of the variables that reflect the cultural nature of the Gulf Coast, its social characteristics, labor force, and service in an attempt to delineate possible problems with and barriers to the development of geothermal energy in the

region. The following chapter focuses on the local impacts of geothermal wells and power-generating facilities using data on such variables as size and nature of construction and operating crews. Data are summarized for the areas studied. A flow chart is utilized to describe research that is needed in order to exploit the resource as quickly and effectively as possible. Areas of interface among various parts of the research that will include exchange of data between the social-cultural group and the institutional, legal, environmental, and resource utilization groups are identified. (MCW)

83 (CONF-760222--P5, pp vp, Part 3) GEOTHERMAL RESOURCES OF THE TEXAS GULF COAST: ENVIRONMENTAL CONCERNS ARISING FROM THE PRODUCTION AND DISPOSAL OF GEOTHERMAL WATERS. Kreitler, C.W.; Gustavson, T.C. (Texas Univ., Austin). 1976.

From 2. geopressured geothermal energy conference; Austin, Texas, United States of America (USA) (23 Feb 1976).

Proceedings of second geopressured geothermal energy conference. Volume V. Legal, institutional, and environmental.

An attempt is made to foresee areas of general environmental concern that will arise during exploration for and development of geopressured-geothermal resources on the Texas Gulf Coast. Disposal of hot saline water and potential subsidence and faulting of the land surface that may result from geothermal-water production are major concerns. The geology of the area is briefly discussed followed by detailed discussions on geothermal fluid disposal; potential subsidence and fault activation; and natural hazards of the geothermal fairways. Geothermal resource production facilities on the Gulf coast of Texas could be subject to hurricane or storm-induced flooding, winds, coastal erosion, or expansive soils. None of these hazards is generated by geothermal resource production, but each has potential for damaging geothermal production and disposal facilities. Production of fluids from geo-pressured geothermal reservoirs will result in reservoir pressure declines and subsequently in compaction of sediments within and adjacent to the reservoir. The magnitudes of environmental impact of subsidence and fault activation varies with current land use; the greatest impact would occur in urban areas, whereas relatively minor impacts occur in rural, undeveloped agricultural areas. (MCW)

84 (ERDA--76-1(Vol.2)) Uncl NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION: CREATING ENERGY CHOICES FOR THE FUTURE. VOLUME 2. PROGRAM IMPLEMENTATION. (Energy Research and Development Administration, Washington, D.C. (USA)). 1976. 409p. Dep. NTIS $11.00.

The plan for energy RD and D summarizes the U.S. ERDA's current views on the energy technologies which the Nation will need to achieve longer-term energy independence. This volume identifies those actions that can be taken to implement the plan described in Volume 1. The document contains descriptions of the federal energy RD and D programs now underway, as well as possible future efforts. It includes financial data for FY 75, FY 76, and FY 77. The description of actions proposed in this volume represents the considered judgment of Federal agency management as to which projects are reasonable to pursue on the basis of information now available. The document is divided into five parts: energy technology programs, supporting technology programs, energy-related supporting activities, special analyses, and appendix. The following energy technology programs are discussed: fossil energy (coal, petroleum, and natural gas), solar energy (solar thermal and solar electric energy), geothermal energy, conservation, fusion power, fission power, and the nuclear fuel cycle. (RWR)

85 (NSF/RA--760230) Uncl STATE POLICIES FOR GEOTHERMAL DEVELOPMENT. Sacarto, D.M. (National Conference of State Legislatures, Denver, Colo. (USA)). 1976. 94p. National Science Foundation, Washington, DC.

The most prominent geothermal resources in the USA occur in fifteen Gulf and Western states including Alaska and Hawaii. In each state, authority and guidelines have been established for administration of geothermal leasing and for regulation of development. Important matters addressed by these policies include resource definition, leasing provisions, development regulations, water appropriation, and environmental standards. Some other policies that need attention include taxation, securities regulations, and utility regulations. It is concluded that conditions needed for the geothermal industry to pursue large-scale development are consumer (utility) confidence in the resource; equitable tax treatment; prompt exploration of extensive land areas; long and secure tenure for productive properties; prompt facility siting and development; and competitive access to various consumers. With these conditions, the industry should be competitive with other energy sectors and win its share of investment capital. This publication reviews for the states various technical, economic, and institutional aspects of geothermal development. The report summarizes research results from numerous specialists and outlines present state and Federal policies. The report concludes generally that if public policies are made favorable to their development, geothermal resources offer an important energy resource that could supply all new electric capacity for the fifteen states for the next two decades. This energy--100,000 MW--could be generated at prices competitive with electricity from fossil and nuclear power plants. An extensive bibliography is included. (MCW)

86 RESULTS OF AN OPINION SURVEY ON THE 1977 BUDGET PROPOSAL OF THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION. PRINTED AT THE REQUEST OF HENRY M. JACKSON, CHAIRMAN, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE. Washington, DC; Committee on Interior and Insular Affairs (1976). 75p.

An opinion survey of the 1977 ERDA budget proposal was sent to 17 non-Government energy experts affiliated with industry, universities, and trade organizations to evaluate the budget's relevance to long-term energy goals. Responses supported increasing non-nuclear areas, such as conservation and fossil energy research and environmental control, and decreasing allocations for fusion power and fission reactor research. Specific recommendations were to increase: (1) overall energy budget, (2) non-nuclear programs, (3) conservation programs, (4) short-term (10 to 15 years) programs, (5) advanced power systems (e.g., gas turbines), (6) coal process development, (7) solar heating and cooling, and (8) environmental control; and to decrease: (1) magnetohydrodynamics (MHD), (2) coal liquefaction demonstrations, (3) solar electric development, and (4) nuclear programs. Electric energy generation, with its systems

and storage problems, is not considered conservation. Individual responses are reproduced. (DCK)

87 CONTENTS OF A GEOTHERMAL LEASE: SOME SUGGESTIONS. Root, T.E. Nat. Resour. Lawyer; 8: No. 4, 659-668(1976).

Some provisions that might be included in a geothermal lease are suggested with two caveats in order: (1) the suggestions are not exclusive; a comprehensive lease will contain many more clauses than those suggested; and (2) many problems will be resolved only by litigation or industry practice, since the geothermal industry is in its legal infancy. It is hoped that a standard or near-standard form will emerge. The response to the potential of geothermal resources has been twofold: (1) regulating legislation, on both Federal and state levels, has increased; and (2) the body of knowledge surrounding geothermal resources has been growing rapidly. The literature of geothermal resources has discussed the state of the technological art, geology or geothermal resource occurrence, economics of geothermal resource development, and legal problems of geothermal resource exploration and development; one major topic awaiting treatment is the environmental aspect of geothermal resource development. This article draws upon both of the responses above, and in suggesting solutions to problems of drafting leases, refers to legislation and geothermal literature when appropriate. (MCW)

88 CALIFORNIA'S ENERGY FUTURE. Morris, D.N. Santa Monica, CA; Rand Corporation (1976). 31p. (P--5616). Publications Dept., Rand Corp., 1700 Main St., Santa Monica, CA 90496.

Recommendations for California energy policy are made on the basis of a review of the state's energy sources, patterns of consumption, and projections for both sources and uses. Projected primary energy use for the year 2000 is 10,310 trillion Btu compared to 5,650 in 1975. With conservation, the projection is for 7,840 trillion Btu, and would involve a shift to less use of petroleum and nuclear energy, an increase in natural gas and geothermal, and a slight increase in hydroelectric and coal. Recommendations cover oil and gas routes and terminals, offshore development and deepwater ports, facilities for liquefied natural gas, electricity generation, geothermal and solar research and development, and environmental and institutional issues. The recommendations stress coordination of efforts, centralization of planning, long-range policies, and removal of policies and practices which impede the development of energy supplies. (DCK)

89 GEOTHERMAL WORLD DIRECTORY. Meadows, K.F. (comp. and ed.). Glendora, CA; Katherine F. Meadows (1976). 324p.

Part 1 contains lists of state energy agencies, business and industrial firms, and individuals, both U. S. and worldwide, involved in the development and production of geothermal energy. Parts II and III contain nineteen papers on geothermal energy which were individually processed for ERDA energy data base. One item, "Economic Implications of Small Geothermal Power Plants," by T. Meidav was abstracted individually for EAPA. (LBS)

90 GEOTHERMAL ENERGY. Kruger, P. (Stanford Univ., CA). Trans. Am. Nucl. Soc., Suppl.; 23: No. 1, 35-36(1976).

From Conference on environmental aspects of nonconventional energy resources; Denver, CO, USA (29 Feb 1976).

GEOTHERMAL RESOURCES;GEOTHERMAL ENERGY;HEAT EXTRACTION;REVIEWS;USES;ENVIRONMENTAL EFFECTS; LEGAL ASPECTS

91 MULTI-PURPOSE GEOTHERMAL RESOURCE DEVELOPMENT: AN OVERVIEW. Barnea, J. (UNITAR, New York). pp 217-221 of Geothermal world directory. Meadows, K.F. (comp. and ed.). Glendora, CA; Katherine F. Meadows (1976).

From United Nations conference; San Francisco, CA, USA (May 1975).

The multi-purpose use of geothermal resources, compared to single purpose development, offers the following advantages: (a) it is more economic and may offer additional social benefits (such as heated swimming pools), (b) it usually allows higher efficiency in energy use, (c) it often allows the utilization of associated resources (such as water, minerals, and gases), and (d) it frequently minimizes or eliminates environmental problems. The multi-purpose utilization of geothermal resources is possible due to its unique resource characteristics, namely its multi-component and multi-dimensional features. Geothermal resources may include gaseous, liquid, or solid resources. Its resource structure also includes a heat flow system and storage space. In addition to the direct one-time use of geothermal resource components, there is a re-use potential of some components (such as heat, steam, and water). The possible and economically attractive models of geothermal resource applications will in practice be determined mainly by three groups of factors: (a) the resource type and size; (b) the economic needs and potential of the area in which the geothermal resources are located; and (c) the institutional conditions and restraints. (LBS)

92 INSTITUTIONAL AND ENVIRONMENTAL ASPECTS OF GEOTHERMAL ENERGY DEVELOPMENT. Citron, O.R. (Jet Propulsion Lab., Pasadena, CA). Trans. Am. Nucl. Soc., Suppl.; 23: No. 1, 41-43(1976).

From Conference on environmental aspects of nonconventional energy resources; Denver, CO, USA (29 Feb 1976).

GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS; FEASIBILITY STUDIES;LEGAL ASPECTS;ENERGY SOURCE DEVELOPMENT

93 SOCIAL IMPLICATIONS MAY ARISE WITH FUTURE GEOTHERMAL USAGE. Wehlage, E.F. pp 259-262 of Geothermal world directory. Meadows, K.F. (comp. and ed.). Glendora, CA; Katherine F. Meadows (1976).

From 2. United Nations symposium on the development and uses of geothermal resources; San Francisco, CA, USA (20 May 1975).

The fullest implication of geothermal heat's effect on society--when it is fully and effectively used--is not being given adequate attention. Geothermal development, especially for electrical generation, is becoming socially impacted in the USA. Governmental influences evolve. Its effect on the social structure is not only economic in an energy dilemma, but people as a society will be increasingly involved. Geothermal's nature is that with non-electric utilization (required for greatest benefit) population and industry will be forced to move causing social pressures in an unknown degree. Better social preparation is mandatory. The fullest use of geothermal heat may dictate drastic reorganization.

94 GEOTHERMAL ENERGY. Kruger, P. (Stanford Univ., CA). Annu. Rev. Energy; 1: 159-182(1976).

A general review is given of the major types of geothermal resources, exploration methods, resource extraction technology, utilization technology, and institutional aspects. The development and strategy of a national geothermal program administered by ERDA and the Department of Interior are briefly discussed. 58 references. (LBS)

95 COMPARATIVE ANALYSIS OF THE 1976 ERDA PLAN AND PROGRAM. Washington, DC; United States Congress (1976). 213p. GPO $2.80.

The Office of Technology Assessment, in its 1975 analysis of ERDA's initial plan and program, cited two major areas of weakness. The first was ERDA's pursuit of technological options, while neglecting consideration of the broader aspects of energy production, delivery, and use. In particular, OTA indicated that the realization of technologically established energy options may be prevented by nontechnical constraints such as transportation, resource, manpower, and capital availability; public acceptability; and institutional, jurisdictional, economic, and environmental compatibility. ERDA has made significant progress in this area as reflected in the updated Plan and Program (ERDA-76-1). ERDA has more aggressively interpreted its role in meeting the Nation's energy goals by expanding its efforts to deal with non-technological constraints. It is apparent that ERDA has begun to orient its Research, Development, and Demonstration program more toward solving energy problems rather than just creating technical options. The second deficiency was found in the emphasis of both the ERDA Plan and Program on options directed toward increased energy supply, relative to the programs in end-use demand reduction. Supply programs were over conservation programs by a ratio of 49:1. ERDA has now increased the role and priority of conservation to the same level as the highest priority supply options in meeting the Nation's near-term energy needs. In the year since ERDA's formation, domestic production of natural gas declined 6.9 percent and crude oil 4.5 percent. At the same time, petroleum imports accounted for 37 percent of the Nation's total petroleum consumption in 1975 and are now approaching 40 percent. Achieving energy independence by 1985 has become all but impossible.

96 ECONOMIC AND ENGINEERING IMPLICATIONS OF THE PROJECT INDEPENDENCE 1985 GEOTHERMAL ENERGY OUTPUT GOAL AND THE ASSOCIATED SENSITIVITY ANALYSIS. Mukhopadhyay, A.K. (Jet Propulsion Lab., Pasadena, CA). pp 739-746 of Eleventh intersociety energy conversion engineering conference. Vol. I. New York; American Institute of Chemical Engineers (1976).

The Project Independence 1985 geothermal output goal, viz., 20,000 megawatts (MW) is combined with the available time-line data for a typical geothermal energy plant in order to establish requirements, such as, the rate of lease award, exploration, production drilling, plant construction resource expenditure/supply necessary to meet such an adopted goal. Though the specific time-line used in the study is based on detailed discussions with federal, state and industry representatives, time-lines by their very nature can vary drastically with state and local regulations, the nature of the specific reservoir under development and other factors. Similarly, the exploratory and drilling rig efficiencies and the unit costs associated with the various phases of geothermal development depend on today's framework of technological, environmental and economic constraints. Thus, it is highly imperative to determine the sensitivity of the needed rates of development to various technical, economic and institutional parameters; it is equally significant to investigate the sensitivity with respect to variations of the goal magnitude, the goal rate and the goal date from the nominal values set out in Project Independence. A computer program has been written, so that the results of such a sensitivity analysis can be quickly obtained as printed and plotted output with the least expense.

97 POTENTIAL NATIONAL BENEFITS OF GEOTHERMAL ELECTRICAL ENERGY PRODUCTION FROM HYDROTHERMAL RESOURCES IN THE WEST. Bloomster, C.H.; Engel, R.L. (Battelle Pacific Northwest Labs., Richland, WA). pp 853-859 of Eleventh intersociety energy conversion engineering conference. Vol. I. New York; American Institute of Chemical Engineers (1976).

To evaluate the competitive role of geothermal energy in a predominately nuclear and coal based electric power economy, a computer simulation of the U.S. power economy was employed. The simulation optimizes the installation of new generating capacity on a multiregional basis. This study included only the hydrothermal resources in the West. New geothermal capacity in the West, however, has national impact through reducing the demand and the cost of nuclear and fossil fuels. The potential benefits from geothermal energy are estimated at $2-$8 billion in reduced electricity costs. Geothermal energy is estimated to achieve 8-20 percent of the electricity generation in the West (9,000-17,000 MWe by 1990). The ''most likely scenario'' is the lower values in the above ranges. This scenario would save (1) $11 billion in powerplant capital costs, (2) 32 million separative work units, (3) 64,000 tons (58.2×10^3 tonne) of U_3O_8, and (4) 700 million barrels (112×10^6 m^3) of oil.

98 ELECTRIC UTILITY COMPANIES AND GEOTHERMAL POWER. Pivirotto, D.S. (Jet Propulsion Lab., Pasadena, CA). pp 843-849 of Eleventh intersociety energy conversion engineering conference. Vol. I. New York; American Institute of Chemical Engineers (1976).

The electric utility industry is currently the primary potential market for geothermal energy. Engineers concerned with the design of geothermal power plants, electric conversion equipment or exploration and development technology must therefore consider utility industry requirements which may affect such designs. The needs of the electric utility industry as these needs impact the development of geothermal energy are discussed. The electric utility industry, its structure, the forces which influence utility companies and their relationship to geothermal energy are described. Considerations necessary to a federal program for geothermal development are presented, and a strategy for federal stimulation of utility investment in geothermal energy is suggested. The needs for demonstration of commercial feasibility of hydrothermal resources and for reservoir engineering technique development are pointed out. Possibilities are discussed for stimulating utility investment through financial incentives, amelioration of institutional barriers, and technological improvements.

99 INTERDISCIPLINARY PLANNING FOR GEOTHERMAL DEVELOPMENT AT THE COUNTY LEVEL. Pierson, D.E. pp 850-852 of Eleventh intersociety energy conversion engineering conference. Vol. I. New York; American Institute of Chemical Engineers (1976).

A National Science Foundation grant to the County of Imperial is funding a study for planning for geothermal development at the county level, the outcomes of which will be a geothermal element of the County General Plan and a research methodology for utilization by other government entities. The research work is being subcontracted to two universities. The project results must withstand public accountability in the form of public hearings, and acceptance by the County Planning Commission and the County Board of Supervisors. The subject areas addressed by the study are: resource assessment, engineering, geography, environment, economics, sociology and political/legal. A status report of research results is included.

100 GEOTHERMAL STEAM PRICING AT THE GEYSERS, LAKE AND SONOMA COUNTIES, CALIFORNIA. Dutcher, J.L.; Moir, L.H. (Professional Engineers, San Francisco). pp 786-789 of Eleventh intersociety energy conversion engineering conference. Vol. I. New York; American Institute of Chemical Engineers (1976).

One utility company in the United States produces electricity from geothermal steam. This company buys the steam from several steam producers under contracts with essentially identical rate provisions. These provisions are based on historical fossil-fuel costs and plant efficiency and nuclear generation costs experienced by the utility. A change in the parameters of generation, efficiency, or fuel costs will change the geothermal steam rate. Several changed circumstances are postulated and their effect on the geothermal steam rates considered.

101 PROTECTING THE ENVIRONMENT. McCormack, M.M. (House of Representatives). pp 49-55 of Encyclopedia of energy. Lapedes, D.N. (ed.). New York; McGraw-Hill Book Company (1976).

The environmental impacts of producing and utilizing fossil and nuclear fuels are investigated. The measures applied for keeping these impacts within socially acceptable limits and major legislative approaches to this end are examined. The effects of producing coal, oil, natural gas, uranium, oil shale, tar sands, and geothermal energy are specifically investigated. Heat energy from these sources can be used directly as process heat by industry to heat and cool buildings or for conversion into electrical and mechanical energy. Common to all of these uses are the environmental effects from burning of fossil fuels or the fissioning of uranium. The environmental aspects of the conversion of heat into mechanical energy and electricity are reviewed. The environmental impacts of hydro power, tidal power, solar power, and wind power are discussed briefly. Measures to control air quality, water quality, land pollution, strip mining, and nuclear power are not without impacts of their own in terms of costs, jobs, or resources. The author concludes that the problem is to balance society's need for energy against the need for a livable environment, at the same time giving appropriate attention to important economic technical, and social factors. (MCW)

102 ERDA'S GEOTHERMAL R AND D PROGRAM. Willis, E.H. (Energy Research and Development Administration, Washington, DC). pp 115-128 of Energy technology III: commercialization. Bethesda, MD; Government Institutes, Inc. (1976).

The objective of ERDA's geothermal energy program is to provide a viable energy option by helping to develop and demonstrate the substantial geothermal resources existing in the USA. Three major problem areas are resource uncertainty, technical risks, and institutional impediments. The program strategy is: to reduce resource and reservoir uncertainties; to encourage industrial development of hydrothermal resources; and to develop technologies for exploiting larger geopressured and hot-dry-rock resources. (LBS)

103 OVERSIGHT HEARINGS ON PUBLIC LAW 93-410: THE GEOTHERMAL ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION ACT OF 1974. HEARING BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, SECOND SESSION. Washington, DC; Committee on Science and Technology (1976). 1073p. GPO.

The hearing addresses the comprehensive geothermal program definition submitted by ERDA in October, 1975. This document was developed pursuant to the Geothermal Energy Research, Development and Demonstration Act of 1974, Public Law 93-410. The U.S. Geological Survey estimates that the evaluated geothermal fields alone contain about 42,000 MW centuries of recoverable electricity - enough to satisfy the needs of 140 cities of 1 million people each for the next 30 years at present consumption rates. The act lays out a broad national program for the commercial development of the geothermal resources of this country. It has four major aspects: (1) it requires that ERDA, in cooperation with the Geological Survey, carry out a proper inventory and assessment of the geothermal resources; (2) it establishes an R and D program with the major objective of resolving all the technical problems inhibiting the commercialization of geothermal energy; (3) it requires demonstration of the technological and economical viability of this resource; this legislation mandates that we have, by 1980, 6 to 10 demonstration plants producing electrical power and other energy from a variety of geothermal sources; and (4) the financing is provided through a farsighted loan guarantee program. The first witness was Dr. John Teem, ERDA, accompanied by Dr. Eric Willis, ERDA; the second witness was Dr. Vincent E. McKelvey, Department of the Interior. Finally, R.D. Ginter, of the NASA Office of Energy Programs, presented the testimony from JPL, under the direction of NASA, on a draft geothermal program definition. The hearing contrasted the JPL document with the ERDA report. (MCW)

104 CRITICAL NATIONAL CHOICE: NEW ENERGY HORIZONS...OR HORIZONTAL DISINTEGRATION. Washington, DC; American Petroleum Institute (1976). 11p. American Petroleum Inst., 2101 L St., NW, Washington, DC 20037.

Some members of Congress want to bar U.S. oil companies from developing non-petroleum energy sources. They have introduced bills that would make oil companies give up any ownership or interests they may have in other sources of energy. These sources include coal, oil shale, geothermal steam, uranium, and energy from the Sun. The name given to proposals of this kind is "horizontal divestiture." Other proposals

would dismember the present structure of U.S. oil companies, through what is called "vertical divestiture." This means restricting individual oil companies to just one segment of the petroleum business--either exploration and production, or transportation, or refining/marketing. All of these proposals are being advanced at the very time the United States is becoming even more dependent on high-cost foreign oil. And more and more of the imported oil is coming from the Arab countries, the very ones that imposed the oil embargo against this nation in 1973-1974. The extent of U.S. rising dependence on imported oil is clear: in mid-February of 1976, the U.S. imported more crude oil than at any other time in history. The booklet first explains why various oil companies are searching for different forms of energy besides oil and natural gas. Second, it demonstrates that strong competition exists throughout the energy business today. Entry of oil companies into non-petroleum energy development has, in fact, increased--not reduced--competition.

105 GEOTHERMAL ENERGY: LEGAL PROBLEMS OF RESOURCE DEVELOPMENT. Lindsey, M.K.; Supton, P. Stanford, CA; Stanford Environmental Law Society (1976). 152p.

An attempt is made to describe geothermal resources and the present technology for recovery, assess the true value of this resource and its potential as a source of electrical energy, discuss the law relating to geothermal resource acquisition and development, and suggest alternative means of regulation that would more adequately protect the public interest. While the focus is generally on California and, in particular, on the only geothermal area in North America which is currently producing electricity, the analysis is equally applicable to other areas that are experiencing geothermal development. The ultimate aim of this publication is to give the interested nonspecialist--whether an individual, a public interest group, or a governmental unit--the factual and legal basis necessary for demanding a suitable framework for the rapid recovery of this valuable natural resource. The experiences of the Northern California Power Agency with geothermal energy show that major legal reforms are needed. Leasing preferences for public agencies, royalty rather than cash advance bidding, and antitrust review of geothermal lessees would ensure greater access to geothermal resources by public agencies. (MCW)

106 AUTHORIZING APPROPRIATIONS FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION. CONFERENCE REPORT TO ACCOMPANY H.R. 13350. Washington, DC; House of Representatives (1976). 62p.

The committee of conference, after considering a proposed Senate amendment and inserting its own amendment, authorized the following: (A) for nonnuclear energy research, development, and demonstration of fossil, solar, geothermal, and other forms of energy for energy conservation, and for scientific and technical education, $1,175,671,000; (B) for nuclear energy research and development, basic research, space nuclear systems and other technology, uranium enrichment, national security, and related programs, $5,271,679,000; and (C) for environmental research and safety, basic energy sciences, program support, and related programs, $691,795,000. Specific program breakdowns under each of the above are presented. (MCW)

107 SUMMARY OF SECTION XII: LEGAL AND INSTITUTIONAL ASPECTS. Anderson, D.N. (State Energy Commission, Sacramento, CA). pp cxxix-cxxxii of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 1. Berkeley, CA; Univ. of California (1976).

