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January 1996



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**INFORMATION SYSTEMS AND TECHNOLOGY
TRANSFER PROGRAMS ON
GEOHERMAL ENERGY AND OTHER RENEWABLE
SOURCES OF ENERGY**

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January 1996

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INFORMATION SYSTEMS AND TECHNOLOGY TRANSFER PROGRAMS ON GEOTHERMAL ENERGY AND OTHER RENEWABLE SOURCES OF ENERGY

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ABSTRACT

In order to remain competitive it is necessary to stay informed and use the most advanced technologies available. Recent developments in communication, like the Internet and the World Wide Web, enormously facilitate worldwide data and technology transfer. A compilation of the most important sources of data on renewable energies, especially geothermal, as well as lists of relevant technology transfer programs are presented. Information on how to gain access to, and learn more about them is also given.

INTRODUCTION

In a rapidly changing global economy, energy self-sufficiency plays an important role in a nation's future. To cut their dependency on foreign energy sources and fossil fuels, many countries have established renewable energy research and development programs.

The transfer of recently developed technologies to potential users and the prompt exchange and dissemination of new information and data, are two important factors in the adoption of state-of-the-art technologies which will accelerate technological advance. This is true for all technical and scientific fields, but it is critical for renewable energy projects in an increasingly competitive global energy market.

There are several technology transfer programs and information systems that cover renewable energy resources, especially geothermal. In spite of the (apparently) small number of programs and systems that are in place to disseminate geothermal information, significant technology transfer activity (including sharing of data, computer codes, publications and ideas) is occurring between universities, government-funded

groups, and industrial organizations through informal and formal arrangements.

Older information might be found only in file cabinets and library shelves, but more recent data tend to be stored on computers of individuals and organizations involved in renewable energy activities. Under these circumstances, the main issue is to locate the key persons that have information on the technology of interest, and then develop a working relationship with them. This sometimes is not so straightforward. Fortunately during the last few years, information on technology transfer programs and data on renewable energy sources has become available through computerized databases, and easily accessible through the Internet and the World Wide Web (WWW or Web; see Appendix A).

The purpose of this paper is to identify relevant sources for obtaining information on recent data and technology transfer programs related to renewable energies, especially geothermal. The number of sources is expected to increase with advances in computer technology and the expansion of the Internet.

INFORMATION SYSTEMS

Databases

The first computerized databases on geothermal resources were created in the 1970s to provide rapid, efficient and economical means of storing and disseminating data on the development and utilization of geothermal resources. GRID was a repository of geothermal information that was established at the Lawrence Berkeley (National) Laboratory (Harris and Phillips, 1976). The US Geological Survey developed GEOTHERM, a computerized data file on geothermal fields, geothermal wells and other geothermal topics (Clark et al., 1976). Unfortunately, because

priorities changed and funding support terminated, these databases were maintained and updated for a relatively short period of time, and no longer exist (see for example Bliss, 1986).

Just a few references on geothermal databases can be found in the recent literature (e.g., Blackwell et al., 1994; Xiong et al., 1995), but it is obvious that the information used in plotting maps and figures presented in many publications are computer-based (e.g., Hamza and Muñoz, 1996). Theoretically, it would be possible to obtain copies of those data. The problem is to locate the appropriate references and request the information from the authors (sometimes not an easy task). In any case, the process can be started by scanning the literature listed in a number of publications and data banks accessible through the Internet and the WWW.

Publications

Some important recent sources of geothermal information are as follows:

1. Proceedings of the Geothermal