In general the papers in this section dealing with legal and institutional matters covered the more important aspects of the subjects. The history of geothermal law in New Zealand, Iceland, Japan, and the United States is presented and compared. Without doubt geothermal legal and institutional problems are universal in nature; however, some countries are more advanced than others in their solutions to the problems. In addition, numerous peripheral problems are included, such as: water law, definition of the resource, geothermal rights, and preservation of unique geothermal hot springs areas. Some of the papers deal with economic and forecasting models.

108 SUMMARY OF SECTION XI: ECONOMIC AND FINANCIAL ASPECTS. Barr, R.C. (Earth Power Corp., Tulsa, OK). pp cxxi-cxxviii of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 1. Berkeley, CA; Univ. of California (1976).

Capital is a resource more scarce than oil, gas, coal, uranium, or geothermal energy. The marketplace, if permitted to function, and the efficient use of scarce capital will assure adequate supplies of energy in various forms to the common benefit of society as a whole. Geothermal energy for electrical power generation is viewed as competitive with conventional fuels as a source of energy. In order to substantiate this view, geothermal utilization must therefore be developed on a scale equivalent to millions of barrels of oil production per day. The data presented in these papers to describe the economics of geothermal energy are generally based on experience from activities in the United States. The economic parameters established for operations in the United States are most likely representative of the highest costs to be encountered because of regulatory and environmental constraints and therefore may be used for conservative world-wide economic analysis. World oil prices, the geothermal geologic setting, the means of converting geothermal energy into electricity, and the financial parameters associated with existing and planned additions to electrical generating capacity by the western United States utilities combine to make up the geothermal marketplace in this discussion.

109 GEOTHERMAL ENERGY: PROSPECTS AND LIMITATIONS. Hess, H. Sierra Club Bull.; 61: No. 10, 9-12(1976).

A gradual withdrawal of geothermal energy will extend its use and allow future utilization of this resource as more advanced earth-heat extraction concepts are developed. Unless this is done, geothermal energy will supply only a small fraction of our energy needs and for a relatively short time. A number of countries are already tapping geothermal fields, but the U.S., with two million known acres of geothermal fields, is the largest producer. Leasing of geothermal fields began in 1970 with the Geothermal Steam Act and directions to ERDA to develop a national goal and program for fiscal-year 1977. Wells are drilled 4000 to 10,000 feet deep to tap either steam to turn turbines or hot water to boil a secondary substance. Total known and anticipated resources are estimated to be able

to produce 153,000 megawatts for 30 years. Site locations are important because geothermal energy cannot be transported. Other possibilities for earth heat energy are zones of superheated, pressurized fluids found in the Gulf Coast area and areas of dry hot rock close to the earth's surface in New Mexico. Environmental difficulties arise because the best locations for geothermal sources are also those valued and protected by environmentalists for their scenic and cultural quality and their proximity to areas of volcanic activity. The noise and equipment necessary for drilling operations create a heavy industrial atmosphere which is incompatible with scenic lands. An estimated 20 percent of land surface in a developed field is altered by erosion and siltation. Air and vegetation are polluted by large emissions of hydrogen sulfite gas; water by drilling muds, brines, and steam condensates. (6 references) (DCK)

110 GEOTHERMAL ENERGY AND ITS USES: TECHNICAL, ECONOMIC, ENVIRONMENTAL, AND LEGAL ASPECTS. Banwell, C.J. (United Nations, New York). pp 2257-2267 of Proceedings of the second United Nations symposium on the develoment and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

Among the many so-called ''new'' sources of energy which have been proposed or tested as replacements for the conventional sources (fossil fuels and hydroelectric), geothermal energy is virtually unique as the only alternative which was already cost-competitive with these established sources before the sharp rise in petroleum prices which occurred in 1973. Taking into account the overall effect of petroleum prices on the fossil fuel market, and of the probable cost of increasing the production of fossil fuels from alternative sources, it appears probable that the cost of electrical energy generated from a typical geothermal field will now be roughly half that from any alternative, including nuclear energy. One effect of this cost margin will undoubtedly be to promote the development of geothermal energy from fields which formerly looked less promising. At the same time expanding use will lead to improved exploration and development methods which, in turn, will result in reduced costs. For the immediate future, it seems probable that geothermal energy will be more beneficial to certain developing countries than to the industrial world. This is because geothermal energy can be developed economically in relatively small packages, ranging from 10 to 100 MW. In this way, the financial burden of heavy initial capital investment can be avoided, and later growth in demand can be met by plant extensions. For countries with limited indigenous fuel sources, the savings in fuel import costs can also become very significant. Thus, with fuel oil at $10 per barrel, the annual saving in fuel cost by substituting geothermal power would be over $7 million for each 50 MW of net capacity.

111 TECHNOLOGY FORECAST OF UNITED STATES GEOTHERMAL ENERGY RESOURCE DEVELOPMENT. Maslan, F.; Gordon, T.J.; Stover, J. (Futures Group, Glastonbury, CT). pp 2409-2419 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

This forecast defines the nature of the technology on which this industry depends, the technological impediments which, if uncorrected, might block its growth, the means available to overcome the impediments, and the range of energy production levels which might possibly be expected from this source. A complete relevance tree for geothermal energy technology was first constructed, and was followed by designed interviews with industrial and scientific authorities. The results of these two steps were analyzed in a series of energy system diagrams synthesizing the overall judgments about technologically feasible levels of development, unconstrained by economic and institutional considerations. In the accelerated case, U.S. geothermal electricity capacity results for 1985 are (MWe): vapor, 3500; liquid, 17,000; hot dry rock, 5000; geopressured, 10,000. The results for the year 2000 are: vapor, 10,000; liquid, 500,000; hot dry rock, 200,000; geopressured, 54,000. After this analysis we developed an electric utility simulation model of the decision mechanism involved in the choice and construction of new central-station generating capacity. In effect, this system-dynamics model simulated the introduction of geothermal energy into the utility fuel choice for the U.S. The model incorporates economics, construction time, reliability, fuel availability, environmental factors, and technology. These forecasts simulate the real geothermal energy electricity capacity development and their results were as follows: for 1985, normal development 7000 MWe, accelerated development 19,500 MWe; for 2000, normal development 188,000 MWe, accelerated development 249,000 MWe.

112 GOVERNMENT ACTIVITY REPORT ON GEOTHERMAL ENERGY IN JAPAN. Sakakura, S. (Agency of Industrial Science and Tech., Tokyo). pp 2431-2434 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The move to make effective use of geothermal energy in Japan is being accelerated as a reflection of the world oil crisis. Japan's energy consumption increased fourfold between 1960 and 1974, and Japan is the second largest user of energy in the non-Communist world. She now fills 73.5 percent of her current energy needs through imported oil. To keep pace with expanding uses of energy, and to reduce dependence on imports, the government of Japan has launched a long-term research and development effort, Project Sunshine, which aims to develop several indigenous energy sources including the geothermal. Approximately $9 million (US) has been appropriated for the total Project Sunshine budget for fiscal year 1974, and $16 million for fiscal year 1975. The research and development interests of Project Sunshine include development of direct exploration methods for geothermal energy (to replace the current petroleum-experience methods); development of drilling and measuring systems appropriate for the heat, pressure, corrosion, and other conditions of geothermal work; development of binary-cycle and combined-cycle equipment for power generation from low-enthalpy sources; investigation of techniques for extracting energy from hot dry rocks, including fracturing techniques and artificial hot-water systems; experiments with the use of volcanoes as energy sources for power generation; multipurpose uses; and protection of the environment from deleterious effects. Project Sunshine is scheduled through the year 2000, and its schedule is divided into terms of 5 to 7 years each, during which it is expected that various phases of the development work will be completed. It is hoped that the program will culminate in such things as 100-MW dry-rock or volcanic power plants.

113 EXPLORATION AND DEVELOPMENT OF GEOTHERMAL

RESOURCES IN THE UNITED STATES, 1968 TO 1975. Koenig, J.B. (GeothermEx, Inc., Berkeley, CA); Anderson, D.N.; Huttrer, G.W. pp 139-142 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 1. Berkeley, CA; Univ. of California (1976).

From 1968 to 1975, exploration for geothermal resources in the Western United States increased rapidly. The pace accelerated in late 1973 due to the rise in the price of energy. Energy demand and a favorable economic climate should sustain geothermal development in the future. Federal and state lands are now becoming available, and efforts are being made to speed the leasing programs. Extensive exploration and development are ongoing at The Geyser's and there have been significant discoveries made in the Imperial Valley, California, and at the Valles Caldera, New Mexico. Exploration is continuing at Beowawe and Brady's Hot Springs, Nevada, and Surprise Valley, California. In addition, exploration has been increased in portions of Utah, Idaho, Oregon, and Arizona. Discoveries have been sparse, but should improve as land becomes available and exploration is expanded. Exploration and utilization technology is advancing, but a greater effort is required to meet the demand. Environmental, legal, and institutional problems are still delaying exploration and development; however, increased coordination of federal, state, and local government regulatory programs has been proposed and if undertaken could speed development. The federal government is heavily financing research and development, including exploration and utilization technology and solutions to environmental, legal, and institutional problems.

114 MULTIPURPOSE GEOTHERMAL RESOURCE DEVELOPMENT: AN OVERVIEW. Barnea, J. (United Nations Inst. for Training and Research, New York). pp 2197-2200 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

Three interrelated complexes determine the possible multipurpose utilization of a geothermal resource, namely (1) the resource conditions, (2) the regional economic conditions, and (3) the institutional conditions. The resource conditions may allow hundreds of different resource combinations for multipurpose utilization. These will depend on the type and size of the resource and its temperature; its water and mineral and gas content; its balneological potential; and nearby related resources as well. A variety of possible resource combinations are discussed. The regional economic conditions are overriding for resource utilization as most geothermal resources require local utilization. Detailed discussions lead to the conclusion that developed areas with agriculture, industries, and cities offer the best conditions, whereas rainy and sparsely populated tropical areas represent the most unfavorable economic conditions for multipurpose geothermal projects. Institutional conditions include government regulations at the state and local level; the attitude of geothermal developers such as governments, oil companies, and so on; environmental laws and attitudes; and institutions providing geothermal training and information. It is shown that in almost all cases of government-owned geothermal projects, the actual control is in the hands of government electricity corporations, explaining the electricity-only utilization of most developed geothermal resources. This attitude is shared by most oil companies, and it emerges as a main factor in the U.S. geothermal development. Wider resource information, more economic studies, and institutional improvements are proposed.

115 UNITED STATES LAW AS IT AFFECTS GEOTHERMAL DEVELOPMENT. Aidlin, J.W. (Magma Power Co., Los Angeles). pp 2353-2357 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The laws of the United States and of the various states have inhibited the rapid development of geothermal energy. Although the federal Geothermal Steam Act of 1970 became law in December 1970, it was not until 1974 that competitive lease sales were held on federal lands, and only now are noncompetitive leases being issued or scheduled for issuance. The many legal requirements, obstructions, and limitations have made the task of the limited number of persons charged with responsibility to accelerate geothermal development difficult and time consuming. For example, the requirements of the National Environmental Protection Act, the authority exercised by the Office of Management and Budget and Internal Revenue Service, the requirements of various government agencies, such as the Forest Service, have all contributed to the delay. Above all, there has been, until recently, no overriding priority granted to geothermal development. The various states have defined geothermal resources in their own way and in so doing have in many cases raised issues as to the character and ownership of the resource. Such confusion has inhibited development. Local governmental agencies have delayed development by imposing time-consuming, expensive, and frequently unnecessary requirements relating to environmental matters. A major lack is the absence of adequate means of communication between local and state agencies and industry as to problems to be resolved.

116 LAW AND GEOTHERMAL DEVELOPMENT IN NEW ZEALAND. Dench, N.D. (Ministry of Works and Development, Wellington, N.Z.). pp 2359-2362 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

While the Geothermal Energy Act 1953 provides for the control of specifically geothermal development in New Zealand, legislation dealing with the conservation of natural waters, and with orderly land development, is high on the long list of laws which must be satisfied, in common with many engineering projects. The Act relates to all energy derived from the earth's natural heat, excluding water at temperatures up to 70°C. The sole right to exploit the energy is vested in the Crown (effectively the nation), regardless of land ownership. Furthermore, if development involves the payment of compensation to the landowner, the amount should not include any unrealized potential benefit of the energy. Specific land areas may be reserved for use by the Crown alone. Elsewhere, the landowner or the Crown may allow exploration, including drilling, provided certain safety and administrative conditions are met. The right to use geothermal energy (rather than merely to investigate it) is subject to the granting of a license, unless the energy is for domestic purposes and comes from wells less than 61 m deep. The many small users are also exempt from the payment of a rental amounting to about 3 US cents/GJ of energy used in excess of 10 TJ/yr.

There is legal insistence on the technical and environmental adequacy of any development, and the means for policing it.

117 GEOTHERMAL EXPLORATION AND DEVELOPMENT IN THE UNITED STATES: A TAX ANALYSIS UNDER THE INTERNAL REVENUE CODE. Eisenstat, S.M. (Eisenstat and Gottesman, P.C., Attorneys at Law, New York). pp 2369-2372 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

Hundreds of millions of dollars are invested annually by the private sector to explore and develop oil and gas properties in the U.S. The risk of such investments is reduced by the tax benefits of such activities. A significant portion of the cost of drilling and completing the well is deductible from the ordinary income of the investor; and if production is established, it is subject to depletion (that is, part of the income is tax free). Geothermal exploration and development should receive comparable treatment. The Reich and Rowan cases, the only two reported cases relating to geothermal exploration, found that the same favorable tax consequences which result from oil and gas exploration applied to geothermal exploration. The U.S. Internal Revenue Service is still challenging the tax treatment of geothermal exploration. Congress has proposed certain changes in the Internal Revenue Code to benefit the geothermal industry, but additional legislation is necessary to clarify the tax treatment. Once the tax treatment of geothermal exploration and development has been conclusively determined, substantial funds could be deployed to develop geothermal properties. The tax benefits would reduce the risk of the exploration and would also significantly improve the economics of such an investment.

118 PROPERTY SYSTEMS IN GEOTHERMAL RESOURCES: A CRITIQUE AND RECOMMENDATIONS. Franzen, D.E. (Hertzberg, Kaplan, and Koslow, Los Angeles). pp 2373-2381 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The incentive pattern facing a developer depends on the rights bundle in the resource. To guarantee that exchange relations can operate to allocate resources to their highest value use, it is necessary that property interests be (1) certain and (2) freely transferable. Even when these elements of ''marketability'' are satisfied, resource misallocation may still obtain if the development of the resource generates external costs not borne by the developer. In the case of geothermal fields, external costs in the form of (1) ownership competition for the underlying steam or water, and (2) retrieval costs imposed by exploitation may present developers with false cost alternatives and direct them to exploit the resource at nonoptimally rapid rates. Society will be denied the full value product of the energy field. Preexisting legal classifications such as water and oil, when applied to geothermal resources, result in substantial societal loss by failing to provide marketability and by encouraging overutilization of the resource. Developing statutory law, such as the Federal Geothermal Steam Act, may also be deficient in the same respects. Field development by unitization may, if properly implemented, provide an adequate solution to the external costs problem. Marketability interests can be satisfied by structuring property rights so as to afford owners a determinate share in the underlying energy resource.

119 GEOTHERMAL DEVELOPMENT POLICY FOR AN ISOLATED STATE: THE CASE OF HAWAII. Kamins, R.M. (Univ. of Hawaii, Honolulu). pp 2383-2388 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

Hawaii presents the case of an industrialized economy almost completely dependent on imported fossil fuel, but possessing potential indigenous energy sources. Publicly financed exploration for geothermal resources is under way, and the Hawaii state government is considering what actions should be taken to encourage and also regulate the resource should it be economically useful. In determining the level and kinds of support to give geothermal development, the state should consider benefits going beyond the substitution of geothermal power for imported oil. These benefits may include: (1) insurance against the interruption of petroleum imports or additional increases in their price; (2) stimulation of local employment; (3) population decongestion, with encouragement of population growth near geothermal areas, away from Honolulu; and (4) environmental enhancement, with the institution of power production less polluting than burning oil. Methods of approximating the value of these spillover effects are shown using Hawaii data as an example.

120 TECHNICAL ASSESSMENT OF THE IMPACT OF GEOPRESSURE DEVELOPMENT IN THE CORPUS CHRISTI AREA OF TEXAS. Kleeman, W.T. (Texas General Land Office, Austin); Haynes, K.E.; Freeland, T.F. pp 2389-2401 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

This study is an outgrowth of a four-year ongoing U.S. National Science Foundation (RANN) project on the impact of alternative environmental policies on coastal-zone development in the Corpus Christi area of Texas. In recent years geothermal development has become a distinct possibility in the vicinity of the study area due to the identification of a belt of geopressured sands in the immediate offshore area. The economic interrelationships between alternative environmental policies and the development of a nearby geothermal energy source are examined. This examination is based on a localized version of the Texas Input-Output Model and on information generated from the environmental policy impact analyses. In addition to the impact on output there are also changes in the rates of migration, expansion, and location of housing, and the location of economic activity.

121 CALIFORNIA'S GEOTHERMAL LANDS: A LEGAL FRAMEWORK FOR RESOURCE DEVELOPMENT. Lindsey, M.K. (Stanford Law School, CA). pp 2403-2407 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The State of California has provided a comprehensive legal framework for the development of geothermal resources within the state. The scope of the California statute, and prospecting and leasing procedures are reviewed. It is recommended that deficiencies in the state statute be refined to conform to federal standards. (LCL)

122 GEOTHERMAL RIGHTS AND PROBLEMS OF

LEGISLATION IN JAPAN. Nakamura, S.; Nakahara, T.; Iga, H. (Japan Geothermal Energy Association, Tokyo). pp 2421-2429 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The method of development of geothermal power, which is recently receiving great attention as a form of domestic underground energy resource, is presented. It is not a mineral, however, so it does not come under the Mining Law; and rights pertaining to the development and usage cannot therefore be based on this law. Geothermal power exists mostly in volcanic and hot spring areas, with practically the same quality and form as the hot spring. Development is similar to hot spring drilling so rights for possession and usage are obtained in accordance with the provisions of the Hot Spring Law. Also, many geothermal power areas are within parks of great natural beauty and the development of geothermal power is thereby restricted by the Parks Law. Many geothermal power development areas are also in national lands. Sales and leasing of these lands are mainly to the public or enterprises benefiting the public under the National Properties Law and the National Lands Law. Under the Forestry Law, deforestation is restricted even on private land. In addition, geothermal electric power generation facilities are included as thermal power facilities under the Electricity Utility Industry Law. It is now necessary to establish a systematic organization to handle the above problems to promote the development and usage of geothermal power and to stabilize the question of right. For the present, however, a bill is being considered to designate geothermal power development areas and to determine the developers.

123 LAW OF ICELAND AS IT AFFECTS GEOTHERMAL DEVELOPMENT. Torfason, H. pp 2435-2437 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

In Iceland, geothermal resources are governed by general rules of the common law of property but also regulated by provisions of statutory law allowing the State certain control over their development. The right of ownership and use of geothermal resources generally vests in the owner of the land where the resources lie. Accordingly they are largely under private ownership and not necessarily vested in the State unless the State is the owner of the property to which they belong. The depth to which individual ownership of geothermal resources may reach has not been defined by law. Conflicts between adjoining properties are to be settled by appraisal of their rateable interests in the geothermal field. Geothermal resources may not be separated by sale from the land to which they belong except by permission of the State. In case of sale of the resources or of the land the local municipality and the State have a preemptive right of purchase (at market value). The State has a right to expropriate geothermal resources for public purposes, subject to compensation to the owner by constitutional right. In electricity production, the pivotal rule is that a parliamentary concession is required to establish power plants, and development is in fact mostly handled through utility corporations owned by the State and/or major municipalities. In space heating, the policy of the law is to entrust development to municipalities, who may be granted a monopoly to operate geothermal heating systems in defined areas, to the exclusion of other means of heating. Development for other purposes (agricultural, industrial) is not as heavily regulated by statute. The State, acting through the National Energy Authority, has a right to explore geothermal resources wherever situated by drilling or otherwise and generally to supervise their conservation and development.

124 CALIFORNIA GEOTHERMAL RESOURCES: HOW WELL ARE WE DOING. Warren, C. (State of California Legislature, Sacramento). pp 2439-2441 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The State of California is the location of the largest geothermal electrical generation complex in the world. The legal framework which permitted and guided development of this resource on state-owned lands is contained in the Geothermal Resource Act of 1967. An incentive measure based largely on experience gained in regulation of oil and gas developments, the legislation is credited with assisting in the rapid geothermal development at The Geysers. Environmental concerns, institutional barriers such as unequal tax treatment on both the state and federal levels, and the need for streamlining permitting procedures has resulted recently in passage of some far-reaching new energy legislation including the Warren-Alquist Act of 1974. The legislature is now considering measures to remove some of the remaining legal disincentives and is reviewing the basic geothermal law to require performance from developers while insuring access to the resource to all able developers.

125 SOCIAL IMPLICATIONS THAT MAY ARISE WITH FUTURE GEOTHERMAL USE. Wehlage, E.F. pp 2443-2445 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The fullest implication of geothermal heat's effect on society--when it is fully and effectively used--is not being given adequate attention. Geothermal development, especially for electrical generation, is becoming socially impeded in the USA. Governmental influences evolve. Its effect on the social structure is not only economic in an energy dilemma, but people as a society will be increasingly involved. Geothermal energy's nature is that with nonelectric utilization (required for greatest benefit) population and industry will be forced to move, causing social pressures in an unknown degree. Better social preparation is mandatory. The fullest use of geothermal heat may dictate drastic reorganization.

126 LEGAL ASPECTS OF GEOTHERMAL ENERGY DEVELOPMENT. Weinstein, D.; Gordon, T.J.; Maslan, F. (Futures Group, Glastonbury, CT). pp 2447-2455 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The legal structure for regulation of geothermal energy development should be logically and explicitly related to the nature of the resource and the institutional arrangements most appropriate to its development. The legal regime in the United States is, however, not as rationally structured as it might be. It is a product of past and present laws, at state and federal levels, on mining, mineral leasing, mineral disposal, water resource, the environment, and public land. The regulatory structures

governing exploitation of other natural resources are not entirely appropriate to geothermal development. Recent state and federal legislation attempts to chart a unique course for geothermal resource development, but has not completely overcome the legacy of the past; important questions concerning ownership and acquisition of rights to geothermal resources have been left unresolved. The legislation addresses the roles of the public and private sectors in geothermal resource development. Private developers have questioned federal and state policies with respect to: availability of public lands; competitive and noncompetitive bidding systems; rent and royalty structures; lease terms: environmental and land-use regulation; tax treatment; and allocation of regulatory responsibilities. In some of the areas, policymakers should now reconsider earlier decisions; in other areas they should closely monitor future performance to determine whether policy changes are needed.

127 POSSIBLE CONFLICT BETWEEN THE INTERESTS OF TOURISM AND GEOTHERMAL POWER DEVELOPMENT. Wilson, S.H. pp 2457-2466 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

The discharges of holes drilled for geothermal prospecting or development may cause, through the lowering of the water table, the decay of local hot-spring activity. So far, the losses in New Zealand have been Geyser Valley, a major tourist attraction at Wairakei, two minor areas there, minor hot springs of Kawerau and Broadlands, with a fortunate escape for Waiotapu, a major attraction. There have also been losses through hydroelectric developments, especially at Orakeikorako, a major tourist attraction, where 75 percent of the hot springs have been flooded. If one defines a ''hot spring region'' as a locality where hot spring areas of varied attractions can be conveniently visited from one center, then there are only five such regions in the world. Yellowstone National Park is preeminent in the number and size of its geyser basins, but the Rotorua-Taupo region, although poor in geysers, has the advantages of accessibility at all seasons, association with active volcanism, and a greater variety of scenery. Any further losses of hot springs in the region, now with four major tourist attractions, would be serious. The underground reservoirs of hot water may last under exploitation for only 100 years, perhaps until nuclear fusion energy makes them unnecessary. Hence the fact that losses have been compensated by tourist interest in the bore field, and the power development, loses its significance, especially as later power developments will not have the same interest. Tourism, even if modified in ways not yet envisaged, can be expected to last as long as the natural springs, perhaps for thousands of years. Serious clashes between tourist interests and power developments seem to need further consideration only in New Zealand.

128 ECONOMIC AND SOCIAL ASPECTS OF GEOTHERMAL ENERGY RESOURCE DEVELOPMENT. Maslan, F.; Gordon, T.J.; Deitch, L. (Futures Group, Glastonbury, CT). pp 2325-2331 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Berkeley, CA; Univ. of California (1976).

Development of geothermal energy in the United States will be paced by a number of socio-economic impediments as well as by technological problems. The issues are associated with providing a financially viable base for exploration and development, assuring a market for geothermal steam or hot water, and accomplishing the required research and development in a timely manner. Geothermal development will change the electric utility fuel mix by substituting for nuclear and coal generating plants. Businesses involved in the exploitation of geothermal energy and businesses which can uniquely utilize geothermal resources will be stimulated. Macroeconomic factors will be affected because development of geothermal energy seems likely to furnish 5 to 10 percent of the total U.S. electricity demand by the year 2000. This level of development will stimulate construction of a national electrical grid. Acceleration of geothermal energy development requires changes in certain marketing, financial, and other institutional arrangements. Currently, government regulations overlap and cause delays. Another major problem area is the securing of adequate financing for timely development. The impacts on housing and cities stem from industrialization resulting from the development of the geothermal resource itself and from businesses which can utilize the heat and mineral content of the geothermal fluids. Economic and urban planning benefits will derive from geothermal space and process heat. Geothermal energy will affect international trade relations; foreign technological aid and geothermal markets can be expected to develop as early as the late 1970's.

129 ERDA AUTHORIZATION, FISCAL YEAR 1977. PART IV. BASIC ENERGY SCIENCES. HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, SECOND SESSION, FEBRUARY 26, 1976. Washington, DC; Committee on Science and Technology (1976). 360p. GPO.

Hearings were held on the 1977 ERDA budget for research activities in materials and molecular sciences and the significance of ERDA programs to public utilities. ERDA budget requests for basic energy science showed an increase of $6.8 million, or four percent. Changes in direction increased funding for non-nuclear technology, including fossil, solar, geothermal, conservation, and environmental. Funding was to be reduced for fission- and fusion-related research and science base. Data included program objectives and operating, capital, and construction expenses for specific facilities. Representing ERDA were Dr. Robert L. Hirsch and Dr. James Kane. Dr. Larry Hobart of the American Public Power Association stressed the need for adequate funding of reliability demonstration projects for advanced fuel technologies, such as fuel cells, diesel bottoming cycles, Stirling engines, and improved gas turbines. These offer the potential of more efficient use of conventional fuels, more environmentally acceptable power, and a capacity for smaller-scale equipment. (DCK)

130 WITNESSES FOR OIL: THE CASE AGAINST DISMEMBERMENT. Canes, M.E. (comp.); Markun, P.M. (ed.). Washington, DC; American Petroleum Institute (1976). 300p. $6.95.

Proposed legislation would dismember this country's oil companies in either of two ways. Some proposals would divide the large integrated companies into separate, single-function units. Other proposals would prevent the oil companies--our nation's most experienced energy producers--from participating in the development of other energy resources. Hearings on these bills by

both Houses of Congress have brought vigorous dissent from the executives of the petroleum companies. Their testimony has been brought together in this volume. Fourteen testimonies included on vertical divestiture are: A View From the Independents, Richard J. Boushka; A View From a Large Oil Company, W.T. Slick, Jr.; A Common Form of Industrial Organization, Annon M. Card; An Economist's Analysis, Michael E. Canes; The Standard Oil Breakup of 1911 and Its Relevance Today, Hastings Wyman, Jr.; Vertical Divestiture: Exploration and Production, L.C. Soileau III; Vertical Divestiture: Refining, Walter R. Peirson; Competition in Refining, Donald C. O'Hara; Vertical Divestiture: Pipelines, Charles J. Waidelich; Pipelines, Divestiture, and Independents, Fred F. Steingraber; The Southern Caucus Testifies, J.W. Adams III, C.R. Jackson, Pat Green and J.R. Johnson; A View From a Small Independent Distributor, Robert J. Welsh, Jr.; International Relations and Divestiture, William P. Tavoulareas; and Divestiture and OPEC, a Response to Anthony Sampson, Standard Oil Company of California. Five testimonies on horizontal divestiture are presented, namely: Developing Alternate Sources of Energy, W.T. Slick, Jr.; Who Should Develop Coal: Everybody, C. Howard Hardesty, Jr.; Suggestions for Doubling Our Coal Production, DeWitt W. Buchanan; The Know-How to Develop Oil Shale, John E. Kasch; and Drilling Expertise and Geothermal Energy, Carel Otte. (MCW)

131 ENVIRONMENTAL IMPACTS OF GEOTHERMAL RESOURCE DEVELOPMENT ON COMMERCIAL AGRICULTURE: A CASE STUDY OF LAND USE CONFLICT. Andersen, S.O. (Resources Economist, San Francisco). pp 1317-1321 of Proceedings of the second United Nations symposium on the development and use of geothermal resources. Vol. 2. Berkeley, CA; Univ. of California (1976).

The environmental impacts from geothermal exploitation are largely limited to the area immediately surrounding the production facilities. This creates the unique situation where private landowners and associated development companies could conceivably bear the full benefits and costs of development with neither adverse nor beneficial implications to the rest of society. This relationship provides the remarkable opportunity to test the contention that when all costs and benefits are "internalized," maximum social gain is achieved. The changes in resource management which occur as landowners become better informed of financial and environmental implications of geothermal development are investigated. This paper reports on the preliminary research. The probable impact of actions of increasingly well-informed landowners who negotiate for higher lease returns and stronger environmental protection is examined. First the environmental implications of geothermal development from the private landowner's perspective are summarized, the probable influence on lease provisions is hypothesized, and some of the corporate and social implications of these actions are explored.

132 ERDA AUTHORIZATION, FISCAL YEAR 1977. PART III. GEOTHERMAL. HEARING BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, SECOND SESSION, FEBRUARY 19, 1976. Washington, DC; Committee on Science and Technology (1976). 123p. GPO.

The hearing focused on the proposed budget and program for the ERDA Geothermal Energy Division and on the adequacy of the proposed activities to implement the legislative mandates of the Geothermal Research, Development, and Demonstration Act of 1974, Public Law 93-410. One objective of the law was to establish a comprehensive program for research, development, demonstration, and commercial demonstration of this important energy resource. Another primary objective of the 1974 Geothermal Energy Act was to streamline and coordinate the splintered jurisdictions of the Federal agencies involved in geothermal energy. A major activity set forth in the Act is a resource inventory and assessment program. In addition, the Act established an R and D program to underpin a demonstration program and analyzed the institutional barriers to commercialization of geothermal energy. The budgetary provisions and the strategy for managing these programs were examined at the hearing. The legislative history of the act indicates that it was the intent of the committee to have 6 to 10 electrical powerplants of approximately 10 to 40 megawatt capacity on line by the end of fiscal year 1980. Rep. Mike McCormack, presiding chairman of the subcommittee, stated: "In looking at the proposed fiscal year 1977 budget, the subcommittee must express its clear concern that this objective appears to be in jeopardy due to the absence of any specific construction items for geothermal energy demonstration plants. We want to clarify what the differences were between the division request and the Presidential budget submission for demonstration projects." The witnesses heard on these and other geothermal issues were Dr. Robert L. Hirsch, Dr. Eric H. Willis, Dr. Vincent E. McKelvey, and Dr. Richard S. Fiske. (MCW)

133 STATE TAXATION OF GEOTHERMAL RESOURCES COMPARED WITH STATE TAXATION OF OTHER ENERGY MINERALS. Wagner, S.C. Washington, DC; Geological Survey (1976). 59p.

Comparisons of state taxation on the energy minerals (coal, oil shale, uranium, oil, and natural gas) to that of geothermal energy in six Western States (California, New Mexico, Utah, Idaho, Nevada, and Oregon) are given for planning economics of geothermal resource development. Separate sections include: property taxes; severance taxes; corporate franchise; income and excise taxes; oil and gas production or conservation taxes. An appendix of geothermal resources and byproducts definitions is included and taxes charts are arranged by state and by type of tax. (PCS)

134 INSTITUTIONAL BARRIERS TO GEOTHERMAL ENERGY DEVELOPMENT. SECOND REPORT OF THE INSTITUTIONAL BARRIER PANEL TO THE GEOTHERMAL ADVISORY COUNCIL. Washington, DC; Federal Energy Administration (1976). 12p.

Recommendations for remedial actions either through legislative and/or regulatory amendment or by directed agency action are given for three areas of study: delays in issuance of noncompetitive leases; drilling permit delays; and casual use, burdensome and discriminatory treatment of lessees. Other subjects considered resolved through other avenues were: force majeure clause in the lease agreement; assessment of geothermal resources on Indian Lands; steam price review; redefinition of KGRA and reclassification of noncompetitive lease tracts; limitation of the Secretary of Interior's discretion to readjust lease terms and conditions; royalty rebate; and royalty reduction contingencies. (PCS)

135 INSTITUTIONAL BARRIERS TO GEOTHERMAL ENERGY DEVELOPMENT. A REPORT BY THE INSTITUTIONAL BARRIER PANEL TO THE GEOTHERMAL ADVISORY COUNCIL. Washington, DC; Geothermal Advisory Council (1976). 23p.

Recommendations for solving industry problems in the following areas are given: federal taxation policy; federal--state utility rate structure policy; federal--state environmental protection assessments; federal--state environmental standards for geothermal pollutants; resource assessment; overlapping lease applications; cash bonus competitive bidding; cumulative acreage limitation; utility uncertainty resupplier's performance; readjustment of terms and conditions of leases; minimum leasehold size limitations; work requirements; and decays in the issuance of noncompetitive leases on forest lands. (PCS)

136 GEOTHERMAL ENVIRONMENTAL ADVISORY PANEL. SECOND ANNUAL REPORT, JULY 1, 1975--JUNE 30, 1976. Menlo Park, CA; Geological Survey (1976). 6p.

Progress is reported in interagency cooperation for identifying mitigating measures for most environmental problems associated with geothermal development. The major problems that remain relate to preservation of certain unique geological and geothermal areas and certain delicate ecosystems: areas which are outside the purview of the Panel. (PCS)

137 GEOTHERMAL ENERGY. VOLUME 2. SEARCH PERIOD COVERED: MAY 1975--APRIL 1976. CITATIONS FROM THE NTIS DATA BASE. Smith, M.F. (ed.). Springfield, VA; National Technical Information Service (1976). 298p. (NTIS/PS--76-0463).

Research on all aspects of geothermal energy and its development are contained in this collection. Hot-dry-rock systems, geothermal brines, magma systems, drilling, rock penetration, hydrology, and prospecting are studied. Electric power porduction, space heating, engineering, equipment, materials, corrosion and process economics are also included. (This updated bibliography contains 190 abstracts, all of which are new entries to the previous edition.)

138 GEOTHERMAL ENERGY. VOLUME 1. SEARCH PERIOD COVERED: 1970--1974. CITATIONS FROM THE ENGINEERING INDEX DATA BASE. Smith, M.F. (ed.). Springfield, VA; National Technical Information Service (1976). 251p. (NTIS/PS--76/0464).

Studies of worldwide research on geothermal prospecting, regions and resources are cited. Electric power generation, steam heating, and heat recovery are also included along with government policies, assessment, development and economics. (Contains 141 abstracts)

139 LAWS, REGULATIONS, AND SOCIAL CONSTRAINTS TO THE DEVELOPMENT OF GEOTHERMAL ENERGY. Washington, DC; Smithsonian Science Information Exchange, Inc. (1976). 60p.

A compilation of 57 notices of research projects on geothermal energy development are contained in this document. The supporting and performing organizations, the investigator(s), funding data, and a brief description of the project are included. Legal aspects are briefly cited where applicable. (MCW)

140 BENEFITS AND COSTS TO LANDOWNERS FROM GEOTHERMAL RESOURCE LEASE AND DEVELOPMENT. Andersen, S.O.; Wallace, L.T. Berkeley, CA; Univ. of California (1976). 27p.

Landowners can gain substantially from geothermal resource lease. The amount of gain is dependent on quality and quantity of resources, timing of exploration and development, and terms of the lease agreement. Substantial financial losses from environmental damage and unfavorable tax treatment are also possible. Environmental effects of geothermal exploration and development can reduce the yield and market price of crops and increase crop protection and other operating costs. The timing and extent of geothermal activities can reduce the value of land for residential, recreational, and other development and make financing of non-geothermal operations more costly and difficult to obtain. the possible gains from the lease must be balanced against the possible costs to determine if new land use is profitable. In most lease agreements, the landowner must decide how much he is willing to give for each lease concession and which combination of assured payments and potential payments best suits the individual circumstances. The landowner may need to invest in preliminary exploration to achieve maximum financial return and to protect his other interests. It is emphasized that legal advice is necessary for accurate lease interpretation and revision.

141 STATE TAX HANDBOOK AS OF OCTOBER 1, 1976. Chicago; Commerce Clearing House, Inc. (1976). 672p. $8.50.

The charts in this handbook set forth the tax system of each state and the District of Columbia as of October 1, 1976. Here you will find a brief description of the statewide levies, the basis and rates of each tax and the principal payment and return due dates. Introducing the tax outline for each state is a brief digest of the principal revenue provisions of the state constitution. Here, too, the major features of each state's revenue system are outlined generally. Both corporate and personal income tax information is included.

142 SOME ISSUES REGARDING REGULATORY POLICY, POLITICAL PARTICIPATION, AND SOCIAL IMPLICATIONS OF GEOTHERMAL RESOURCE DEVELOPMENT IN THE IMPERIAL VALLEY. Green, P.S.; Steinberger, M.F. Riverside, CA; Univ. of California (1976). 64p. (PB--256569). NTIS.

In order to delineate social and political issues relating to geothermal development, certain local government officials and community leaders in the Imperial Valley were interviewed on their perceptions of the potential of geothermal resources and regulatory problems implicit in development. County officials exhibited a strong relief that they had an overall responsibility for the general welfare of the residents of Imperial County who would be affected by the potential economic, social, and environmental impacts of geothermal development. With little coordination among agencies at higher levels of government, County officials looked upon County regulations and coordination as a positive force that could: (1) minimize the negative impacts of geothermal development, (2) encourage multipurpose utilization of geothermal resources, and (3) improve land use planning within their jurisdiction. Recommendations for improving the regulatory process included organizational and procedural changes and amendments to state energy legislation. Suggestions for improving public input into the governmental decision making

process were presented in order to make geothermal regulations a joint effort of commercial developers, public officials, and private citizens.

143 BENEFITS OF STIMULATING GEOTHERMAL ENERGY DEVELOPMENT WITH TAX AND RESEARCH SUBSIDIES. Knutsen, C.A. Richland, WA; Battelle, Pacific Northwest Labs. (1976). 43p. (BNWL-SA--5934).

A technique is demonstrated for evaluating benefits of subsidies and examples are given for using it to determine the cost-benefit ratio. Examples use two preferential tax treatments as opposed to direct research grants for the high-temperature, low-salinity hydrothermal resources. Results are compared and some conclusions are given. (PCS)

144 LEGAL, INSTITUTIONAL, AND POLITICAL PROBLEMS IN PRODUCING ELECTRIC POWER FROM GEOTHERMAL RESOURCES IN CALIFORNIA. Schuller, C.R.; Schilling, A.H.; Cole, R.J.; Simon, G.D. Seattle; Battelle Human Affairs Research Centers (1976). 392p.

Non-technical problems hampering the production of electric power from geothermal resources are identified and possible solutions offered. These problems usually occur when one participant in the geothermal process has to deal with another. Laws that shape those interactions are examined in ten major groups: leasing, exploration, reaching agreement for utilization, power plant construction, transmission, financing, environmental reporting, the role of the California Energy Commission, proposed air pollution regulations, and the political economics of individual counties. (PCS)

145 R AND D IN GENERATION: GIVING PRACTICAL DIRECTION TO DIVERSE VIEWS. Rittenhouse, R.C. Power Eng.; 79: No. 12, 44-51(Dec 1975).

Economic, political, environmental, and time restraints challenge utility operations to meet the demands for electric power now and in the future. The most basic datum that needs to be known is the growth rate for the future. Costly and unnecessary delays are being experienced by the nuclear industry, even though it is widely known that future power generation will be from nuclear and coal. Improvements in plant efficiency and reliability have been major goals of research and development with resulting lower rates (until recently) and greater reliability in electric service. The Electric Power Research Institute was organized in 1973 and its staff has free reign to develop research in areas that will prove right for providing the public with lower-cost power in a manner that will have the least environmental impact. Its program has shifted from its original mid- and long-term interests to emphasis on immediate near-term problems. Its overall goal, their time frame, and their approximate percentage of funding out of a total EPRI budget guideline of about $150 million for 1976 are given. The Energy Research and Development Administration is the fourth member (utilities, manufacturers, industry organizations) that has joined to blend technical expertise into a powerful new R and D force on power generation. Rad-wastes, clean fuels from coal, the environment, combustion, transmission and distribution, fusion, solar, geothermal, wind, fuel cells, MHD, and communications research programs being conducted in the United States are briefly described. Budgets for each utility, manufacturer, EPRI, and the government agencies are discussed briefly. (MCW)

146 CALIFORNIA PUBLIC UTILITIES COMMISSION. Sipe, H.T. Geotherm. Energy Mag.; 3: No. 12, 26-27(Dec 1975).

A statement is presented on geothermal resource utilization in California. At the present time, there are 502,000 kilowatts of geothermal generating capacity in the State of California. This generating capacity is in 11 units at Pacific Gas and Electric Company's Geysers Power Plant in Sonoma County. PG and E has current applications pending before the California Public Utilities Commission (PUC) for an additional 406,000 kw from four more units at The Geysers.

147 ENERGY ALTERNATIVES FOR CALIFORNIA: PATHS TO THE FUTURE. Ahern, W.; Doctor, R.; Harris, W.; Lipson, A.; Morris, D.; Nehring, R. Geotherm. Energy Mag.; 3: No. 11, 24-25(Nov 1975).

CALIFORNIA;ENERGY SUPPLIES;FORECASTING;POWER POTENTIAL;NUCLEAR ENERGY;GEOTHERMAL ENERGY; GEOTHERMAL RESOURCES;LEGAL ASPECTS

148 GEOTHERMAL FEDERAL LOAN GUARANTEE PROGRAM (FEDERAL REGISTER). Geotherm. Energy Mag.; 3: No. 11, 33-35; 37-39(Nov 1975).

US ERDA;FINANCING;REGULATIONS;GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES;LOAN GUARANTEES

149 ENGINEERING MANPOWER AND ENERGY NEEDS. IV. FEDERAL POLICIES HAVE AN IMPACT. Benson, F.J. (Texas A and M Univ., College Station). Chem. Eng. Prog.; 71: No. 11, 43-45(Nov 1975).

It is the view of the author that governmental policies with impact on energy supply and demand may have unexpected and disastrous consequences on the energy supply situation, particularly where such policies dictate rapid changes in energy use that are not in the economic interests of those affected. For example, the very low price of natural gas has caused it to be used for very mundane purposes and also has resulted in the cessation of drilling and exploration. Some Federal policies and regulations promote use of some forms of energy or discriminate against other forms for various social reasons. The author says that it seems reasonable for the nation to shift from crude oil and natural gas to coal as the major fossil fuel. Federal policies have caused uncertainty regarding investments in capital and technological developments. Risks will not be taken as long as it seems probable that changes in Federal policies may increase the risks or reduce the potential economic gains. The reasonable initial program suggested by the author involves beginning with a concerted effort of exploration and drilling for petroleum; development of the nation's coal resources accompanied with substantial coal research; and in a longer range program, the development of solar energy, the nuclear fusion process, geothermal energy, and energy from biological processes. (MCW)

150 (NSF-RA-N--74-246) Uncl ANALYSIS OF THE POTENTIAL USE OF GEOTHERMAL ENERGY FOR POWER GENERATION ALONG THE TEXAS GULF COAST. Wilson, J.S.; Shepherd, B.P.; Kaufman, S. (Dow Chemical Co., Freeport, Tex. (USA)). 15 Oct 1975. 69p. Dep. NTIS $4.50.

Three forms of potential geothermal energy may exist in the State of Texas: hot rocks in the Trans Pecos region, convection type geothermal water in the Rio Grande Rift basin, and geopressured geothermal water along the

Gulf Coast. Of these, only the geopressured waters have been verified. Exploration wells for oil and gas have established the presence of deep hot water deposits along the coastal area, offshore and inland for 75 miles. These exist in thick shale and sand beds in the geopressured zone. The most favorable area appears to be at depths of 12,000 to 15,000 feet where the temperatures range from 300 to 400°F. Indications are that a series of relatively small, 10 to 50 megawatt, power plants could be located along the coastal plain of Texas. These plants could produce at least 20,000 megawatts and possibly as much as 100,000 megawatts under the most favorable conditions. Cost of the power appears to be in the range of 25 to 35 mills per kilowatt hour in 1980 providing the water is saturated with natural gas which could be sold to offset some of the cost. If the gas is present, at least 6 billion cubic feet per day of natural gas would be produced. Unit capital investment for such plants would exceed projected costs for nuclear or fossil fueled power plants. Successful development of a demonstration plant with public funds could establish the viability of geopressured waters as a source of power and natural gas and encourage private investment to exploit this energy source, should it prove competitive with other sources of electric power generation.

151 (PB--246568) Uncl MINERAL LEASING ON INDIAN LANDS: REPORT TO THE FEDERAL TRADE COMMISSION. Dick, J. (Federal Trade Commission, Washington, D.C. (USA). Bureau of Competition). Oct 1975. 241p. (FTC--7510003-ML/IL). NTIS $8.00.

This report covers past and present leasing policies for Indian lands, the statutory and regulatory framework, and an evaluation of leasing policies--particularly their effect on competition. It contains a series of recommendations designed to safeguard the interests of the Indians and otherwise aid the mineral leasing program in achieving its primary objectives.

152 (PB--246663) Uncl STAFF REPORT TO THE FEDERAL TRADE COMMISSION ON FEDERAL ENERGY LAND POLICY: EFFICIENCY, REVENUE, AND COMPETITION. (Federal Trade Commission, Washington, D.C. (USA)). Oct 1975. 970p. (FTC--7510003-FELP). NTIS $23.75.

Past land disposal policies, economic and technological conditions relevant to the choice of a leasing approach, and the general direction and effectiveness of policy for each of the following fuel areas are discussed: offshore oil and gas, onshore oil and gas, oil shale, coal, uranium, and geothermal energy sources.

153 (PB--250636) Uncl AN ANALYSIS OF THE ERDA PLAN AND PROGRAM. (Office of Technology Assessment (U.S. Congress), Washington, D.C.). Oct 1975. 330p. (OTA-E--12). NTIS $10.00.

An analysis is given of the energy research and development programs of the Energy Research and Development Administration (ERDA). The analysis was performed primarily by task groups assembled to cover each of ERDA's major programmatic areas: (1) fossil energy; (2) nuclear energy; (3) solar, geothermal, and advanced technologies; (4) conservation; and (5) environment and health. Since the ERDA plans reflect the President's view of national energy RandD policy, they will in large measure determine the broader options for our future national energy policy; this assessment is intended to provide the Congress with much of the background information necessary for an effective analysis of the ERDA programs.

154 DEVELOPMENT OF THE NATION'S GEOTHERMAL ENERGY RESOURCES. II. Kruger, P. (Div. of Geothermal Energy, (ERDA), Washington, DC). Aware; No. 61, 8-13(Oct 1975).

GEOTHERMAL ENERGY;RESEARCH PROGRAMS; LEGISLATION;US ERDA;ENVIRONMENTAL EFFECTS; ECONOMICS;REGULATIONS;USA;GEYSERS GEOTHERMAL FIELD;EXPLORATION;ELECTRIC POWER;PLANNING

155 ENERGY ANALYSIS AND PUBLIC POLICY. Gilliland, M.W. (Univ. of Oklahoma, Norman). Science; 189: No. 4208, 1051-1056(26 Sep 1975).

ENERGY POLICY;ECONOMIC POLICY;NET ENERGY; ENVIRONMENTAL EFFECTS;MATERIALS;ENERGY SOURCES; ECOLOGY;MINERALS;COST BENEFIT ANALYSIS; GEOTHERMAL ENERGY;SYSTEMS ANALYSIS

156 (CONF-750720--, pp 59-86) GEOTHERMAL ENERGY RESOURCES. Sep 1975.

From Conference on the magnitude and deployment schedule of energy resources; Portland, Oregon, USA (21 Jul 1975).

Magnitude and deployment schedule of energy resources.

Geothermal energy may be considered to be the thermal energy contained in the upper 10 km of the earth's crust, which has a mean temperature gradient between 20 to 30°C/km, a mean emissive heat flux of about 1.5 μcal/cm²sec, and a heat content above 15°C of some 3 x 10^{26} cal, of which about 6 x 10^{24} cal is under the United States. This resource base is equivalent to the heat content of 8 x 10^{14} metric tons of coal or 5 x 10^{18} kWh, representing about 375,000 times the forecasted U.S. total electric power production for the year 1985. Unfortunately, geothermal heat in the outer 10 km of the earth's crust is too diffuse to be exploitable as an energy resource on a worldwide basis. Resources suitable for commercial exploitation may be defined as localized geologic deposits of heat concentrated at attainable depths, in confined volumes, and at sufficient temperatures for intended utilization. Although geothermal resources have been developed largely for generation of electric power, utilization of geothermal resources for non-electrical purposes such as space or industrial heating, desalination of water, and mineral recovery may be of great value in conserving fossil and nuclear fuels. Environmental impacts of geothermal energy are discussed. Legal problems associated with geothermal resources vary from state to state. Three subgroup papers include: Wet and Dry Steam Systems, by David L. Williams; Hot Dry Rock Systems, by William E. Brigham; and Geopressured Systems, by Myron Dorfman. A Review of Geothermal Energy Resources was presented by Geoffrey Robson. (MCW)

157 ADMINISTRATIVE REQUIREMENTS FOR DEVELOPMENT OF GEOTHERMAL RESOURCES. Lyons, T. Geotherm. Energy Mag.; 3: No. 9, 16-25(Sep 1975).

OREGON;GEOTHERMAL RESOURCES;LEGAL ASPECTS; LAND LEASING

158 ENERGY CHOICES AND PUBLIC POLICY. Fisher, J.L. (United States House of Representatives, Washington, DC). J. Air Pollut. Control Assoc.; 25: No. 9, 910-912(Sep 1975).

It is suggested that the U.S. needs a broad statement of energy goals to go along with the

economic goals established in the Employment Act of 1946, the Full Employment Act so called, and to go along with the environmental goals stated in the National Environmental Policy Act of 1969, setting up the Council on Environmental Quality, the environmental impact statements, and the rest. The energy goals for the nation should include these: (1) low-cost, low-price reliable energy supply; (2) environmental protection; (3) national security; (4) energy conservation; (5) an efficient, competitive energy industry; (6) some protection against dislocations resulting from energy shifts, retraining for miners, regional development programs, unemployment compensation, and the rest; and (7) vigorous, imaginative R and D programs. (auth)

159 (JPL--5040-6(Vol.1)) Uncl PROGRAM DEFINITION FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY. VOLUME I. BACKGROUND AND PROGRAM DEFINITION SUMMARY. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 29 Aug 1975. Contract NAS7-100. 57p. Jet Propulsion Lab., Pasadena, CA.

The research program defined, with its supporting rationale, includes proposed federal government actions to facilitate a significant acceleration in the commercial utilization of the Nation's valuable geothermal energy resources in an environmentally acceptable manner. (MOW)

160 (JPL--5040-6(Vol.2)) Uncl PROGRAM DEFINITION FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY. VOLUME II. PROGRAM DEFINITION DEVELOPMENT RATIONALE AND SUBPROGRAM DESCRIPTIONS. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 29 Aug 1975. Contract NAS7-100. 195p. Jet Propulsion Lab., Pasadena, CA.

The purpose of this study is to give a comprehensive program definition of an integrated effort and commitment for effectively developing geothermal energy resources. A problem analysis discussion is given along with program development suggestions. Subprograms such as resource exploration, utilization, research and development, community planning, and policy analysis are described in detail. (MOW)

161 (JPL--5040-6(Vol.3)) Uncl PROGRAM DEFINITION FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY. VOLUME III. APPENDIXES. (Jet Propulsion Lab., Pasadena, Calif. (USA)). 29 Aug 1975. Contract NAS7-100. 389p. Jet Propulsion Lab., Pasadena, CA.

The following appendixes are given: (1) implication of the 1985 goal and updated sensitivity analysis, (2) geothermal development timelines, (3) leasing and exploration, (4) research and development, (5) electric utilities, (6) nonelectric geothermal market, (7) geopressurized resource R and D, (8) community planning, (9) summary of ERDA patent policy relevant to geothermal energy, (10) factors affecting the development of known geothermal prospects, (11) environmental laws and regulations, (12) elementary treatment of economics of geothermal power production, (13) conversion cycle analysis, (14) projection of attainable geothermal energy development and use, and (14) geothermal energy, research, development, and demonstration act of 1974. Separate abstracts were prepared for each appendix. (MOW)

162 (JPL--5040-6(Vol.3), pp 29p, App. C) LEASING AND EXPLORATION. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

This appendix sets forth the analysis and information used in deriving the recommendations (presented in Volume II) to aid the exploration and assessment of geothermal resources. The following subjects are discussed: leasing acreage requirements, availability and status of land for leasing, capital requirements for exploration, income to federal government from geothermal development, exploration industry status and attitudes, governmental attitudes, and nonrecommended actions. It should be noted that the calculations were based on assumed goals of 8,000 MWe by 1985 and 100,000 MWe by the year 2000. (MOW)

163 (JPL--5040-6(Vol.3), pp 48p, App. E) ELECTRIC UTILITIES. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

A discussion of electric utility companies, their structure, the forces that influence them, and their relationship to geothermal energy is given, based on interviews with utility and financial institution executives. (MOW)

164 (JPL--5040-6(Vol.3), pp 18p, App. H) COMMUNITY PLANNING. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

The results of a series of interviews designed to obtain the views of the community on the issues considered critical to their well-being is presented. These views help form the basis for program definition recommendations. (MOW)

165 (JPL--5040-6(Vol.3), pp 2p, App. I) SUMMARY OF ERDA PATENT POLICY RELEVANT TO GEOTHERMAL ENERGY. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

This appendix provides background information on patent policy as it pertains to the course of action, rationale, and recommendations presented in Vol. II of the program plan. (MOW)

166 (JPL--5040-6(Vol.3), pp 31p, App. K) ENVIRONMENTAL LAWS AND REGULATIONS. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

This appendix examines the pertinent aspects of various environmental laws and regulations that affect geothermal development. (MOW)

167 (JPL--5040-6(Vol.3), pp 11p, App. D) GEOTHERMAL ENERGY RESEARCH,DEVELOPMENT, AND DEMONSTRATION ACT OF 1974. 29 Aug 1975.

Program definition for the development of geothermal energy. Vol. III. Appendixes.

This appendix consists entirely of a copy of the Act. (MOW)

168 GEOTHERMAL RESOURCES OPERATIONAL (GRO) ORDER NO. 4 FOR CENTRAL AND WESTERN REGIONS. Fed. Regist. (Wash., D.C.); 40: No. 159, 34427-34431(14 Aug 1975).

Regulations are issued by the U.S. Department of the Interior in order to provide general environmental protection requirements for these regions. The regulations cover land use and reclamation; pollution prevention, including liquid disposal, solid waste

disposal, and air quality; fire prevention; slope stability and erosion control; pollution inspections; disposal of fluids in injection wells; and several other topics. These regulations became effective as of 8/1/75.

169 GEOTHERMAL POWER: STRANGLED BY RED TAPE. Atchison, S. Bus. Week; 68-69(11 Aug 1975).
A commentary is given on problems faced by industry in seeking to develop geothermal resources. The problems briefly discussed include government roadblocks, tax problems, and classification of geothermal resources. Corrective actions by Congress are suggested.

170 DEVELOPMENT OF THE NATION'S GEOTHERMAL ENERGY RESOURCES. Kruger, P. (Energy Research and Development Administration, Washington, DC). Geotherm. Energy Mag.; 3: No. 8, 25-27(Aug 1975).
From 2. energy technology conference; Washington, DC (12 May 1975).
GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES;USA; FORECASTING;RESEARCH PROGRAMS;GEOTHERMAL EXPLORATION;REVIEWS;LEGAL ASPECTS;GOVERNMENT POLICIES

171 STATE POLICY CONSIDERATIONS FOR GEOTHERMAL DEVELOPMENT IN HAWAII. Grabbe, E.M.; Kamins, R.M. Geotherm. Energy Mag.; 3: No. 7, 5-9; 11-13(Jul 1975).
HAWAII;PLANNING;GOVERNMENT POLICIES; GEOTHERMAL RESOURCES;WELL DRILLING; ENVIRONMENTAL IMPACTS;ELECTRIC POWER;USES; ENERGY POLICY

172 SENATE JUDICIARY COMMITTEE HB 2040: APRIL 30, 1975, OREGON. Hook, J.W. Geotherm. Energy Mag.; 3: No. 7, 45(Jul 1975).
OREGON;HEARINGS;GEOTHERMAL ENERGY;USES;SPACE HEATING;DISTRICT HEATING;ELECTRIC POWER; GEOTHERMAL RESOURCES;LEGISLATION

173 (ANCR--1214) Uncl NATIONAL PROGRAM DEFINITION STUDY FOR THE NON-ELECTRICAL UTILIZATION OF GEOTHERMAL ENERGY. Kunze, J.F.; Richardson, A.S. (Aerojet Nuclear Co., Idaho Falls, Idaho (USA). Idaho National Engineering Lab.). Jun 1975. Contract AT(10-1)-1375. 106p. Dep. NTIS $5.45.
RESEARCH PROGRAMS;PLANNING;GEOTHERMAL ENERGY; USES;ENERGY DEMAND;SPACE HEATING;REFRIGERATION; PROCESSING;AGRICULTURE;ECONOMICS;MARKET; FORECASTING;DISTRICT HEATING;US ERDA;HEATING

174 RECENT GEOTHERMAL DEVELOPMENTS IN COLORADO. Pearl, R.H. Geotherm. Energy Mag.; 3: No. 6, 45-47(Jun 1975).
COLORADO;GEOTHERMAL RESOURCES;LAND LEASING; PUBLIC LANDS;LEGISLATION;THERMAL WATERS

175 (NP--20699) FEDERAL ORGANIZATION FOR NONNUCLEAR ENERGY RESEARCH AND DEVELOPMENT ACTIVITIES OF DEPARTMENTS AND AGENCIES OTHER THAN ERDA: FY 1976. Bates, D.M. (Library of Congress, Washington, DC (USA). Congressional Research Service). 30 May 1975. 90p. TIC.
The purpose of this report is to summarize the activities of Federal departments and agencies, other than the Energy Research and Development Agency (ERDA), in energy R and D. Approximately $2.115 billion will be spent in fiscal year 1976 for Federal energy R and D by these departments and agencies: ERDA; Nuclear Regulatory Commission (NRC); Environmental Protection Agency; Department of the Interior; National Science Foundation; Departments of Transportation, Defense, Agriculture, and Commerce; and the National Aeronautics and Space Administration. The R and D efforts will be directed toward five program areas: fossil energy (coal, oil, gas, and shale), solar and geothermal, conservation, nuclear energy, and environmental control. Research support programs of the energy R and D programs will fund basic research and studies of environmental effects. Information, provided for each department and agency except ERDA, includes an identification of the units with principal energy R and D responsibilities, anticipated energy R and D funding, and program area details. Because the emphasis of this report is on non-nuclear energy, the NRC is covered briefly. Although the Federal Energy Administration is not listed as an agency with a direct energy R and D program, information is presented on its R and D program. (BYB)

176 SELF-SUFFICIENCY IN ENERGY. Marshall, W. Atom (London); No. 223, 62-66(May 1975).
United Kingdom. ENERGY SUPPLIES;PLANNING; ENERGY SHORTAGES;MATERIALS;FOOD;ENERGY SOURCES; ENERGY POLICY;UNITED KINGDOM;MARKET;NUCLEAR POWER PLANTS;NORTH SEA;SGHWR REACTOR;ENERGY CONSERVATION;PETROLEUM;COAL;GEOTHERMAL ENERGY; TIDAL POWER;TOTAL ENERGY SYSTEMS

177 SOME REFLECTIONS ON THE HISTORY OF THE UNITED NATIONS AND U.S. GOVERNMENT GEOTHERMAL ACTIVITIES. Barnea, J. Geotherm. Energy Mag.; 3: No. 5, 16-18(May 1975).
UNITED NATIONS;US ORGANIZATIONS;USA; GOVERNMENT POLICIES;ENERGY POLICY;GEOTHERMAL RESOURCES;GEOTHERMAL EXPLORATION;MEETINGS; INTERNATIONAL ORGANIZATIONS;REVIEWS;GEOTHERMAL ENERGY

178 PUBLIC INTEREST VS. PRIVATE PARTISANSHIP IN GEOTHERMAL DEVELOPMENT. Bowen, R.G. (Consulting Geologist, Portland, OR). Geotherm. Energy Mag.; 3: No. 5, 87-88(May 1975).
GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES; HEARINGS;PLANNING;ECONOMIC DEVELOPMENT; ENVIRONMENT;PRESERVATION;ENERGY SOURCE DEVELOPMENT

179 MAXIMUM AND TIMELY COMMERCIAL DEVELOPMENT OF DOMESTIC GEOTHERMAL ENERGY. Quillen, J.H. Geotherm. Energy Mag.; 3: No. 5, 28-31(May 1975).
GEOTHERMAL ENERGY;PROJECT INDEPENDENCE;US ERDA;RESERVES;RESEARCH PROGRAMS;GEOTHERMAL RESOURCES;LEGAL ASPECTS;LAND LEASING;PUBLIC LANDS;REGULATIONS;LEGISLATION

180 REDUCING THE RISKS IN GEOTHERMAL EXPLORATION: A TAX UPDATE. Eisenstat, S.M. Geotherm. Energy Mag.; 3: No. 5, 93-94(May 1975).
GEOTHERMAL EXPLORATION;LEGISLATION; GEOTHERMAL RESOURCES;TAXES;PRODUCTION

181 GEOTHERMAL EXPLORATION: STRATEGY AND BUDGETING. Barr, R.C. Geotherm. Energy Mag.; 3: No. 5, 39-41(May 1975).
GEOTHERMAL EXPLORATION;BUDGETS;WELL DRILLING; LAND LEASING;SITE SELECTION;GEOPHYSICAL SURVEYS; COST

182 1974: THE GEOTHERMAL YEAR IN RETROSPECT. Wehlage, E.F. Trans., Int. Soc. Geotherm. Eng.; 1: No. 2, S.7409.1-S.7409.7(May 1975).

Development problems and outlook. GEOTHERMAL ENERGY;ELECTRIC POWER;REVIEWS;USA;KROV MACHINE; BINARY-FLUID SYSTEMS;STEAM TURBINES;LEGAL ASPECTS;ENVIRONMENTAL EFFECTS;GEOTHERMAL RESOURCES

183 U.S. TAXES ON ENERGY RESOURCES. Brannon, G.M. (Georgetown Univ., Washington, DC). Am. Econ. Rev.; 65: No. 2, 397-406(May 1975).
From Eighty-Seventh Annual Meeting of the American Economic Association; San Francisco, CA (28 Dec 1974).
Project Independence should be designed to accept oil imports, build up reserves, and guarantee losses to producers of substitutes, rather than becoming another protective tariff with percentage depletion allowances and deductions of intangibles on successful wells. Contrary to claims, lower income taxes are not producing a reserve, which could be provided through direct purchase of crude for storage or by payment for in situ reserves. Risks are better avoided through loss guarantees, and integrated corporate tax rate reduction is preferable to selective politically controlled relief. Revised bidding procedures on public lands would correct the overdrilling trend that has resulted from current land-ownership rules. Low electricity prices and over-use of resources have resulted from the unnecessary undertaxing of public utilities. Property and excise taxes, import quotas, prorationing, environmental controls, and natural gas price regulations have all played a heavy part in the past tax structure. Current issues revolve around price controls, windfall taxes, income distribution, and resource allocations. Future policies will need to address the concepts of zero imports, balanced reserves, and reduced consumption. U.S. consumers should not be deprived of the benefits of reduced world oil prices in the future. This would mean keeping the U.S. in the world market while economically developing substitutes. (24 references) (DCK)

184 (PB--246241) Uncl A TECHNOLOGY ASSESSMENT OF GEOTHERMAL ENERGY RESOURCE DEVELOPMENT. Gordon, T.J.; Maslan, F.; Deitch, L. (Futures Group, Glastonbury, Conn. (USA)). 15 Apr 1975. Contract NSF-C836. 563p. NTIS $13.50.
Geothermal energy, energy derived from the intrinsic heat of the earth may become an important element of the energy inventory of the United States and the world in the next few decades. This report deals with some potential uses of geothermal energy in the United States, evaluates systems and makes recommendations for future applications. Specifically the objectives of this study were to: (1) identify potential constraints to the development of geothermal power; (2) determine feasibility; (3) determine its social, political, economic and environmental impacts in this country; and (4) provide input to the policy process regarding geothermal energy.

185 (PB--243467/8ST) Uncl STATE POLICY CONSIDERATIONS FOR GEOTHERMAL DEVELOPMENT IN HAWAII. Grabbe, E.M.; Kamins, R.M. (Hawaii State Dept. of Planning and Economic Development, Honolulu (USA)). Apr 1975. 24p. NTIS $3.25.
This is a brief background report that outlines the various policy options open to Hawaii in developing its geothermal energy resources. Topics that are addressed included: uses of the resource; outcomes of exploration and development; constraints on geothermal drilling in Hawaii; State policies toward geothermal drilling and development; and, roles of state and county government in geothermal development.

186 (UCID--16807) Uncl REGULATORY ASPECTS OF GEOTHERMAL ENERGY DEVELOPMENT IN THE SALTON SEA/IMPERIAL VALLEY AREA. Tonnessen, K. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Apr 1975. Contract W-7405-eng-48. 26p. Dep. NTIS $4.00.
GEOTHERMAL RESOURCES;REGULATIONS;GOVERNMENT POLICIES;GEOTHERMAL ENERGY;IMPERIAL VALLEY; SALTON SEA;LAND LEASING;US ORGANIZATIONS; ENVIRONMENTAL PROTECTION AGENCY

187 NSF/RANN FY 1975 PROGRAM FOR GEOTHERMAL RESOURCES RESEARCH AND TECHNOLOGY. Kruger, P. (Natl. Sci. Foundation, Washington, DC). Geotherm. Energy Mag.; 3: No. 4, 15-20(Apr 1975).
RESEARCH PROGRAMS;NATIONAL SCIENCE FOUNDATION;GEOTHERMAL ENERGY;GEOTHERMAL EXPLORATION;WELL DRILLING;ENGINEERING; GEOTHERMAL WELLS;RESERVES;GEOTHERMAL ENERGY CONVERSION;EXPLOITATION;LEGAL ASPECTS; ENVIRONMENTAL EFFECTS

188 ENVIRONMENTAL IMPACT OF A GEOTHERMAL POWER PLANT. Axtmann, R.C. (Princeton Univ., NJ). Science; 187: No. 4179, 795-803(7 Mar 1975).
Wairakei geothermal field. WAIRAKEI GEOTHERMAL FIELD;GEOTHERMAL POWER PLANTS; ENVIRONMENTAL IMPACTS;AIR POLLUTION;WATER POLLUTION;THERMAL EFFLUENTS;THERMAL POLLUTION; HYDROGEN SULFIDES;CARBON DIOXIDE;ARSENIC; MERCURY

189 (TID--26866) Uncl REPORT TO THE CONGRESS. PROBLEMS IN IDENTIFYING, DEVELOPING, AND USING GEOTHERMAL RESOURCES. (Department of the Interior, Washington, D.C. (USA)). 6 Mar 1975. 76p. Dep. NTIS $7.00.
GEOTHERMAL RESOURCES;LEGISLATION;US ORGANIZATIONS;LAND LEASING;POWER GENERATION; GEOTHERMAL ENERGY;RESEARCH PROGRAMS;BRINES; DESALINATION;REVIEWS;FRESH WATER;PRODUCTION; ELECTRIC POWER

190 (NP--20694) REPORT TO THE CONGRESS: PROBLEMS IN IDENTIFYING, DEVELOPING, AND USING GEOTHERMAL RESOURCES. (General Accounting Office, Washington, D.C. (USA)). Mar 1975. 78p. TIC.
The problems related to the identification, technological development, and use of geothermal resources are reviewed, and an assessment is made of the potential and progress of developing these resources as a source of both water and energy. Three government agencies--the National Science Foundation, the Department of the Interior, and the Atomic Energy Commission--have been involved in geothermal activities. The Federal budget for FY 1975 requested about $49 million for geothermal exploration, research, and development. It is difficult to determine the potential for large scale geothermal power generation because of: 1) a lack of information on the extent and locations of resources; and 2) unsolved technological and environmental problems. Estimates of possible electric power that could be generated from geothermal resources in the U.S. by 1985 range from 4,000 to 132,000 megawatts. The geothermal leasing program, under the U.S. Geological Survey, has not proceeded as rapidly as expected, due to lack of knowledge on characteristics of resources, early state of

technology, and lack of information used in classifying resources. The Bureau of Reclamation is heading a program in Imperial Valley, California, for producing 10,500 megawatts of power and 2.5 million acre-feet of fresh water a year from geothermal brines. Several recommendations are made to the Secretary of the Interior to improve geothermal resource development. (BYB)

191 (PB--244863) Uncl AN ANALYSIS IDENTIFYING ISSUES IN THE FISCAL YEAR 1976 ERDA BUDGET. (Office of Technology Assessment (U.S. Congress), Washington, D.C.). Mar 1975. 101p. NTIS $5.25.
The report, prepared with the assistance of an ad hoc OTA Energy Panel, appraises the relative levels of funding of various programs embodied in the Fiscal Year 1976 budget of the Energy Research and Development Administration (ERDA), and identifies major issues involving future energy problems. Areas examined include fossil fuel research; nuclear energy research; solar, geothermal, and advanced energy systems; conservation and energy productivity; and environmental impacts.

192 HAWAII GEOTHERMAL PROJECT. Kamins, R.M. (Univ. of Hawaii, Honolulu). Geotherm. Energy Mag.; 3: No. 3, 49-53(Mar 1975).
HAWAII;MAGMA SYSTEMS;GEOTHERMAL RESOURCES; GEOTHERMAL EXPLORATION;RESEARCH PROGRAMS; GEOPHYSICAL SURVEYS;VOLCANIC REGIONS; ENGINEERING;MANAGEMENT;SITE SELECTION;WELL DRILLING;ENERGY POLICY;GOVERNMENT POLICIES

193 GEOTHERMAL ENERGY: THE CHALLENGES THAT LIE AHEAD (PART 2 OF A TWO-PART ARTICLE). Fuchs, R.L. (Geosystems Corp., New York City); Huttrer, G.W. (Thermex Co., Denver). Eng. Min. J.; 176: No. 2, 78-82(Feb 1975).
GEOTHERMAL ENERGY;EXPLOITATION;ECONOMICS; LEGAL ASPECTS;LAND LEASING;GEOTHERMAL EXPLORATION;BROADLANDS GEOTHERMAL FIELD;WELL DRILLING;GEOPHYSICAL SURVEYS;GEOTHERMAL POWER PLANTS;LARDERELLO GEOTHERMAL FIELD;GEYSERS GEOTHERMAL FIELD;MATSUKAWA GEOTHERMAL FIELD; POWER GENERATION;ENERGY SOURCE DEVELOPMENT

194 (NP--20667) Uncl ENERGY: 1975. THE FIRST ANNUAL REPORT OF THE IOWA ENERGY POLICY COUNCIL. (Iowa Energy Policy Council, Des Moines (USA)). 15 Jan 1975. 59p. TIC.
Iowans need to make decisions to select and develop a primary source of energy for electricity generation. Iowa's energy sources, with the exception of 2% from state coal and hydroelectric resources, are all imported. Future needs will require a mix of continued large imports, development of the 7.2 billion tons of coal reserves, and/or development of renewable energy resources. The political, environmental, economic, and social implications of four options (high consumption-low production, low consumption-low production, high consumption-high production, and low consumption-high production) are analyzed, and the following recommendations made: (1) all reasonable conservation efforts should be made; (2) individuals and corporations should seek out the opportunities that conservation offers; (3) conservation should include efforts to achieve energy efficiency, full cost pricing, and economic incentives; (4) end use control of natural gas should limit it to high priority uses; (5) oil imports should be limited and balanced inventories maintained; (6) construction of new electricity generation plants should be approached conservatively; (7) Iowa should increase its research and analysis of the nuclear power potential; (8) public funds should be provided for energy R and D; (9) energy policies should maintain high environmental standards; and (10) mandatory measures should be limited and energy policies should respect individual and corporate freedoms. (DCK)

195 (PB--238791) Uncl REVIEW OF THE PROJECT INDEPENDENCE REPORT SUBMITTED TO OFFICE OF ENERGY RESEARCH AND DEVELOPMENT, NATIONAL SCIENCE FOUNDATION, JANUARY 10, 1975. Globe, S.; Craig, R.A. (Battelle Columbus Labs., Ohio (USA)). 10 Jan 1975. Contract NSF-C-914. 183p. NTIS $7.00.
PROJECT INDEPENDENCE;US FEA;REVIEWS;ENERGY POLICY;GOVERNMENT POLICIES;NATURAL GAS;COAL; NUCLEAR ENERGY;SOLAR ENERGY;INDUSTRY;ENERGY CONSERVATION;GEOTHERMAL ENERGY

196 RECENT DEVELOPMENTS IN THE TAXATION OF GEOTHERMAL EXPLORATION. Eisenstat, S.M. Geotherm. Energy Mag.; 3: No. 1, 17(Jan 1975).
TAXES;GEOTHERMAL EXPLORATION;LEGISLATION;USA; FINANCING

197 TOWARDS A RESPONSIBLE ENERGY POLICY. Krutilla, J.V.; Page, R.T. (Resources for the Future Inc., Washington, DC). Policy Analysis; 1: No. 1, 77-100(Win 1975).
Integration of economic and ethical factors.
ENERGY POLICY;NUCLEAR ENERGY;FOSSIL FUELS;SOLAR ENERGY;GEOTHERMAL ENERGY;ENERGY CONSERVATION; COST;ENERGY SOURCES;ENERGY SUPPLIES;SOCIO-ECONOMIC FACTORS

198 (COM--75-10500) Uncl REVIEW OF PROJECT INDEPENDENCE BLUEPRINT PANEL SUBCOMMITTEE REPORTS ON FEA-INTERAGENCY TASK FORCES. REPORT ON CTAB RECOMMENDATIONS FOR A NATIONAL ENERGY PROGRAM. SUBCOMMITTEE WORKING DOCUMENTS. (Commerce Technical Advisory Board, Washington, D.C.). 1975. 308p. NTIS $9.25.
ENERGY SOURCES;RECOMMENDATIONS;PROJECT INDEPENDENCE;FORECASTING;US FEA;COAL LIQUEFACTION;DATA COMPILATION;COAL GASIFICATION; ENERGY CONSERVATION;COAL PREPARATION;PETROLEUM; NATURAL GAS;NUCLEAR ENERGY;SOLAR ENERGY; GEOTHERMAL ENERGY;FLUE GAS;DESULFURIZATION; OCEAN THERMAL POWER PLANTS;WIND POWER;OIL SHALES;ENVIRONMENTAL IMPACTS;GOVERNMENT POLICIES;ECONOMICS;REVIEWS

199 (CONF-750612--, pp 327-330) ROLE OF PUBLIC LANDS IN GEOTHERMAL ENERGY. Armstrong, B. (General Land Office, Austin, TX). 1975.
From 1. geopressured geothermal energy conference; Austin, Texas, USA (2 Jun 1975).
First geopressured geothermal energy conference.
A brief discussion is given on legal aspects of leasing of public lands for the development of geothermal resources within the State of Texas. The land commissioner of the State of Texas is charged with the management of some 22 million acres of state land. The legal aspects of 8 million acres of relinquishment act lands, of which the surface owner is the agent for the state in terms of leasing, are considered. (LS)

200 GEOTHERMAL ENERGY: ECONOMIC POTENTIAL OF THREE SITES IN ALASKA. Rosenbruch, J.C.; Bottge, R.G. (Bureau of Mines, Washington, D.C. (USA)). 1975. vp. Bureau of Mines, Washington, DC.
The Bureau of Mines evaluated the prospects for using geothermal energy to generate

electricity for mines in remote areas. Given the development of a geothermal resource for this purpose, the subsidiary uses of space heating and agriculture were then examined to see if other industries might be viable given a cheap source of heat energy. Sites investigated were located in three areas of Alaska: Kobuk in the northwest, Unalaska in the southwest, and Stikine River in the southeast. Each site was relatively close to mineral deposits whose prospects for development would be enhanced with cheap power. 30 refs.

201 THE ENERGY CRISIS AND PROPOSED SOLUTIONS. PANEL DISCUSSIONS BEFORE THE COMMITTEE ON WAYS AND MEANS, HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, FIRST SESSION ON THE ENERGY CRISIS AND PROPOSED SOLUTIONS, PART 3 OF 4. Washington, DC; Committee on Ways and Means (1975). 478p.
NATURAL GAS;PETROLEUM;ENERGY SUPPLIES; AUTOMOBILES;EFFICIENCY;ENERGY CONSERVATION; GOVERNMENT POLICIES;ENERGY POLICY;SOLAR ENERGY; GEOTHERMAL ENERGY;COAL;URANIUM;ENERGY SHORTAGES; ECONOMICS

202 MONTANA ENERGY POLICY STUDY. Martin, D.H.; Frizzell, T.W.; Bourke, R.L. Helena, MT; Montana Environmental Quality Council (1975). 298p. Environmental Quality Council, Montana State Legislature, State Capitol, Helena, MT.
MONTANA;ENERGY DEMAND;ENERGY SOURCES; FORECASTING;WIND POWER;COAL GASIFICATION;COAL LIQUEFACTION;PETROLEUM;NATURAL GAS;ENERGY CONSERVATION;ELECTRICITY;COAL;URANIUM;ECONOMICS; SOLAR ENERGY;PHOTOSYNTHESIS;GEOTHERMAL ENERGY; ENERGY POLICY

203 ERDA AUTHORIZATION. PART II. 1976 AND TRANSITION PERIOD: GEOTHERMAL. HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, FIRST SESSION. Washington, DC; Committee on Science and Technology (1975). 319p.
BUDGETS;GEOTHERMAL ENERGY;HEARINGS;US ERDA; RESEARCH PROGRAMS

204 NONNUCLEAR ENERGY RESEARCH AND DEVELOPMENT: FISCAL YEAR 1976 AUTHORIZATION. HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH AND WATER RESOURCES OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE, NINETY-FOURTH CONGRESS, FIRST SESSION ON S. 598. Washington, DC; Committee on Interior and Insular Affairs (1975). 778p.
US ERDA;HEARINGS;BUDGETS;ENERGY SOURCES; ENVIRONMENTAL EFFECTS;ENERGY CONSERVATION; SAFETY;RESEARCH PROGRAMS;COAL;PETROLEUM;OIL SHALES;SOLAR ENERGY;GEOTHERMAL ENERGY;ENERGY POLICY

205 ANALYSIS OF THE ERDA PLAN AND PROGRAM. Washington, DC; Office of Technology Assessment (1975). 318p. GPO $3.85.
An analysis is presented of the program plan submitted by the Energy Research and Development Administration (ERDA) to Congress on June 30, 1975, entitled "A National Plan for Energy Research, Development, and Demonstration: Creating Energy Choices for the Future." Included in this analysis are background data and discussions of the major issues and questions, to enable Congress to review ERDA's energy R and D programs. It is stated that the ERDA Plan (Volume I of ERDA's report) is a "significant milestone in the evolution of a long-term national energy policy," but that "the ERDA Program (Volume II), to implement this plan, does not appear adequate to achieve the stated goals." Two major deficiencies in the program are pointed out: (1) ERDA's emphasis on technological research with little consideration for the research needed to overcome non-technical constraints to using new technologies; and (2) insufficient emphasis on energy conservation. (BYB)

206 AUTHORIZING APPROPRIATIONS FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION. CONFERENCE REPORT TO ACCOMPANY H.R. 3474. Washington, DC; Congressional Committee of Conference (1975). 83p.
Compromise by the House and Senate Conference Committee (chaired by Sen. Henry Jackson) was needed to bring the ERDA budget in line with information and program developments subsequent to original requests. Decisions to accelerate non-nuclear programs led to the following changes: authorization for increases in solar, fossil, and geothermal programs, and conservation R and D; authorization for increments only for physical research, environment and safety, and program support; and no changes in advanced energy systems supporting activities, scientific and technical education, or programs conducted by the Council on Environmental Quality, Water Resources Council, or National Bureau of Standards. Major additions are in Section 102, to establish an oil shale demonstration program and in Section 103, to provide up to $6 billion in loan guarantees for construction of commercial demonstration facilities. Increases in nuclear programs are: (1) $99.5 million for increased electrical costs at gaseous diffusion plants; (2) $1.9 million for safeguards; and (3) $91.9 million for expanded research, particularly nuclear fuel cycle and light water reactor technology. (DCK)

207 GEOTHERMAL ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT OF 1974. OVERSIGHT HEARINGS: LOAN GUARANTIES. HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, FIRST SESSION. Washington, DC; Committee on Science and Technology (1975). 692p.
The Geothermal Loan Guaranty Program was enacted in 1974 to encourage commercial development of this new energy technology through federally guaranteed loans. Two days of hearings, chaired by Rep. Mike McCormack, were held to (1) review proposed regulations for implementing the program and identify needed changes and (2) examine the overlap of P.L. 93-410 (the Geothermal Energy Research, Development, and Demonstration Act of 1974) and the ERDA Authorization Bill, which will provide a $6 billion loan guarantee program. This review will serve as a model for the total loan program. There were eight witnesses, representing ERDA, Congress, and private industry, and 22 prepared statements from both the public and private sector. Areas of concern included: (1) lag time in funding; (2) requirements for environmental statements; (3) the extent of state and local participation; (4) patent implications; and (5) a possible slanting toward big business. (DCK)

208 STUDIES IN ENERGY TAX POLICY. Brannon, G.M. (ed.). Cambridge, MA; Ballinger Publishing Co. (1975). 1p. $15.00.
Book. TAXES;ENERGY POLICY;ECONOMICS; PETROLEUM INDUSTRY;INDUSTRY;ENERGY SOURCES;

ENVIRONMENTAL EFFECTS;ENERGY CONSUMPTION; FINANCING;INCOME;EXPLORATION;GOVERNMENT POLICIES

209 AN ANALYSIS IDENTIFYING ISSUES IN THE FISCAL YEAR 1976 ERDA BUDGET. REPORT PREPARED FOR THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, U.S. SENATE AND THE JOINT COMMITTEE ON ATOMIC ENERGY, NINETY-FOURTH CONGRESS, FIRST SESSION. Washington, DC; Committee on Science and Technology (1975). 84p. GPO $1.25.
BUDGETS;RESEARCH PROGRAMS;ENERGY POLICY; GOVERNMENT POLICIES;FOSSIL FUELS;COAL;NUCLEAR ENERGY;ENERGY CONSERVATION;SOLAR ENERGY; GEOTHERMAL ENERGY;EFFICIENCY;ENERGY STORAGE; AUTOMOBILES;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;ENERGY;US ERDA

210 CONTINUING ENERGY CRISIS IN AMERICA. Washington, DC; Congressional Quarterly Inc. (1975). 126p. Congressional Quarterly Inc., 1414 22nd St., NW, Washington, DC 20037.
US ERDA;LEGAL ASPECTS;USA;PETROLEUM;ENERGY SOURCES;ENERGY CONSERVATION;ENERGY SHORTAGES; PROJECT INDEPENDENCE;ECONOMICS;MARKET;ENERGY POLICY;ECONOMIC POLICY;OFFSHORE DRILLING;CANADA; OIL SHALES;NUCLEAR FUELS;SAFETY;NATURAL GAS; COAL;TAXES;SOLAR ENERGY;GEOTHERMAL ENERGY

211 ENERGY DEVELOPMENT AND LAND USE IN TEXAS. FINAL REPORT ON PROJECT E/S-1: IMPACT ON LAND USE AND VALUE OF ALTERNATIVE STRATEGIES FOR PRODUCTION, DISTRIBUTION, AND UTILIZATION OF ENERGY IN TEXAS IN THE PERIOD 1974--2000. McFarland, W.F. Austin, TX; State of Texas Governor's Energy Advisory Council (1975). 127p. Texas Transportation Inst., Texas A and M Univ., College Station, TX.
LEGISLATION;ENERGY;ENERGY SOURCES;LAND USE; NATURAL GAS;PETROLEUM;PRODUCTION;DISTRIBUTION; URANIUM;ELECTRIC POWER;POWER GENERATION;COAL; LIGNITE;WASTE DISPOSAL;TEXAS;LEGAL ASPECTS;WIND POWER;SOLAR ENERGY;GEOTHERMAL ENERGY;NUCLEAR POWER;SOLID WASTES;ENERGY POLICY;ENVIRONMENTAL IMPACTS;ENERGY SOURCE DEVELOPMENT

212 FEDERAL ENERGY/ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM. Gage, S.J. (Environmental Protection Agency, Washington, DC). pp 242-270 of Energy technology II. Sullivan, T.F.P. (ed.). Washington, DC; Government Institutes, Inc. (1975).
From 2. Energy Technology Conference; Washington, DC (12 May 1975).
ENERGY SOURCES;ENVIRONMENT;SOLAR ENERGY; GOVERNMENT POLICIES;GEOTHERMAL ENERGY;FUELS; PLANNING;RESEARCH PROGRAMS;LEGISLATION; ENVIRONMENTAL EFFECTS;ENERGY CONSERVATION;SOLID WASTES;ECOLOGY;ECONOMICS;HEALTH HAZARDS;FUEL CELLS;PETROLEUM;NATURAL GAS;COAL;NUCLEAR ENERGY; SYNTHETIC FUELS;COAL GASIFICATION;COAL LIQUEFACTION

213 ALTERNATIVE SOURCES OF ENERGY: PRACTICAL TECHNOLOGY AND PHILOSOPHY FOR A DECENTRALIZED SOCIETY. Eccli, S. (ed.). New York; Seabury Press (1975). 279p. Seabury Press, 815 Second Ave., New York, NY 10017 $6.95.
ECOLOGY;COMBINED CYCLES;SOLAR ENERGY;WIND POWER;HYDROELECTRIC POWER;METHANE;WOOD; TRANSPORTATION SYSTEMS;GEOTHERMAL ENERGY;WASTE HEAT;RECOVERY;COMPRESSED AIR;ENERGY POLICY; REGULATIONS;ENERGY CONSERVATION;ALCOHOLS; AGRICULTURE;DESIGN;ENGINEERING;SOLID WASTES; MAGNETOHYDRODYNAMICS;FUEL CELLS;SYNTHETIC FUELS

214 ENERGY ALTERNATIVES: A COMPARATIVE ANALYSIS. Washington, DC; Council on Environmental Quality (1975). 671p. GPO $7.45, Stock No. 041-011-00025-4.
SYSTEMS ANALYSIS;ENERGY SOURCES; ENVIRONMENTAL EFFECTS;EFFICIENCY;COST;COAL;OIL SHALES;PETROLEUM;NATURAL GAS;OIL SANDS; HYDROELECTRIC POWER;NUCLEAR ENERGY;ENERGY; GEOTHERMAL ENERGY;SOLAR ENERGY;ENERGY CONSERVATION;COAL GASIFICATION;ELECTRIC POWER; POWER GENERATION;TRANSPORT;ENERGY CONSUMPTION; ECONOMICS;INDUSTRY;HTGR TYPE REACTORS;LMFBR TYPE REACTORS;PROCESSING;COMPARATIVE EVALUATIONS

215 HIGHLIGHTS OF ENERGY RELATED LEGISLATION IN THE 93RD CONGRESS. PREPARED AT THE REQUEST OF HENRY M. JACKSON, CHAIRMAN, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE PURSUANT TO S.RES. 45. Gulick, F.A.; Hartzog, N. Washington, DC; Committee on Interior and Insular Affairs (1975). 147p.
LEGISLATION;RESEARCH PROGRAMS;ALASKA OIL PIPELINE;RESERVES;PETROLEUM;ALLOCATIONS;ENERGY CONSERVATION;ENERGY SUPPLIES;GOVERNMENT POLICIES;REGULATIONS;NATURAL GAS;SOLAR ENERGY; GEOTHERMAL ENERGY;ENERGY POLICY;ENERGY

216 ENERGY SELF-SUFFICIENCY: HOW MUCH; HOW SOON. Zraket, C.A. (Mitre Corp., McLean, VA). pp 35-44 of Mining year book, 1975. Denver; Colorado Mining Association (1975).
From National Western Mining Conference and Exhibition; Denver, CO (7 Feb 1975).
GEOTHERMAL ENERGY;MARKET;ENERGY POLICY;USA; SOLAR ENERGY;ENERGY CONSERVATION;PROJECT INDEPENDENCE;ENERGY SUPPLIES;SECURITY;PETROLEUM; COAL;NUCLEAR ENERGY;NATURAL GAS;ENVIRONMENTAL EFFECTS;DEMAND FACTORS;ECONOMICS;REGULATIONS; LEASES;RESEARCH PROGRAMS;OIL SHALES;SYNTHETIC FUELS;BREEDER REACTORS;FUSION REACTIONS

217 GEOTHERMAL ENERGY DEVELOPMENT. HEARING BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH AND WATER RESOURCES OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE, NINETY-FOURTH CONGRESS, FIRST SESSION. Washington, DC; Committee on Interior and Insular Affairs (1975). 518p.
Delays in leasing and loan guarantee programs for geothermal research and development were the subject of committee hearings chaired by Senator Frank Church. Fourteen persons representing the Idaho Raft River Cooperative and the Bureau of Land Management made statements offering reasons for the delays, including: (1) ERDA has been indecisive and reluctant to proceed; (2) the Raft River project has a complex land pattern and private ownership; (3) Raft River has leases to be renewed and no bases for negotiation until ERDA underwrites some of the research risks; (4) ERDA encouraged Idaho to proceed with two years of successful exploratory drilling and has since delayed funds for further work; and (5) Pacific Northwest geothermal projects have been delayed by environmental and legal constraints, and financing and technical problems. ERDA representatives responded that more information and orderly planning are needed before continuing. New technology must be developed, and ERDA prefers a deliberate approach. (DCK)

218 FINANCING INFRASTRUCTURE IN ENERGY DEVELOPMENT AREAS IN THE WEST. PROCEEDINGS OF A CONFERENCE HELD AUGUST 21 AND 22, 1975, IN SNOWBIRD, UTAH. Logan, UT; Rocky Mountain Institute for Policy Research (1975). 32p.
The problem of financing the infrastructure

in energy development areas was explored in a seminar sponsored by the Rocky Mountain Institute for Policy Research at Snowbird, Utah on August 21 and 22, 1975. Experts from industry, universities, and Federal, state, and Indian governments accepted the challenge of defining the parameters of this complex problem and exploring alternative solutions. Even assuming that requisite attention is given to preserving the social and natural environment, development of the energy resources located in remote areas of the Western Interior (including portions of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, the Dakotas, Utah and Wyoming) is not feasible without the emplacement of new support sectors in those areas. Urgently needed are mine-mouth industrial and residential sectors, additional transportation, and public facilities. The design and construction of these support systems will require large capital expenditures over and above the expenditures of private energy development corporations for mineral rights, processing plants, and transportation and transmission. Current estimates (Section III) are that more than $16 billion will be invested during the coming decade by energy developers in the western interior. The majority of these projects will focus on coal and coal-fired electrical plants and transportation/transmission facilities.However, sizeable sums will be dedicated to other projects, including aspects of the nuclear fuel cycle, petroleum and natural gas development, coal gasification, and oil shale and tar sands plants, as well as some solar and geothermal prototypes. (MCW)

219 ALTERNATE ENERGY SOURCES FOR HAWAII. PROCEEDINGS OF THE WORKSHOP HELD MAY 8--9, 1975, IN HONOLULU, HAWAII. Honolulu; Hawaii Natural Energy Institute (1975). 48p. Hawaii Natural Energy Inst., c/o Coll. of Engineering, Holmes Hall, University of Hawaii, Honolulu, HI 96804.

In May 1974, Governor Ariyoshi appointed a Committee on Alternate Energy Resources to study the potential of energy resources as possible substitutes for seaborne petroleum, which Hawaii depends on entirely. The Committee established task forces to evaluate ten alternate energy sources and to look into the economic, environmental, storage, and transport aspects of these energy alternatives in their report of March 1975, it was recommended that a Workshop on Alternative Energy Sources be held. The purpose of the workshop was to incorporate the best current thinking of some of the top scientists, engineers, and planners in developing the optimum plan for Hawaii's energy future and to provide some national visibility to the variety and abundance of natural energy resources in the State. U.S. FEA Regional Administrator Arntz remarked in an initial opening speech that Hawaii was ahead of sister states in confronting its energy crisis. In the keynote speech that followed, Edward Teller, stated that alternative energy sources need to be developed that can yield results by 1985. A summary of the ERDA energy research was presented by Louis B. Werner. Separate workshop sessions were conducted on solid waste and bioconversion, wind, solar, and geothermal energy; and, in a General Workshop session, the broader aspects of the Alternate Energy report were discussed and recommendations made. The program, participants, and a summary of the Committee Report are included in three appendices. (MCW)

220 ENERGY TECHNOLOGY UPDATE FOR COLORADO DECISION MAKERS. PROCEEDINGS OF A CONFERENCE HELD MARCH 5, 1975, IN GOLDEN, COLORADO. Golden, CO; Colorado Energy Research Institute (1975). 160p. $5.00.

The Colorado Energy Research Institute (CERI) was created to coordinate research and development in Colorado in energy-related fields. The objective of the meeting, sponsored by CERI and Region VIII of the Federal Energy Administration, was to communicate research and development information on technological, as well as social, economic, and environmental matters to the leaders in government and industry to provide the basis for energy decisions. Ten papers were presented following opening remarks by T. J. Vogenthaler, Director of CERI, and by Gordon Altot, Jr. from FEA. The papers are entitled: Environmental Impact of Technological Development; Advanced Systems--Wind, Hydrogen, and MHD; Nuclear Power--Present Reactor Technology; Coal Gasification and Liquefaction; Geothermal Energy; Solar Heating and Cooling; Oil Shale; Solar Thermal Power; Coal Recovery and Mining; and Energy Conservation. (MCW)

221 ENERGY POLICIES OF THE WORLD: VENEZUELA. Martinez, A.R. Newark, DE; University of Delaware (1975). 100p. $3.50.

Venezuela ranks fifth in the world in total oil output and 92 percent of its production in 1974 was exported, making it the third largest exporter after Saudi Arabia and Iran. No comprehensive energy policy has been reached yet, but important separate decisions by the government indicate policy directions. The use of energy in Venezuela has been conditioned by the characteristics of the existing resources and by the political-economic plans that evolve from private choices and government regulation. The success of the policy will depend upon the effectiveness, efficiency, and authority of the government and its several agencies. A bill ordering the nationalization of the petroleum industry in Venezuela was signed into law by the President on August 29, 1975. In this work, the author has also analyzed the production and reserve data for natural gas, oil shales, hydraulic power, coal, nuclear fission resources, and solar, wind, tidal, and geothermal energy for Venezuela. Following the chapter on issues, the chapters are entitled: Historical Development of Energy Uses; The Energy Resources of Venezuela; The Production and Consumption of Energy in Venezuela; Means and Ends in Formulating Policy; and Recommendations for a Venezuelan Energy Policy. The final chapter on observations and conclusions is followed by a listing of 17 selected references. (MCW)

222 REICH CASE: ECONOMIC IMPLICATIONS OF DEPLETION ALLOWANCES. Peterson, R.E.; Seo, K.K. (Univ. of Hawaii, Honolulu). Geothermics; 4: No. 1-4, 66-75(1975).

The Reich case was tried in the 1969 Tax Court of the United States and the Court held that geothermal steam is a gas and is an exhaustible resource at The Geysers field. Accordingly, all geothermal steam producers are now entitled to deduct as current expense the intangible costs of developing and drilling geothermal steam wells and all producers who can demonstrate that their geothermal steam resource is depletable are entitled to what is now a 22 percent depletion allowance. The key expert witness in the case was Dr. Henry J. Ramey, Jr. and a summary is presented of his monograph which was submitted as evidence. His conclusion, based on a reservoir engineering analysis, was that the geothermal resource at the Big Geysers area had, as of 1968, 20 to 46 years of productive life remaining. In the

economics discussion, it is demonstrated that the corporate income tax discriminates against risky and capital-intensive industries such as oil and gas and geothermal. The central economic argument in favor of percentage depletion allowances and expensing privileges is that these provisions remove the discriminatory bias of corporate income taxes. The economic consequences of depletion allowances are: a short- and long-run increase in production; a short- and long-run increase in investment in renewal--exploration, discovery, and development; lower prices; a ratio of reserves to output--the Life Index--which tends to be constant; and a short-run increase in profits which encourages the entry of new firms and a long-run situation in which average rates of return are again equalized across industries.

223 PROCEEDINGS OF CITIZENS' FORUM ON POTENTIAL FUTURE ENERGY SOURCES HELD AT PORTLAND, OREGON, JANUARY 17, 1974. Portland, OR; Oregon Department of Geology and Mineralogy Industry (1975). 62p.

Six papers presented at this forum deal with various aspects and the future potential of wind power, solar power, geothermal power, conversion of oil shale, and coal gasification and liquefaction. The data and its interpretation should provide some of the information necessary to understand the advantages and limitations of some of the alternate sources of energy.

224 GEOTHERMAL ENERGY AND THE LAW. I. THE FEDERAL LANDS MANAGEMENT PROGRAM. Stone, C.D. Los Angeles; Univ. of Southern California Law Center (1975). 287p.

A broad range of problems in the legal and institutional environment which hampers the development of the geothermal industry is discussed. The topics include: the development of geothermal energy; pre-leasing procedures, public vs private assessment, exploratory permits, and related strategies; the rate of geothermal leasing, past and future; compensation strategies; lessee qualifications; lands available for leasing, noncompensatory lease terms; ongoing leasehold and production requirements; problems of ''secondary'' geothermal uses; and water law conflicts. (LBS)

225 GEOTHERMAL ENVIRONMENTAL ADVISORY PANEL. FIRST ANNUAL REPORT, JUNE 1, 1974--JUNE 30, 1975. Menlo Park, CA; Geological Survey (1975). 8p.

Progress is reported in studying the baseline ecology for potential geothermal development in order to present guidelines for environmental standards, required for implementing the monitoring requirements of 30 CFR 270.34(k). Program goals are consistent with the Department of the Interior's overall mineral management policy, which seeks to assure orderly and timely resource development, protection of the environment, and receipt of fair market value for disposition of mineral resources. (PCS)

226 FINANCIAL ASPECTS OF GEOTHERMAL RESOURCES DEVELOPMENT, SAN FRANCISCO, CALIFORNIA, OCTOBER 23--24, 1975. Davis, CA; Geothermal Resources Council (1975). 172p.

Sixteen papers were included. Separate abstracts were prepared for six. (MHR)

227 STATUS OF ECONOMICS AND FINANCING GEOTHERMAL ENERGY POWER PRODUCTION. Greider, B. (Chevron Oil Co., San Francisco). pp 13-36 of Financial aspects of geothermal resources development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).

The following topics are discussed: electricity market, fuels, nuclear competition, U.S. industry, profitability, exploration costs, financing project in the U.S.A. and elsewhere, steam and hot water systems, comparison of generating systems, and geopressured systems. Key issues to be resolved for economic and beneficial use of geothermal energy are listed. (MHR)

228 U.S. ENERGY RESOURCES DEVELOPMENT ADMINISTRATION: GEOTHERMAL LOAN GUARANTY PROGRAM. pp 37-40 of Financial aspects of geothermal resources development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).

The program is outlined briefly under the following headings: legislative authority, program obectives, principles guiding program implementation, formulation of regulations, eligible purposes/priorities for guaranties, program features, and loan processing flow chart. (MHR)

229 GEOTHERMAL TAX CONSIDERATIONS AND SHELTERS. Eisenstat, S.M. (Eisenstat and Gottesman, New York). pp 49-52 of Financial aspects of geothermal resources development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).

Legal decisions resulting from implementation of Treasury regulations (26 CFR 612; 613; 704; 752; 741; 731) are reviewed for the effect they have on geothermal exploration financing. Tax laws and tax shelters for oil, gas, and geothermal are currently being revised in Congress. Tangible and intangible drilling costs; partnership interests sale, nonrecourse loans, personal income, and percentage depletion allowance are some of the topics discussed. (PCS)

230 GEOTHERMAL EXPLORATION AND DEVELOPMENT IN THE UNITED STATES: A TAX ANALYSIS UNDER THE INTERNAL REVENUE CODE. Eisenstat, S.M. (Eisenstat and Gottesman, New York). pp 59-65 of Financial aspects of geothermal development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).

The tax incentives are examined as they apply to geothermal activities under the following headings: intangible drilling deduction and percentage depletion, tax consequences in exploring and developing geothermal resources, and tax planning. The few cases providing legal precedents are mentioned and various regulations are indicated in footnotes. (MHR)

231 FORMATION, FUNDING, AND DEVELOPMENT OF A SMALL EXPLORATION COMPANY. Castellanos, H.P. Jr. (Diablo Exploration, Inc., Oakland, CA). pp 67-70 of Financial aspects of geothermal resources development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).

Procedures, problems, and special considerations for the development of the geothermal industry are outlined. (MHR)

232 GEOTHERMAL ENERGY: AN INDUSTRY APPRAISAL. Olson, H.J.; Dolan, W.M. (Amax

Exploration, Inc., Denver). pp 131-138b of Financial aspects of geothermal resources development, San Francisco, California, October 23--24, 1975. Davis, CA; Geothermal Resources Council (1975).
The following topics are examined briefly: the nature of the geothermal resource; prospecting concerns; production practice; marketing aspects; environmental concerns; geothermal's probable abundance; applicable land; legal and institutional considerations; and investment and revenue timing compared to mining. A case is made for realistic legislative treatment of geothermal resources in line with other sub-surface resources. (MHR)

233 LEGAL AND INSTITUTIONAL FACTORS. GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA. Bates, M.R.; Krier, J.E.; Montgomery, W.D. Pasadena, CA; California Inst. of Tech. (1975). 18p.
Recommendations are discussed for the conduct of a research and demonstration program directed to commercial exploitation of the geothermal resources of the Salton Sea region of California. The legal and institutional aspects of geothermal energy exploitation which need study are described. (MHR)

234 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 1: EXPLORATORY OPERATIONS. Washington, DC; Geological Survey (1975). 7p.
This Order (effective February 1, 1975) is established pursuant to the authority prescribed in 30CFR270.11 and in accordance with 30CFR270.78. All exploratory operations other than drilling of exploratory and development wells will be conducted in accordance with the provisions of this Order. All plans for exploratory operations to be conducted shall include provisions for appropriate environmental protection and reclamation of disturbed lands. A cultural resources investigation approved by the Area Geothermal Supervisor shall be performed prior to any surface disturbance other than casual use. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30CFR270.48. The following exploratory operations are delineated: casual use, geophysical exploration, drilling of shallow wells, and reporting completion of exploration operations, general safety and environmental aspects, and notification of entry.

235 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 2: DRILLING, COMPLETION, AND SPACING OF GEOTHERMAL WELLS. Washington, DC; Geological Survey (1975). 15p.
This Order (effective February 1, 1975) is established pursuant to the authority prescribed in 30CFR270.11 and in accordance with 30CFR270.14, 270.15, and 270.40. All wells shall be drilled in such a manner as to minimize damage to the environment and to protect life, health, property, usable ground waters, and geothermal resources. After some generalized instructions are given, specific requirements for the lesser to comply with are given on: well casing; blowout prevention; equipment and procedures; drilling fluids; well logging; wellhead equipment and testing; and well spacing.

236 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 3: PLUGGING AND ABANDONMENT OF WELLS. Washington, DC; Geological Survey (1975). 5p.
This Order (effective February 1, 1975) is established pursuant to the authority prescribed in 30CFR270.11 and in accordance with 30CFR270.14 and 270.45. The lessee shall comply with the following minimum plugging and abandonment procedures for all geothermal resources wells. Oral approvals shall be in accordance with 30CFR270.11. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30CFR270.40. Each Sundry Notice (Form 9-331) shall include a notation of any proposed variances from the requirements of this Order. References in this Order to approvals, determinations, or requirements are to those given or made by the Area Geothermal Supervisor or his delegated representative. Specific directions are given for: permanent abandonment, temporary abandonment, and suspended wells.

237 GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 4: GENERAL ENVIRONMENTAL PROTECTION REQUIREMENTS. Washington, DC; Geological Survey (1975). 21p.
This Order (effective August 1, 1975) is established pursuant to the authority prescribed in 30CFR270.11 and in accordance with 30CFR270.2, 270.34(k), 270.37, 270.41, 270.42, 270.43, 270.44, and 270.76. Lessees shall comply with the provisions of this Order. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30CFR270.48. References in this Order to approvals, determinations, or requirements are to those given or made by the Area Geothermal Supervisor or his delegated representative. Guidelines are specifically discussed for the following areas: aesthetics; land use and reclamation; public access; recreation; slope stability and erosion control; biota; cultural resources preservation; subsidence and seismicity; pollution, waste disposal, and fire prevention; water quality; and noise abatement.

238 STRUCTURE OF THE GEOTHERMAL INDUSTRY THROUGH 1974. Montgomery, W.D. Pasadena, CA; California Institute of Technology (1975). 99p.
Four chapters are included which deal, respectively, with the technical and institutional conditions that shape geothermal development, the factors that determine the value of a geothermal lease, patterns of bidding for geothermal leases offered by the Federal government, and the emerging structure of the geothermal industry. The final chapter is a summary of conclusions and recommendations for further research.

239 (NSF/RA/N--74-159, pp 111) ROLE OF THE U.S. GEOLOGICAL SURVEY IN ASSESSING THE NATION'S GEOTHERMAL ENERGY RESOURCES. Eaton, G.P. (Geological Survey, Denver). 31 Dec 1974.
From Proceedings of the conference on research for the development of geothermal energy resources; Pasadena, CA (23 Sep 1974).
Proceedings of the conference on research for the development of geothermal energy resources.
US ORGANIZATIONS;USA;GEOTHERMAL RESOURCES; PUBLIC LANDS;GEOTHERMAL EXPLORATION;RESEARCH PROGRAMS;GEOLOGICAL SURVEYS;GEOPHYSICAL SURVEYS; GEOCHEMICAL SURVEYS;HYDROLOGY

240 (NSF/RA/N--74-159, pp 160-163) IMPERIAL VALLEY'S PROPOSAL TO DEVELOP A GUIDE FOR GEOTHERMAL DEVELOPMENT WITHIN ITS COUNTY. Pierson, D.E. (Imperial County Department of Public Works, El Centro, CA). 31 Dec 1974.

From Proceedings of the conference on research for the development of geothermal energy resources; Pasadena, CA (23 Sep 1974).
Proceedings of the conference on research for the development of geothermal energy resources.
IMPERIAL VALLEY;GEOTHERMAL RESOURCES; PLANNING;SITE SELECTION;ECONOMIC DEVELOPMENT; LAND USE;ENVIRONMENTAL EFFECTS;GEOLOGY; ENGINEERING;RESEARCH PROGRAMS;ENERGY SOURCE DEVELOPMENT

241 (NSF/RA/N--74-159, pp 331-334) COOPERATIVE EFFORTS BY INDUSTRY AND GOVERNMENT TO DEVELOP GEOTHERMAL RESOURCES. Butler, D.R. (Chevron Oil Minerals Staff, San Francisco). 31 Dec 1974.
From Proceedings of the conference on research for the development of geothermal energy resources; Pasadena, CA (23 Sep 1974).
Proceedings of the conference on research for the development of geothermal energy resources.
GOVERNMENT POLICIES;USA;RESEARCH PROGRAMS; INDUSTRY;US ORGANIZATIONS;PLANNING;GEOTHERMAL ENERGY;ENERGY SOURCE DEVELOPMENT

242 (NSF/RA/N--74-159, pp 122-127) LEASING OF FEDERAL GEOTHERMAL RESOURCES. Stone, R.T. (Geological Survey, Menlo Park, CA). 31 Dec 1974.
From Proceedings of the conference on research for the development of geothermal energy resources; Pasadena, CA (23 Sep 1974).
Proceedings of the conference on research for the development of geothermal energy resources.
GEOTHERMAL RESOURCES;LAND LEASING;PUBLIC LANDS;REGULATIONS;US ORGANIZATIONS;USA

243 (NSF/RA/N--74-159, pp 139-159) INSTITUTIONAL AND ENVIRONMENTAL PROBLEMS IN GEOTHERMAL RESOURCE DEVELOPMENT. Maslan, F.; Gordon, T.J.; Deitch, L. (Futures Group, Glastonbury, CT). 31 Dec 1974.
From Proceedings of the conference on research for the development of geothermal energy resources; Pasadena, CA (23 Sep 1974).
Proceedings of the conference on research for the development of geothermal energy resources.
REGULATIONS;ENVIRONMENTAL IMPACTS;GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES;INDUSTRY;ECONOMIC DEVELOPMENT;ENERGY SOURCE DEVELOPMENT

244 (CONF-741145--1) Uncl SUMMARY GUIDE TO THE INSTITUTIONAL PROBLEMS CONFRONTING THE GEOTHERMAL ENERGY INDUSTRY. Finn, D.F.X. (Geothermal Energy Inst., San Francisco, Calif. (USA)). 10 Dec 1974. 10p. Geothermal Energy Institute, 680 Beach Street, San Francisco, CA 94109.
From Annual meeting Society of Economic Geologists; Miami, Florida, USA (18 Nov 1974).
GEOTHERMAL RESOURCES;REGULATIONS;LEGAL ASPECTS;PLANNING;RECOMMENDATIONS;ENVIRONMENT; INDUSTRY;LEGISLATION;LEASES;TAXES;GEOTHERMAL EXPLORATION;GEOTHERMAL ENERGY;GOVERNMENT POLICIES

245 GEOTHERMAL RESOURCES RESEARCH AND TECHNOLOGY. Kruger, P. (Adv. Geothermal Energy Res. and Tech., Natl. Sci. Found.). Aware; No. 51, 2-7(Dec 1974).
From Conference on Research for Development of Geothermal Energy Resource; Pasadena, CA (23-5 Sep 1974).
USA;GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES; POWER DEMAND;ENERGY DEMAND;RESEARCH PROGRAMS; PLANNING;EXPLOITATION;GEOTHERMAL EXPLORATION; INDUSTRY;GOVERNMENT POLICIES;FINANCING;CAPITAL; WELL DRILLING;GEOTHERMAL ENERGY CONVERSION; ENVIRONMENTAL EFFECTS;LEGAL ASPECTS;INVESTMENT; ECONOMICS

246 FEDERAL ENERGY ADMINISTRATION HEARING ON WESTERN REGIONAL RESOURCE DEVELOPMENT. Aidlin, J.W. Geotherm. Energy Mag.; 2: No. 12, 24-28(Dec 1974).
GEOTHERMAL RESOURCES;HEARINGS;USA;GOVERNMENT POLICIES;LEGAL ASPECTS;US FEA;PROJECT INDEPENDENCE;ENERGY SOURCE DEVELOPMENT

247 GEOTHERMAL ENERGY: POTENTIALLY THE WEST'S MAJOR ENERGY RESOURCE. Bowen, R.G. Geotherm. Energy Mag.; 2: No. 12, 29-30(Dec 1974).
Project Independence hearings. GEOTHERMAL ENERGY;USA;GEOTHERMAL RESOURCES;HEARINGS;POWER POTENTIAL;PROJECT INDEPENDENCE

248 SOLAR AND GEOTHERMAL ENERGY: NEW COMPETITION FOR THE ATOM. Science; 186: No. 4166, 811-13(29 Nov 1974).
SOLAR ENERGY;GEOTHERMAL ENERGY;REVIEWS; ECONOMICS;LEGAL ASPECTS

249 (NP--20555) Uncl WESTERN STATES WATER REQUIREMENTS FOR ENERGY DEVELOPMENT TO 1990. (Western States Water Council, Salt Lake City, Utah (USA)). Nov 1974. 44p. Western States Water Council, Rm. 1725, Univ. Club Bldg., Salt Lake City, UT 84112.
NEW MEXICO;NEVADA;WATER RESOURCES;OREGON; PROCESSING;UTAH;ENERGY SOURCE DEVELOPMENT; WASHINGTON;HYDROELECTRIC POWER PLANTS;URANIUM; NATURAL GAS;PETROLEUM;COAL;GEOTHERMAL ENERGY; REGULATIONS;LEASING;ENVIRONMENTAL EFFECTS; CONSUMPTION RATES;ARIZONA;CALIFORNIA;COLORADO; IDAHO;MONTANA;WYOMING;WATER REQUIREMENTS

250 (NP--20944) Uncl PROJECT INDEPENDENCE. FINAL TASK FORCE REPORT: GEOTHERMAL ENERGY. (Federal Energy Administration, Washington, D.C. (USA)). Nov 1974. 123p. GPO $2.00.
This report contains the final technical analysis of the Project Independence Interagency Geothermal Task Force chaired by the National Science Foundation. The potential of geothermal energy, resources, fuel cycles, and the status of geothermal technology are outlined. Some constraints inhibiting rapid and widespread utilization and some Federal actions to remove utilization barriers are described. (MOW)

251 GEOTHERMAL RESOURCE CHARACTERISTICS, EXPLORATION CONSIDERATIONS, AND PROPERTY ACQUISITION TECHNIQUES. Olson, H.J.; Dolan, W.M. (Amax Exploration, Inc., Denver). Econ. Geol.; 69: No. 7, 1185(Nov 1974).
GEOTHERMAL RESOURCES;GEOTHERMAL EXPLORATION; INDUSTRY;MINING;PETROLEUM;LAND USE;COST;LEGAL ASPECTS;LAND LEASING

252 INSTITUTIONAL, BUSINESS, AND FINANCIAL ASPECTS OF THE GEOTHERMAL ENERGY INDUSTRY. Finn, D.F.X. (Geothermal Energy Inst., San Francisco, CA). Econ. Geol.; 69: No. 7, 1179(Nov 1974).
GEOTHERMAL ENERGY;LEGAL ASPECTS;ECONOMICS; TAXES;GOVERNMENT POLICIES;REGULATIONS;LAND LEASING;FINANCING

253 GEOTHERMAL: AS WE SEE IT TODAY. Otte, C. (Union Oil Co., Los Angeles). pp 16-21A of Pacific Southwest energy and minerals conference. Denver; Dept. of the Interior (Nov 1974).

From Pacific Southwest energy and minerals conference; Los Angeles, CA, USA (11 Nov 1974).

The normal geothermal gradient is about 1.5°F per 100 feet, or at a depth of 15,000 ft the temperature equals about 250°. This temperature is too deep to capture, but in some areas molten rock or magma formed at great depths in the crust succeeds in working itself close to the surface; this causes a sharp steepening of the geothermal gradient that may be 10 times the normal gradient. One such belt extends from the tip of South America through North America, Alaska, and around the Western Pacific. This belt delineates areas of geothermal development, New Zealand, Chile, Mexico, California, Kamchatka, Japan, and the Philippines. Other areas include Italy and Iceland. The historical development of the utilization of geothermal steam in these areas is reviewed. Developments in the U.S. began in 1960 at The Geysers with a 12,500-kW generating plant, and now installed generating capacity is 412,000 kW, the largest in the world. U.S. geothermal developments are underway in the Jemez Mountains in New Mexico and the Imperial Valley of California. In the U.S., geothermal power is developed in increments of 50 to 100 MW, which appear to be optimum blocks of power for the number of wells required, the pipeline distance, and size and cost of the turbine. At increments of 100 MW, geothermal power is economically competitive with energy produced by fossil fuel and nuclear plants of about 1000-MW size that enjoy the advantage of economy of scale. Many developing countries cannot handle such large increments as 1000 MW to their installed capacity, and smaller blocks of fossil power are uneconomic. This makes geothermal power a very attractive form of power generation in the developing countries that have geologic potential. Four institutional constraints to geothermal development include environmental control, leasing regulations, ownership of geothermal resources, and tax treatment. 4 figures. (MCW)

254 (NSF-RA-N--74-244) Uncl IMPACT OF STATE AND FEDERAL LAW ON DEVELOPMENT OF GEOTHERMAL RESOURCES IN TEXAS. PROJECT L/R-9, FINAL REPORT. Edwards, T. (Texas Governor's Energy Advisory Council, Austin (USA)). 31 Oct 1974. 56p. National Science Foundation, Washington, DC.

The significant geothermal resource in Texas consists of enormous reservoirs of hot, geopressured water, which formed along the Gulf Coast when water-laden sediments were deposited between surrounding impermeable features, so that the water which would otherwise have been forced out of the sediments was unable to escape. These deposits exist under tremendous pressure created by the weight of the overburden. A geopressure source absorbs heat indirectly, because the geopressured deposits create an insulating barrier that traps and absorbs the thermal energy of the underlying magma. The water from a geopressure source will not be as hot as water from a dry steam or wet steam source, but the quantity available is enormous, and the water pressure itself would be an additional energy source along with the thermal energy. The water may be fresh, or nearly so, and it will contain significant amounts of recoverable methane gas in solution. It may be possible to utilize the water pressure, thermal energy, and the methane gas to generate electricity in small power plants at the recovery site, and the water that has been passed through the turbines and heat exchangers may be a valuable by-product in itself, depending on its quality and regional demands for agriculture and industry. One of the impediments to the development of this resource, given the very sizable commitments of capital entailed, is the uncertain legal status of geothermal resources. This report attempts to locate geothermal resources within the general framework of Texas property law and to determine whether these resources can be developed under the law as it now exists. (MCW)

255 HAWAII GEOTHERMAL LAW. Sheets, G.M. Geotherm. Energy Mag.; 2: No. 10, 26-27(Oct 1974).

HAWAII;GEOTHERMAL RESOURCES;LEGISLATION; MINERALS;ORES;GEOLOGIC DEPOSITS;MINING;PUBLIC LANDS

256 UNION OIL TESTIMONY: GEYSERS POWER PLANT 12 HEARING (CALIFORNIA PUBLIC UTILITIES COMMISSION). Suter, V.E. Geotherm. Energy Mag.; 2: No. 10, 20-25(Oct 1974).

GEYSERS GEOTHERMAL FIELD;ENVIRONMENTAL EFFECTS;GEOTHERMAL POWER PLANTS;INDUSTRY; HEARINGS;WELL DRILLING;PLANNING;DRILLING FLUIDS

257 INSTITUTIONAL, BUSINESS, AND FINANCIAL ASPECTS OF THE GEOTHERMAL ENERGY INDUSTRY (ABSTRACT). Finn, D.F.X. (Geothermal Energy Inst., San Francisco). Geol. Soc. Am., Abstr. Programs; 6: No. 7, 735(Oct 1974).

From 1974 annual meetings of the Geological Society of America; Miami Beach, FL, USA (18 Nov 1974).

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258 GEOTHERMAL RESOURCES: POTENTIAL ENERGY GIANT. Verespej, M.A. Ind. Week; 182: No. 11, 48-60(9 Sep 1974).

Energy from geothermal resources could save the USA in a given year, from 560 1 x 10^6 to 5.6 1 x 10^9 barrels of oil by year 2000. Geothermal potential, principles and occurrence of geothermal energy, funding and agencies in the USA for promoting geothermal energy research, technology and experience already available, and legal and environmental aspects are examined.

259 PACKWOOD GEOTHERMAL BILL (SENATE BILL S. 3392). Packwood, R. Geotherm. Energy Mag.; 2: No. 9, 33-37(Sep 1974).

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260 ENERGY SYSTEMS. I. Haefele, Wolf (Kernforschungszentrum Karlsruhe (F.R. Germany). Inst. fuer Angewandte Systemtechnik und Reaktorphysik). Indian J. Power River Val. Dev.; 24: No. 9, 261-270(Sep 1974).

Rapid increase in energy utilization has created the energy problem for tackling which it is necessary to adopt a systems approach. The components of any energy system are: its (i) production (ii) handling and (iii) embedding into global and social complex. For proper understanding of the energy problem, three overlapping time phases are considered: (1) the short range phase 1970-1985 (2) the medium range phase 1980-1995 and (3) the long range phase 1990-2050, each of which will be characterised by the utilization of particular sources of energy in a certain pattern which is described. The role of nuclear power in

relation to other sources of energy is outlined. Sensing, optimization and forecasting are the three aspects of modelling of energy demand and supply, which are discussed in detail. Estimates of: (i) known and unknown reserves of fossil fuel and nuclear fuels in terms of uranium and thorium deposits and (ii) lithium and deuterium resources in view of the feasibility of fusion power are given. Besides nuclear power either by fission or fusion, the other options for the large-scale supply of energy (i.e. a few Q/year for a thousand year or much more) are: (i) geothermal sources and (ii) solar power, of which the feasibility is discussed.

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264 LEGISLATIVE GOALS OF ELECTRIC COMPANIES IN 1974. Toll, D.R. Public Util. Fortn.; 93: No. 6, 17-19(14 Mar 1974).
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266 GEOTHERMAL POWER EXPANSION IN CALIFORNIA. Electr. Rev. (London); 194: No. 5, 138(15 Feb 1974).
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269 (CONF-740209--, pp 617-632) PENULTIMATE GEOTHERMAL SYSTEM IN LEGAL PERSPECTIVE. Sheets, G.M. (Univ. of Hawaii, Honolulu). 1974.
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313 WATER AND POWER FROM GEOTHERMAL RESOURCES IN CALIFORNIA. AN OVERVIEW. White, C.R.; Yates, P.J. Sacramento, CA; California Dept. of Water Resources (1974). 60p.
Information is included on the physical characteristics of the different types of development methods and problems, environmental concerns, and legal and institutional aspects. Because the legal and institutional aspects are becoming increasingly significant, more detailed study of the discussion is included in an appendix. (MHR)

314 ENERGY TAXES AND SUBSIDIES. Brannon, G.M. Cambridge, MA; Ballinger Publishing Co.

(1974). 189p.
This study deals with sensitive and difficult questions of public policy. Taxes and subsidies are among the most powerful tools available to government in shaping the nation's energy and economic future. Decisions to establish, change or retain various tax provisions or subsidy programs can have profound impacts on energy prices, growth rates, production and consumption patterns, income levels and distributions, and international trade patterns. All of these subjects are treated with vigor along with the current concerns for pollution abatement in the environment. (PCS)

315 PROCEEDINGS OF THE WORKSHOP ON ENVIRONMENTAL ASPECTS OF GEOTHERMAL RESOURCES DEVELOPMENT, 20--22 SEPTEMBER 1974. Anderson, D.N.; Bowen, R.G. Sacramento, CA; California State Dept. of Conservation (1974). 126p. (PB--245209). NTIS.
The purpose of this conference was to identify the environmental degradation related to the use of geothermal resources to produce electricity and, if possible, suggest directions for research to mitigate these problems. Six work groups were established: Water Quality, Air Quality, Biological Impact, Hazards, Environmental Impact Evaluation, and Land Use and Socio-Economic Impact. A chairman's summary, problems, and recommended approaches to solution are presented in each area. In summary, those who urge rapid development of geothermal resources as a group realize that there are environmental costs, but feel the overall impact is much less per unit of power than the impact of conventional and nuclear sources. Many of those urging caution and restraint in the development of geothermal energy realize that the environmental impact is less than most other power sources but feel by their efforts geothermal conversion can be made even cleaner.

316 ENERGY REGULATION BY THE FEDERAL POWER COMMISSION. Breyer, S.G.; Macavoy, P.W. Washington, DC; Brookings Institution (1974). 173p.
The authors investigate the three major areas of FPC's work: natural gas pipeline prices, natural gas field prices, and electricity production. They conclude that the Commission helped neither the consumer nor industry. They contend that regulation had little effect upon pipeline prices and that it did not significantly promote a better coordinated electric power industry. Although the Commission kept gas field prices low, in doing so it may have created a shortage that hurt consumers more than low prices helped them. Since the Commission's tasks (controlling monopoly power, transferring income from producer to consumer, planning for more efficient production) are typical forms of economic regulation, the study has a number of implications regarding the regulatory process in general. These are discussed in the final chapter.

317 INTERSTATE ENVIRONMENTAL PROBLEMS: A GUIDE TO WATER POLLUTION AND WATER SCARCITY. Harris, R.W.; Jeffery, W.D.; Stewart, B.W. Jr. Stanford, CA; Stanford Environmental Law Society (1974). 169p. $4.25.
This book is concerned with environmental problems which originate in one state and spread to another and offers legal and practical information to help a citizen group defend its ''environmental rights.'' The book is divided into five chapters. Chapter 1 presents a detailed case study of the Truckee River System in California--Nevada to illustrate some of the problems and solutions which arise in an interstate setting. Chapters 2 and 3 introduce the legal and technical backgrounds of water scarcity and water pollution: the problems most often encountered in interstate environmental disputes. Chapter 4 summarizes the political, administrative, and judicial remedies available to private citizens. Chapter 5 outlines the strategies and tactics for waging an effective environmenal campaign. And for those interested in further information, the text is supplemented by nearly five hundred footnotes, four appendices, and a selected bibliography.

318 DEVELOPMENT OF GEOTHERMAL RESOURCES AND THE 1970 GEOTHERMAL STEAM ACT: LAW IN SEARCH OF DEFINITION. Bjorge, K.R. (Northern Kentucky State Coll., Covington). Univ. Colo. Law Rev.; 46: 1-25(1974).
It is submitted that the court erred in U.S. vs Union Oil Company (Calif. 1974), by: (1) failing to find that Congress intended the Stock Raising Homestead Act to grant an estate limited to surface use with such subsurface rights as reasonably necessary to serve the purpose of surface ownership, and (2) in inferentially treating geothermal resources as water resources to arrive at the conclusion that geothermal resources were not reserved because water is not a mineral within terms of the Stock Raising Homestead Act. Alternate legal concepts are suggested. (PCS)

319 VICTORY SAND AND CONCRETE, INC. VS COMMISSIONER OF INTERNAL REVENUE, JANUARY 2, 1974. Tax Court Rep.; 61: 407-424(1974).
Petitioner was engaged in the business of extracting and selling sand and gravel from the Kansas River, on a tract of land owned by it. Sand and gravel in the bed of the river was replenished to some extent by the flow of the river but the quality and quantity thereof was diminishing, particularly after flood control and conservation dams were built on the tributaries of the Kansas River upstream from petitioner's mining area. Held, petitioner had an economic interest in the deposit of sand and gravel in its permit area sufficient to entitle it to percentage depletion deductions produced by its operations. Held, further, the mineral deposit in which petitioner had an economic interest is a wasting asset within the meaning of the depletion statutes.

320 GEOTHERMAL RESOURCES LEASING: GENERAL. Fed. Regist. (Wash., D.C.); 38: 387-420(21 Dec 1973). (43CFR3200).
These regulations are issued pursuant to the Geothermal Steam Act of 1970 (84 Stat. 1566; 30 USC 1001-1025) and rights to develop and utilize geothermal resources in land subject to these regulations may be acquired only in accordance with these regulations.

321 GEOTHERMAL RESOURCES: LEASING ON PUBLIC, ACQUIRED, AND WITHDRAWN LANDS. Fed. Regist. (Wash., D.C.); 38: No. 245, 35068-35073(21 Dec 1973). (30CFR270; 30CFR271).
Text of leasing regulations for public, acquired and withdrawn lands is presented. Regulations became effective January 1, 1974. (PCS)

322 (WASH--1281) Uncl NATION'S ENERGY FUTURE. A REPORT TO RICHARD M. NIXON,

PRESIDENT OF THE UNITED STATES. Ray, D.L. (USAEC, Washington, D.C.). 1 Dec 1973. 182p. GPO $1.95.
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323 (PB--237045) Uncl CALIFORNIA ENERGY WORKSHOP: DEVELOPING A PLAN OF ACTION TO MEET THE ENERGY CRISIS IN CALIFORNIA. Jebins, A.B. (California State Office of Science and Technology, Sacramento (USA)). Dec 1973. 52p. NTIS $4.25.
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324 THE POTENTIAL FOR ENERGY PRODUCTION FROM GEOTHERMAL RESOURCES: REPORT OF THE SUBCOMMITTEE ON WATER AND POWER RESOURCES, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE, NINETY-THIRD CONGRESS, FIRST SESSION. Washington, DC; Committee in Interior and Insular Affairs (Dec 1973). 40p. GPO $0.50.
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325 (WASH--1281-8) Uncl GEOTHERMAL ENERGY PROGRAM. SUBPANEL REPORT VIII USED IN PREPARING THE AEC CHAIRMAN'S REPORT TO THE PRESIDENT. (USAEC, Washington, D.C.). 13 Nov 1973. 192p. Dep. NTIS $12.75.
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326 (EIS-CA--73-1681-F-1) Uncl GEOTHERMAL LEASING PROGRAM. VOLUME I. PROMULGATION OF LEASING AND OPERATING REGULATIONS. FINAL ENVIRONMENTAL IMPACT STATEMENT. (Department of the Interior, Washington, D.C. (USA)). 24 Oct 1973. 519p. NTIS $1.45.
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327 (EIS-CA--73-1681-F-2) Uncl GEOTHERMAL LEASING PROGRAM. VOLUME II. LEASING OF GEOTHERMAL RESOURCES IN THREE CALIFORNIA AREAS. FINAL ENVIRONMENTAL IMPACT STATEMENT. (Department of the Interior, Washington, D.C. (USA)). 24 Oct 1973. 547p. NTIS $1.45.
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328 (EIS-CA--73-1681-F-3) Uncl GEOTHERMAL LEASING PROGRAM. VOLUME III. APPENDICES A THROUGH H. PROPOSED GEOTHERMAL, LEASING, AND OPERATING REGULATIONS. FINAL ENVIRONMENTAL IMPACT STATEMENT. (Department of the Interior, Washington, D.C. (USA)). 24 Oct 1973. 701p. NTIS $1.45.
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The thesis of this article is that by arguing analogously from the National Environmental Policy Act to California Environmental Quality Act to obtain adequate disclosure of adverse environmental effects from proposed land uses, and by using the facts thus disclosed in making the requisite findings for The Coastal Zone Initiative (popularly known and Proposition 20) and other laws regulating new subdivisions, decision makers may be required to deny permits in certain environmentally sensitive areas that are currently under great development pressures. This paper also analyzes several California and non-California court cases to approach the issue of whether this denial constitutes an unconstitutional use of the police power. To fully comprehend the possible far-reaching effects of these statutes and cases an understanding of environmentally sensitive land use regulation, the participants in the systems, and the role of the courts in the local decision making is essential. (PCS)

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386 AMERICA'S ENERGY POTENTIAL: A SUMMARY AND EXPLANATION PREPARED BY CONGRESSMAN MORRIS K. UDALL, CHAIRMAN, SUBCOMMITTEE ON THE ENVIRONMENT FOR USE OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS OF THE U.S. HOUSE OF REPRESENTATIVES, NINETY-THIRD CONGRESS, FIRST SESSION, OCTOBER 1973. Washington, DC; Joint Committee on Atomic Energy (1973). 22p. GPO.
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416 REICH, A.E. ET AL. VS COMMISSIONER OF INTERNAL REVENUE AND G.D. ROWAN ET AL. VS COMMISSIONER OF INTERNAL REVENUE. U.S. COURT OF APPEALS, NINTH CIRCUIT. JANUARY 21, 1972. Fed. Rep.; 2: No. 454, 1157-1159(1972).
From decisions of the tax court, 52 T.C. 700, favorable to taxpayers, an appeal was taken. The Court of Appeals, Wright, Circuit Judge, held that taxpayers' reserves of geothermal steam constituted an exhaustible natural resource and that geothermal steam was a ''gas'' within meaning of Internal Revenue Code provisions for percentage depletion deduction for intangible costs of drilling and developing oil and gas wells. Affirmed.

417 SALT WATER IS A MINERAL: OWNERSHIP OF A NATURAL RESOURCE OF INCREASING IMPORTANCE IN OIL-PRODUCING STATES. Hudson, L. Tex. Law Rev.; 50: 448-461(1972).
Salt water, a resource with newfound promise, defies easy allocation between the surface and mineral estates. The author, relying on history, precedents, and policy, contends that salt water should be classified as a mineral belonging to the mineral owner whereas domestic water should be considered a nonmineral appurtenant to the surface estate.

418 GEOTHERMAL RESOURCES IN CALIFORNIA--POTENTIALS AND PROBLEMS. Goldsmith, M. Pasadena, CA; Calif. Inst. Tech., Environmental Quality Lab. (Dec 1971). 45p.
GEOTHERMAL RESOURCES;CALIFORNIA;ECONOMICS; POWER POTENTIAL;GEYSERS GEOTHERMAL FIELD; GEOTHERMAL POWER PLANTS;THERMAL WATERS;VAPOR-DOMINATED SYSTEMS;ENVIRONMENTAL EFFECTS;GROUND SUBSIDENCE;BLOWOUTS;SEISMIC WAVES;AIR POLLUTION; GASEOUS WASTES

419 GEOTHERMAL ENERGY, ITS FUTURE AND ECONOMICS. Horvath, J.C.; Chaffin, R.L. (Georgia State Univ., School of Business Administration). Atlanta Econ. Rev.; 21: No. 12, 15-33(Dec 1971).
GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES;LEGAL ASPECTS;DRILLING;EXPLOSIVE STIMULATION; GEOTHERMAL EXPLORATION;NUCLEAR EXPLOSIVES; ECONOMICS;USES;ENVIRONMENTAL EFFECTS;USA; REVIEWS;GEYSERS GEOTHERMAL FIELD;GEOTHERMAL POWER PLANTS

420 EARTH'S HEAT TAPPED FOR GEOTHERMAL POWER DEVELOPMENT. Allen, D.R. (Duncan, Allen, and Mitchell Law Firm). Public Power; 29: No. 6, 35-9(Nov-Dec 1971).
GEOTHERMAL RESOURCES;EXPLOSIVE STIMULATION; COST;LEGAL ASPECTS;ENVIRONMENTAL EFFECTS; GEOTHERMAL ENERGY;POWER POTENTIAL;REVIEWS; ECONOMICS

421 (PB--203102-D) Uncl GEOTHERMAL LEASING PROGRAM, CONSIDERS IMPACT OF LEASING AND OPERATING REGULATIONS TO IMPLEMENT THE GEOTHERMAL STEAM ACT OF 1970 AND LEASING OF 3 AREAS IN CALIFORNIA. DRAFT ENVIRONMENTAL IMPACT STATEMENT. (Department of the Interior, Washington, D.C. (USA)). 6 Oct 1971. 234p. NTIS $3.00.
CALIFORNIA;GEOTHERMAL EXPLORATION;LAND LEASING;ENVIRONMENTAL IMPACT STATEMENTS; GEOTHERMAL STEAM ACT;REGULATIONS;GEOTHERMAL RESOURCES

422 ENVIRONMENTAL IMPACT STATEMENT FOR THE GEOTHERMAL LEASING PROGRAM; DRAFT. Washington, DC; US Dept. Interior (Sep 1971). vp.
CALIFORNIA;GEOTHERMAL FIELDS;GEOTHERMAL RESOURCES;EXPLOITATION;ENVIRONMENTAL IMPACT STATEMENTS;LAND LEASING

423 GEOTHERMAL RESOURCES LEASING AND OPERATIONS ON PUBLIC, ACQUIRED, AND WITHDRAWN LANDS. II. Pecora, W.T. Fed. Regist. (Wash., D.C.); 36: No. 142, 13722-13740(23 Jul 1971). (43CFR3000; 43CFR3045; 43CFR3200; 30CFR270).
Text of proposed amendments to existing regulations and procedures to be followed in conducting exploration of the public land for oil and gas or geothermal resources are presented. Regulations are for implementation of the Geothermal Steam Act. Leasing subparts include definitions; geophysical exploration operations; available land, limitation, unit agreements; lessee qualification; leasing terms; surface management requirements; service charges, rental and royalties; lease bonds; noncompetitive leases; land previously leased for geothermal resources; competitive leases; conversion rights to geothermal leases or application for leases; leasing rules; extension, assignments and transfers; production and uses of byproducts; cooperative conservation provisions; terminations and expirations. Operations subparts cover definitions, supervisor functions and jurisdiction; lessee (including operator) requirements relative to drilling and well operations for production, pollution control, noise abatement, safety and abandonment; measurement of production and computation of royalties; and required report. (PCS)

424 S. CON. RES. 29, TO EXPRESS THE SENSE OF CONGRESS THAT THE BUREAU OF RECLAMATION SHOULD ACCELERATE ITS INVESTIGATIONS OF GEOTHERMAL RESOURCES AS A POTENTIAL MAJOR NEW SOURCE OF WATER SUPPLIES FOR THE WESTERN UNITED STATES; TEXT; STATEMENT. Washington, DC; US Congress. Senate (7 Jun 1971). vp.
USA;WATER RESOURCES;GEOTHERMAL RESOURCES; LEGISLATION

425 PRESIDENT'S MESSAGE ON SUPPLY OF ENERGY

AND CLEAN AIR, ALSO FACT SHEET FROM OFFICE OF THE WHITE HOUSE PRESS SECRETARY. Nixon, R.M. Washington, DC; Executive Office of the President (4 Jun 1971). 12p.
USA;ENERGY POLICY;ENVIRONMENT;ENERGY SUPPLIES;EARTH ATMOSPHERE;AIR POLLUTION;SULFUR OXIDES;COAL;RESEARCH PROGRAMS;THERMONUCLEAR REACTORS;NUCLEAR POWER PLANTS;MHD GENERATORS; POWER TRANSMISSION LINES;FOSSIL FUELS; GEOTHERMAL ENERGY;NUCLEAR FUELS;ENERGY CONSERVATION;ELECTRIC POWER;POWER PLANTS;SITE SELECTION;RESEARCH PROGRAMS;LAND LEASING

426 GEOTHERMAL STEAM ACT OF 1970: KNOWN GEOTHERMAL RESOURCES AREAS; PARTIAL LIST. (US Dept. Interior. Geol. Surv.). Fed. Regist. (Wash., D.C.); vp(Mar-Apr 1971).
USA;GEOTHERMAL RESOURCES;LEGISLATION; GEOTHERMAL STEAM ACT;KGRA

427 S. 564, TO ESTABLISH A FIVE-YEAR GEOTHERMAL RESEARCH PROGRAM; TEXT; STATEMENT. Washington, DC; US Congress. Senate (3 Feb 1971). vp.
USA;GEOTHERMAL ENERGY;RESEARCH PROGRAMS; LEGISLATION

428 GEOTHERMAL STEAM ACT OF 1970; PROCEDURE TO BE FOLLOWED IN CLAIMING RIGHTS. Fed. Regist. (Wash., D.C.); 623(15 Jan 1971).
USA;GEOTHERMAL RESOURCES;LEGISLATION; GEOTHERMAL STEAM ACT

429 (CONF-710571--, pp vp, Paper 6) IMPLEMENTING THE FEDERAL GEOTHERMAL STEAM ACT OF 1970. Stone, R.T. 1971.
From 1. northwest conference on geothermal power; Olympia, Washington, USA (21 May 1971).
First northwest conference on geothermal power.
LEGISLATION;GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES;LAND LEASING;US ORGANIZATIONS; ENVIRONMENTAL IMPACT STATEMENTS;GEOTHERMAL STEAM ACT;IMPLEMENTATION

430 (PB--218830, pp 72) ENERGY COMPANY: A MONOPOLY TREND IN THE ENERGY MARKETS. Netschert, B.C. 1971.
Exploration and exploitation of geothermal resources in arid and semiarid lands.
USA;ENERGY SUPPLIES;MARKET;ECONOMICS; INDUSTRY;COST;ELECTRIC POWER;RECOMMENDATIONS; REGULATIONS;GOVERNMENT POLICIES

431 (PD--218830, pp 89) GEOTHERMAL LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT). 1971.
Exploration and exploitation of geothermal resources in arid and semiarid lands.
USA;GEOTHERMAL RESOURCES;LEGAL ASPECTS; ENVIRONMENTAL IMPACT STATEMENTS;GEOTHERMAL POWER PLANTS;REGULATIONS;GEOTHERMAL EXPLORATION; LEGISLATION;LAND LEASING;POLLUTION;GROUND SUBSIDENCE

432 GEOTHERMAL SCIENCE AND TECHNOLOGY: A NATIONAL PROGRAM. Austin, G.F.; Austin, W.H. Jr.; Leonard, G.W. pp 341-461 of Geothermal energy resources and research. China Lake, CA; Department of Defense (1971).
GEOTHERMAL ENERGY;CALIFORNIA;REVIEWS; RESEARCH PROGRAMS;COST;POWER GENERATION;HEAT; HEARINGS;GEOTHERMAL RESOURCES;USA;GOVERNMENT POLICIES

433 STATEMENT AT HEARINGS BEFORE THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS. Nassikas, J.N. Washington, DC; Federal Power Commission (1971). 80p. GPO.
Four Corners Area. USA;ELECTRIC POWER;POWER GENERATION;FOSSIL-FUEL POWER PLANTS;NUCLEAR POWER PLANTS;GEOTHERMAL ENERGY;SOLAR ENERGY; FUEL CELLS;ENERGY POLICY;HEARINGS;NATURAL GAS; FUEL OILS;LEGAL ASPECTS

434 CLASSIFICATION OF PUBLIC LANDS VALUABLE FOR GEOTHERMAL STEAM AND ASSOCIATED GEOTHERMAL RESOURCES. Godwin, L.H.; Haigler, L.B.; Rioux, R.L.; White, D.E.; Muffler, L.J.P. Washington, DC; US Geological Survey (1971). 18p.
Geothermal steam act of 1970. USA;GEOTHERMAL RESOURCES;LEGAL ASPECTS;LEGISLATION;HOT SPRINGS; THERMAL WATERS;GROUND WATER;STEAM;GEOTHERMAL STEAM ACT

435 GEOTHERMAL ENERGY PROSPECTS IN RELATION TO POLICY OF REGIONAL UTILIZATION OF ENERGY RESOURCES IN INDONESIA. Hoesni, A.M.; Arismunandar, A.; Radja, V.T. Trans. World Energy Conf., 8th; 4: (1971).
From 8. World Energy Conference; Bucharest, Rom. (28 Jun-2 Jul 1971).
GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES; INDONESIA;RESERVES;GOVERNMENT POLICIES

436 COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE FEDERAL GEOTHERMAL LEASING PROGRAMS. Finn, D.F.X. New York; Geothermal Energy Institute (1971). 575p.
GEOTHERMAL FIELDS;USA;LAND LEASING; ENVIRONMENTAL IMPACT STATEMENTS

437 NATURAL RESOURCES DEVELOPMENT AND POLICIES, INCLUDING ENVIRONMENTAL CONSIDERATIONS. New York; United Nations (1971). 19p.
ENERGY SOURCES;ENVIRONMENTAL EFFECTS; ENVIRONMENT;ENERGY POLICY;PETROLEUM;AIR POLLUTION;WATER POLLUTION;WATER POLLUTION; EXHAUST GASES;GEOTHERMAL ENERGY;HYDROELECTRIC POWER PLANTS;POWER GENERATION;TIDAL POWER;POWER TRANSMISSION;SATELLITES;ELECTRIC POWER;COAL; PETROLEUM INDUSTRY;ORBITAL SOLAR POWER PLANTS; ENERGY CONSUMPTION

438 NATURAL RESOURCES DEVELOPMENT AND POLICIES, INCLUDING ENVIRONMENTAL CONSIDERATIONS. NOTE BY THE SECRETARY-GENERAL: ADDENDUM, CHANGING PATTERNS IN THE WORLD ENERGY SITUATION. New York; United Nations (1971). vp.
ENERGY SUPPLIES;ENERGY CONSUMPTION;ENERGY SOURCES;ENERGY DEMAND;STATISTICS;COAL;PETROLEUM; NATURAL GAS;GEOTHERMAL ENERGY;SOLAR ENERGY; NUCLEAR ENERGY;WIND POWER;TIDAL POWER; ENVIRONMENTAL EFFECTS;REVIEWS;ENERGY POLICY

439 ECONOMICS OF THE COMMON POOL: PROPERTY RIGHTS IN EXHAUSTIBLE RESOURCES. Friedman, A.E. UCLA Law Rev.; 18: 855-887(1971).
A brief overview introduces the problem then focuses on the meaning of a socially optimal rate of exploitation of an exhaustible resource. The problem of externality in the common pool is examined and an economic analysis is developed to explain how differing ownership rights affects the rates at which exhaustible resources are exploited. A general theoretical solution is proposed and illustrated with an application to groundwater mining. (PCS)

440 GEOTHERMAL STEAM ACT OF 1970. Bible, A. Idaho Law Rev.; 8: 86-92(1971).
Legislative history and intent for passage of the Act are reviewed and compared with the Mineral Leasing Act (30 USC 223). Projected litigation over mineral rights' ownership clauses is expected to delay geothermal exploration and development. (PCS)

441 LAW OF OIL AND GAS. Hemingway, R.W. St. Paul; West Publishing Co. (1971). 508p.
Titles of the nine chapters are: mineral estate; definition; creation of interests in the oil and gas mineral estate by the landowner; conveyances, partition and adverse possession of the mineral estate; trespass, surface and sub-surface, and third party claims; the oil and gas lease (leases from owners of concurrent, successive, or restricted interests; duration; royalty and other particular lease clauses); covenants of the lessee to protect, develop, and administer the lease; and, transfers by the lessor and the lessee. A table of cases and a subject index are also included. (JGB)

442 FREE ELECTRICITY; PLAN TO GET MORE ENERGY FROM HEAT INSIDE EARTH MOVES FORWARD A BIT (GEOTHERMAL STEAM ACT OF 1970). Large, A.J. Wall St. J.; 1+(10 Dec 1970).
GEOTHERMAL ENERGY;NATURAL STEAM;POWER GENERATION;ELECTRIC POWER;LEGISLATION; GEOTHERMAL STEAM ACT

443 (PB--196325) Uncl ENERGY FUEL MINERAL RESOURCES OF THE PUBLIC LANDS. VOLUME VI: LEGAL STUDY OF COAL RESOURCES ON PUBLIC LANDS; GEOTHERMAL RESOURCES ON PUBLIC LANDS. INTERIM REPORT. (Utah Univ., Salt Lake City. College of Law). Dec 1970. Contract PLLRC--68-C-11. 630p. NTIS $9.00; $0.95 (mf).
COAL RESERVES;GEOTHERMAL RESOURCES;LEGAL ASPECTS;MINERAL SPRINGS;LAND LEASING;PUBLIC LANDS;MINERAL RESOURCES

444 AUTHORIZING THE SECRETARY OF THE INTERIOR TO MAKE DISPOSITION OF GEOTHERMAL STEAM AND ASSOCIATED GEOTHERMAL RESOURCES REPORT TO ACCOMPANY S. 368. Washington, DC; US Congress. House. Committee on Interior and Insular Affairs (30 Sep 1970). 22p.
USA;GEOTHERMAL RESOURCES;LEGISLATION;NATURAL STEAM;GEOTHERMAL ENERGY

445 GEOTHERMAL RESOURCE DEVELOPMENT; REPORT TO ACCOMPANY S. 368. Washington, DC; US Congress. Senate. Committee on Interior and Insular Affairs (4 Sep 1970). 30p.
USA;GEOTHERMAL RESOURCES;LEGISLATION; EXPLOITATION

446 GEOTHERMAL STEAM AND RESOURCES. Washington, DC; US Senate, Committee on Interior and Insular Affairs (Jul 1970). vp.
NATURAL STEAM;GEOTHERMAL RESOURCES;LEGAL ASPECTS;POWER GENERATION;ENVIRONMENTAL IMPACT STATEMENTS;HEARINGS

447 (PD--218830, pp 88) GEOTHERMAL STEAM ACT OF 1970 (EXPLOITATION AND DEVELOPMENT OF GEOTHERMAL STEAM RESOURCES). 1970.
Exploration and exploitation of geothermal resources in arid and semiarid lands.
USA;GEOTHERMAL RESOURCES;REGULATIONS; GOVERNMENT POLICIES;EXPLOITATION;LEGAL ASPECTS; LEGISLATION;LAND LEASING;GEOTHERMA STEAM ACT

448 GEOTHERMAL STEAM ACT OF 1970. EXPLOITATION AND DEVELOPMENT OF GEOTHERMAL STEAM RESOURCES. Washington, DC; US Congress (1970). 11p.
GEOTHERMAL RESOURCES;LEGISLATION;NATURAL STEAM;THERMAL WATERS;EXPLOITATION;BRINES;LAND LEASING;GEOTHERMAL EXPLORATION;GEOTHERMAL STEAM ACT

449 ECONOMICS OF GEOTHERMAL POWER IN THE UNITED STATES. Kaufman, A. (Director, Office of Economic Research, Public Serv. Com., Albany, NY). Geothermics; No. 2, 967p.(1970).
GEOTHERMAL ENERGY;ECONOMICS;USA;GEYSERS; CALIFORNIA;FORECASTING;ELECTRIC POWER;LEGAL ASPECTS;ENVIRONMENTAL EFFECTS;POLLUTION

450 COMPENDIUM OF PAPERS PRESENTED AT THE IMPERIAL VALLEY--SALTON SEA AREA GEOTHERMAL HEARING, OCT 22 AND 23. Sacramento; California Geothermal Research Board, State of California Joint Legislative Committee on Atomic Development (1970). vp.
IMPERIAL VALLEY;SALTON SEA;CALIFORNIA; HEARINGS;GEOTHERMAL ENERGY;GEOTHERMAL RESOURCES

451 ELECTRIC POWER, FUELS DEVELOPMENT, AND PROTECTION OF THE ENVIRONMENT: LEGISLATION INTRODUCED IN THE 91ST CONGRESS. Bowman, W.D. Washington, DC; Library of Congress (1970). 25p.
ENERGY POLICY;ELECTRIC POWER;POWER GENERATION;ENVIRONMENT;LEGISLATION;NUCLEAR POWER PLANTS;REGULATIONS;OIL SHALES;WATER POLLUTION;SURFACE MINING;MINERALS;GEOTHERMAL ENERGY;DEMAND FACTORS;GOVERNMENT POLICIES; NATURAL GAS;AIR POLLUTION;POWER TRANSMISSION; WASTE HEAT;ENERGY SOURCES

452 ONE THIRD OF THE NATION'S LAND: A REPORT TO THE PRESIDENT AND TO THE CONGRESS BY THE PUBLIC LAND LAW REVIEW COMMISSION. Washington, DC; Public Land Law Review Commission (1970). 355p. GPO.
The Public Land Law Review Commission was charged with reviewing laws, policies, practices, and procedures affecting the public lands in the U.S. which constitute about one-third of its land area. The full test of the statute creating the Commission is given in Appendix A. Chapter I describes what and where public lands are and Chapter II discusses to whom public lands are important. One hundred and thirty-seven specific recommendations are discussed in the following chapters entitled: Planning Future Public Land Use; Public Land Policy and the Environment; Timber Resources; Range Resources; Mineral Resources; Water Resources; Fish and Wildlife Resources; Intensive Agriculture; the Outer Continental Shelf; Outdoor Recreation; Occupancy Uses; Tax Immunity; Land Grants to States; Administrative Procedures; Trespass and Disputed Title; Disposals, Acquisitions, and Exchanges; Federal Legislation Jurisdiction; and Organization, Administration, and Budgeting Policy. Personnel data and functions of the agencies are discussed in other appendices. (MCW)

453 ENERGY FUEL MINERAL RESOURCES OF THE PUBLIC LANDS. VOLUME I. MASTER REPORT: A STUDY PREPARED FOR THE PUBLIC LAND LAW REVIEW COMMISSION. Cambridge, MA; Abt Associates (1970). 434p. (PB--196320). NTIS.
The report constitutes the resources portion of a study of energy fuel mineral resources of the public lands. General considerations

include: to what extent, if any, should fuel mineral exploration, development, and production on the public lands be limited by declaring either that some public lands shall not be available for this purpose, or that special restrictions should be made applicable to some classes of public lands. In what circumstances, if any, should the fuel mineral interest be reserved to the United States when disposing of public lands for other uses. Should public lands containing fuel minerals be disposed of and, if so, under what conditions. What policy or policies should govern the pricing of energy fuel minerals on public lands.

454 GEOTHERMAL STEAM POSES OWNERSHIP QUESTIONS. Electr. World; 171: 24(17 Mar 1969).
GEOTHERMAL RESOURCES;LEGAL ASPECTS; GEOTHERMAL ENERGY;NATURAL STEAM;OWNERSHIP RIGHTS

455 WATER SUPPLY: ECONOMICS, TECHNOLOGY, AND POLICY. Hirshleifer, J.; de Haven, J.C.; Milliman, J.W. Chicago; University of Chicago Press (1969). 400p.
An attempt is made in this book to effect a major change, rather than merely a marginal modification in the trend of current practice and thought on water-supply problems. Since publication of the first edition of this book in 1960, the authors have re-examined water developments in their two major case-study areas: New York City and Southern California. The evaluations and recommendations of the authors from the original book are further discussed here in twelve chapters: The Water Problem; Out Water Resources; The Present Picture; The Economics of Utilization of Existing Water Supplies; Criticisms of Market Allocations; The Political Allocation Process; Municipal Water Rates; Investment in Additional Water Supplies; The Practical Logic of Investment Effciency Calculations; Technological Features and Costs of Alternative Supplies of Water; Water Law: Government Discretion or Property Rights; New York's ''Water Crisis'': Case Study of a Crucial Decision; Water for Southern California: Case Study of an Arid Region; and Some Controversial Conclusions and Their Implications. (MCW)

456 REICH, ARTHUR E. AND CAROLYN C. REICH VS COMMISSION OF INTERNAL REVENUE, U.S. TAX COURT, JULY 31, 1969. Tax Court Rep.; 52: 700-717(1969).
The petitioners participated in ventures to drill for and exploit geothermal steam. One of these ventures was successful and the resulting wells produced sufficient steam to supply electrical generating plants. One of the petitioners claimed percentage depletion against the gross income it received from steam production in the successful venture. All the petitioners expensed the intangible costs of drilling and developing geothermal steam wells. Held, the petitioner which participated in the successful venture is entitled to deduct percentage depletion at the rate of 27 1/2 percent against gross income it received from steam production. Held, further, all petitioners are entitled to expense the intangible costs of drilling and developing geothermal steam wells.

457 NEVADA'S GEOTHERMAL RESOURCES. Schilling, J.H. NV Business Rev.; 3-5(Aug 1968).
NEVADA;GEOTHERMAL RESOURCES;NATURAL STEAM; POWER GENERATION;LEGAL ASPECTS

458 INTERNAL REVENUE SERVICE REGULATIONS. Fed. Regist. (Wash., D.C.); 33: 317-321(26 Jul 1968).
Text of the Internal Revenue Service Regulations pertaining to mineral depletion allowances are given. (PCS)

459 STATE, FEDERAL LAWMAKERS WEIGH GEOTHERMAL LEASING. Electr. World; 167: 38(6 Mar 1967).
GEOTHERMAL FIELDS;LAND LEASING;LEGAL ASPECTS; GEOTHERMAL ENERGY

460 TOWARD A THEORY OF PROPERTY RIGHTS. Demsetz, H. (Univ. of Chicago). Am. Econ. Assoc. Pap. and Proc.; 57: 347-359(Mar 1967).
An economic theory of property rights is presented in three parts: the concept and role of property rights in social systems; guidance for investigating the emergency of property rights; and some principles relevant to the coalescing of property rights into particular bundles and to the determination of the ownership structure that will be associated with these bundles. (PCS)

461 GEOTHERMAL ENERGY LANDS OUTLINED. Calif. Div. Mines, Geol., Mineral Info. Serv.; 20: No. 6, 58, 72(1967).
USA;GEOTHERMAL RESOURCES;LEGAL ASPECTS;LAND RECLAMATION

462 CALIFORNIA'S GEOTHERMAL RESOURCES. Sacramento; State of California, Joint Legislative Committee on Tidelands (1967). 194p.
Legal and technological status. CALIFORNIA; GEOTHERMAL RESOURCES;GEOTHERMAL EXPLORATION; LEGISLATION

463 CALIFORNIA LAWS FOR THE CONSERVATION OF GEOTHERMAL ENERGY, AN ACT TO AMEND THE HEADING OF CHAPTER 4, AND TO ADD TO CHAPTER 3, DIVISION 3, OF THE PUBLIC RESOURCES CODE, RELATING TO GEOTHERMAL RESOURCES. Sacramento; State of California (1967). vp.
CALIFORNIA;LAWS;GEOTHERMAL ENERGY; REGULATIONS;MANAGEMENT;GEOTHERMAL EXPLORATION; LAND LEASING

464 DISPOSITION OF GEOTHERMAL STEAM - 1967. Washington, DC; US Congress. House. Committee on Interior and Insular Affairs (1967). 244p.
USA;GEOTHERMAL RESOURCES;NATURAL STEAM; LEGISLATION;GEOTHERMAL ENERGY;HEARINGS

465 GEOTHERMAL STEAM LEASING; HEARINGS BEFORE SUBCOMMITTEE ON MINERALS, MATERIALS AND FUELS ON S. 23 AND S. 912, MARCH 12-22, 1970. Washington, DC; US Congress. Senate. Committee on Interior and Insular Affairs (1967). 133p.
USA;GEOTHERMAL RESOURCES;NATURAL STEAM; GEOTHERMAL FIELDS;LAND LEASING;LEGISLATION

466 GEOTHERMAL STEAM ACT OF 1966 (S. 1674); MEMORANDUM OF DISAPPROVAL, 14 NOV 1966. (US President). Weekly Compilation of Presidential Documents; 1699(21 Nov 1966).
USA;GEOTHERMAL RESOURCES;LEGISLATION; GEOTHERMAL STEAM ACT

467 GEOTHERMAL STEAM. Washington, DC; US Congress. House. Committee on Interior and

Insular Affairs (28 Sep 1966). 36p.
USA;GEOTHERMAL RESOURCES;EXPLOITATION; NATURAL STEAM;LEGISLATION;GEOTHERMAL ENERGY; GEOTHERMAL STEAM ACT

468 GEOTHERMAL POWER IN CALIFORNIA, A RESPONSE TO SENATE RESOLUTION NO. 138, RELATING TO THE USE OF GEOTHERMAL POWER FOR THE TRANSPORTATION OF WATER OVER THE TECHACHAP MOUNTAINS. Campbell, I.; James, L.B.; Oakeshott, G.B.; Richter, R.C.; Koenig, J.B. Sacramento; Calif. Dept. Water Res. (1966). 8p.
Research proposals. CALIFORNIA;GEOTHERMAL ENERGY;RESEARCH PROGRAMS;GEOTHERMAL RESOURCES; WATER;TRANSPORT;LEGAL ASPECTS;LEGISLATION

469 LEGAL PROBLEMS OF THE GEOTHERMAL INDUSTRY. Brooks, J.W., Jr. Univ. NM Law School, Nat. Res. J.; 6: No. 4, 511-41(1966).
GEOTHERMAL ENERGY;ECONOMICS;GEOTHERMAL FIELDS;NATURAL OCCURRENCE;LEGAL ASPECTS; GEOTHERMAL EXPLORATION;GEOTHERMAL RESOURCES; LEGISLATION

470 GEOTHERMAL RESOURCES IN CALIFORNIA. Koenig, J.B. Calif. Div. Mines, Geol., Mineral Info. Serv.; 19: No. 6, 94-5(1966).
CALIFORNIA;GEOTHERMAL RESOURCES;MINERAL RESOURCES;GEYSERS GEOTHERMAL FIELD;SALTON SEA; GEOTHERMAL EXPLORATION;EXPLOITATION; ENVIRONMENTAL EFFECTS;CORROSIVE EFFECTS;SCALING; LEGAL ASPECTS;COST;ECONOMICS;HEARINGS; GEOTHERMAL EXPLORATION;GOVERNMENT POLICIES; GEOTHERMAL ENERGY

471 DISPOSITION OF GEOTHERMAL STEAM. Washington, DC; US Congress. House. Committee on Interior and Insular Affairs (1966). vp.
USA;GEOTHERMAL RESOURCES;EXPLOITATION; NATURAL STEAM;LEGISLATION;LEGAL ASPECTS; GEOTHERMAL ENERGY;GEOTHERMAL STEAM ACT

472 SOME ASPECTS OF PROPERTY RIGHTS. Demsetz, H. (Univ. of Chicago). J. Law Econ.; 9: 61-70(1966).
Some aspects of property rights are discussed as they bear on the two basic economic laws which state that (1) demand curves are negatively sloped and that (2) queues will tend to be eliminated by a price that is free to fluctuate. Traditional approaches are treated as well as some which have been ignored in the past since property rights have not been treated explicitly. (PCS)

473 USE OF GEOTHERMAL HEAT POTENTIAL. Bible, A.H. Public Util. Fortn.; 73: 54-5(29 Apr 1965).
USA;GEOTHERMAL RESOURCES;GEOTHERMAL ENERGY; POWER GENERATION;LEGAL ASPECTS;LEGISLATION

474 (PD--218830, pp 90) GEOTHERMAL STEAM ACT OF 1965 (A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO MAKE DISPOSITION OF GEOTHERMAL STEAM AND ASSOCIATED GEOTHERMAL RESOURCES). 1965.
Exploration and exploitation of geothermal resources in arid and semiarid lands.
USA;GEOTHERMAL RESOURCES;LAND LEASING; REGULATIONS;LEGAL ASPECTS;LEGISLATION;NATURAL STEAM;PUBLIC LANDS;GEOTHERMAL STEAM ACT

475 PUBLIC HEARING ON GEOTHERMAL ENERGY AND ASSOCIATED MINERAL RESOURCES. Palm Springs, CA; State of California, Senate Fact-Finding Committee on Nat. Res. (1965). 177p.
CALIFORNIA;GEOTHERMAL ENERGY;HEARINGS; MINERAL RESOURCES;GEOTHERMAL EXPLORATION

476 CALIFORNIA LAWS FOR THE CONSERVATION OF GEOTHERMAL ENERGY (CHAPTER 1483, STATUTES OF 1965), AN ACT TO ADD CHAPTER 4, DIVISION 3, TO THE PUBLIC RESOURCES CODE, RELATING TO GEOTHERMAL ENERGY AND ASSOCIATED RESOURCES. Sacramento; State of California (1965). vp.
CALIFORNIA;GEOTHERMAL ENERGY;LAWS; REGULATIONS;LEGISLATION

477 INITIAL EXPLORATORY WELL COVENANT. III. Oil and Gas Law; 5: 59-63(1964).
Implied covenants from oil and gas well drilling leases are discussed with precedents for breach and its remedy, and well abundament theory. (PCS)

478 ACQUISITION OF GEOTHERMAL RIGHTS: PROPOSED METHODS. Randall, G.C. Idaho Law Rev.; 1: No. 1, 49-66(1964).
It is shown that in most western states the geothermal power developer is confronted initially with the problem of acquiring valid rights to the hot water or steam. He must choose between attempting to acquire such rights through placer location, Oil and Gas Leasing Act, or under state water appropriation laws. Case studies are presented to illustrate the uncertain situation a prospective developer faces. It is suggested that the placer location is the best and safest way to acquire hot water or steam.

479 ANALYSIS OF THE USUAL OIL AND GAS LEASE PROVISIONS. Gregg, D.H. South Tex. Law J.; 5: No. 1, 1-46(Win 1960).
The usual provisions of oil and gas leases are discussed using the most common Producer's 88, revised as a model. The importance of each is stressed. Extensive Texas case decisions affecting each lease provision are cited. (PCS)

480 PROPERTY THEORIES AFFECTING THE LANDOWNER IN A NEW OIL AND GAS PRODUCING STATE. Cohen, H. Ala. Law Rev.; 10: v(1958).
This article surveys legal theories and statutes which have affected the landowner's legal position concerning oil and gas beneath his subdivision of land before and after oil activity has taken place. (PCS)

481 EVOLUTION OF OIL AND GAS LAW. Merrill, M.H. Miss. Law J.; 13: No. 3, 281-291(Mar 1941).
This survey of case law in condensed form reveals a development of scientific, industrial, and business experience that united to produce the present-day law. Constant movement from extreme individualism to emphasis on the common interest in the proper exploitation and use of important minerals in the legal decisions of the present time is detailed by case citations. Rules have modified over the years but the American Dream is still preserved. (PCS)

482 ECONOMICS OF EXHAUSTIBLE RESOURCES. I. THE PECULIAR PROBLEMS OF MINERAL WEALTH. Hotelling, H. (Stanford Univ., CA). J. Polit. Econ.; 39: No. 2, 137-175(Apr 1931).
The discussion is confined in scope to absolutely irreplaceable assets. Topics include peculiar problems of mineral wealth;

free competition; maximum social value and state regulation; monopoly; value of a mine monopoly; retardation of production under monopoly; price effects from cumulated production, and the author's mathematically derived optimum solutions. (PCS)

483 (CONF-720742--) Uncl PROCEEDINGS OF THE ENERGY RESEARCH PRIORITIES CONFERENCE HELD AT BERWICK ACADEMY, SOUTH BERWICK, MAINE, JULY 30--AUGUST 4, 1972. (National Science Foundation, Washington, D.C. (USA)). [nd]. 161p.
From Energy research priorities conference; South Berwick, Maine, USA (30 Jul 1972).
ENERGY POLICY;MEETINGS;ENERGY CONSERVATION; ECONOMIC POLICY;SOLAR ENERGY;GEOTHERMAL ENERGY; COAL;ENERGY CONVERSION;LMFBR TYPE REACTORS; REGULATIONS;REGULATORY GUIDES;FUSION REACTIONS; COST BENEFIT ANALYSIS;RESEARCH PROGRAMS; ENVIRONMENTAL IMPACTS;ENERGY CONSUMPTION; PETROLEUM;ELECTRIC POWER;USA;NUCLEAR ENERGY;US AEC;MANAGEMENT;RESERVES;OIL SHALES;OIL SANDS; SYNTHETIC FUELS;URANIUM ORES;ENERGY

484 (LA-UR--73-570) Uncl SOME INTERFACES IN RESOURCE UTILIZATION. Reinig, L.P. [nd]. Contract W-7405-eng-36. 16p. (CONF-730440--1). Dep. NTIS $3.00.
From Symposium on responses to the dilemma: environmental quality vs. economic development; Lubbock, Texas, USA (19 Apr 1973).
Geothermal energy, energy transmission, and desalination of underground water in New Mexico. ECONOMICS;GEOTHERMAL ENERGY;NUCLEAR POWER;DESALINATION;ENERGY SOURCES;HUMAN POPULATIONS;FOSSIL FUELS;ENVIRONMENT;BRINES; LEGAL ASPECTS;ELECTRIC POWER;NEW MEXICO; TECHNOLOGY UTILIZATION;GROUND WATER

485 RECENT DEVELOPMENTS IN THE TAXATION OF GEOTHERMAL EXPLORATION. Eisenstat, S.M. San Francisco, CA; Geothermal Energy Inst. ([nd]). 4p.
TAXES;GEOTHERMAL EXPLORATION;LEGISLATION; REGULATIONS;LAND LEASING;FINANCING

CORPORATE INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the citation number. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (TID-4585) is used in the standardization of corporate entries. TID-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. Report numbers, if applicable, are given in parentheses at the end of the entry. For publications with multiple authors, an author entry is provided for each. Entries for the second and succeeding author give a reference to first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

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SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms. Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR/QUALIFIER
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which thetitle contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. ''See references'' are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). ''See also references'' are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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REPORT NUMBER INDEX

The numbers assigned to all reports cited in the publication appear in the first column of the index. The citation numbers are included in the second column. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index.

Report No.	Abstract No.	Availability
NUMERICAL-		
10CFR790	58	Fed. Regist. (Wash., D.C.), 41: No. 103, 21433-21440(26 May 1976)
30CFR270	321	Fed. Regist. (Wash., D.C.), 38: No. 245, 35068-35073(21 Dec 1973)
30CFR270	423	Fed. Regist. (Wash., D.C.), 36: No. 142, 13722-13740(23 Jul 1971)
30CFR270	30	Fed. Regist. (Wash., D.C.), 41: No. 236, 53498-53499(7 Dec 1976)
30CFR271	321	Fed. Regist. (Wash., D.C.), 38: No. 245, 35068-35073(21 Dec 1973)
43CFR3000	423	Fed. Regist. (Wash., D.C.), 36: No. 142, 13722-13740(23 Jul 1971)
43CFR3045	423	Fed. Regist. (Wash., D.C.), 36: No. 142, 13722-13740(23 Jul 1971)
43CFR3200	320	Fed. Regist. (Wash., D.C.), 38: 387-420(21 Dec 1973)
43CFR3200	423	Fed. Regist. (Wash., D.C.), 36: No. 142, 13722-13740(23 Jul 1971)
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778886	330	NTIS, $4.75
ANCR-		
1214	173	Dep. NTIS, $5.45
BNWL-SA-		
5934	143	Battelle, Pacific Northwest Labs. (1976).
COM-		
75-10500	*198*	*NTIS, $9.25*
CONF-720742-		(Energy research priorities conference, South Berwick, Maine, USA, 30 Jul-4 Aug 1972)
	483	
CONF-730440-		(Symposium on responses to the dilemma: environmental quality vs. economic development, Lubbock, Texas, USA, 19-20 Apr 1973)
1	484	See LA-UR-73-570
CONF-7305117-		(National conference on geothermal energy, Palm Springs, California, USA, 10-11 May 1973)
P2	335	See NSF/RA/N-73-117(Vol.2)
CONF-740654-		(Geothermal power development conference, Berkeley, California, USA, 18 Jun 1974)
	271	See LBL-3099
CONF-741145-		(Annual meeting Society of Economic Geologists, Miami, Florida, USA, 18-20 Nov 1974)
1	244	Geothermal Energy Institute, 680 Beach Street, San Francisco, CA 94109
3	270	Amax Exploration, Inc., 4704 Harlan St., Denver, CO 80212
CONF-760222-		(2. geopressured geothermal energy conference, Austin, Texas, United States of America (USA), 23-25 Feb 1976)
P5	80	Dep. NTIS, $11.00
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76/1	66	See MTR-7137
EIS-CA-		
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73-1681-F-2	327	NTIS, $1.45
73-1681-F-3	328	NTIS, $1.45
73-1681-F-4	329	NTIS, $1.45
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5040-6 (Vol.1)	159	Jet Propulsion Lab., Pasadena, CA
5040-6 (Vol.2)	160	Jet Propulsion Lab., Pasadena, CA
5040-6 (Vol.3)	161	Jet Propulsion Lab., Pasadena, CA
5040-25 (Rev.A)(App.)	44	Energy Resources Conservation and Development Commission
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LBL-		
3099	271	Dep. NTIS, $5.45
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5204	50	Dep. NTIS, $4.00
MTR-		
7137	66	Dep. NTIS, $4.00
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20212	360	GPO, $4.20
20555	249	Western States Water Council, Rm. 1725, Univ. Club Bldg., Salt Lake City, UT 84112
20667	194	TIC
20694	190	TIC
20699	175	TIC
20944	250	GPO, $2.00
21008	73	TIC
21229	67	Wyoming Geological Survey, Laramie, $0.50
21256	51	Bureau of Land Management, Lakeview, OR
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21381	74	Univ. of California, Riverside
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760230	85	National Science Foundation, Washington, DC
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73-117 (Vol.2)	335	Univ. of California, Riverside
74-244	254	National Science Foundation, Washington, DC
74-246	150	Dep. NTIS, $4.50
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76/0462	52	NTIS, $25.00
76-0463	137	National Technical Information Service (1976).
76/0464	138	National Technical Information Service (1976).
76/0465	53	NTIS, $25.00
OTA-E-		
12	153	See PB-250636
P-		
5616	88	Publications Dept., Rand Corp., 1700 Main St., Santa Monica, CA 90496

Abbreviations Used in Availability Column

AT Liquid Metal Fast Breeder Reactor applied technology is available to domestic requesters within the United States from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.
Information regarding subscription purchase will be sent on request.
Foreign requesters should address inquiries to the above address.

Dep. DOE reports so designated are maintained in the organizations listed on the inside back cover.

EM Inquiries regarding the availability of blueline prints of DOE engineering drawings which were formerly available for sale by NTIS should be addressed to Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

GJO Available from DOE Grand Junction Office, P. O. Box 2567, Grand Junction, Colorado 81501.

GPO For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

LMEC Available *only to requesters within the United States* from the Liquid Metal Engineering Center, P. O. Box 1449, Canoga Park, California 91304.

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RSO Available *only to requesters within the United States* from the Reactor Standards Office, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37830.

TIC Available from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

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Issue 4

October 1977

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A12	10.75	E12	25.00	T12	650.00
A13	11.00	E13	28.00	T13	675.00
A14	11.75	E14	31.00	T14	750.00
A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
A17	13.00	E17	40.00	T17	900.00
A18	13.25	E18	45.00	T18	950.00
A19	14.00	E19	50.00	T19	1,000.00
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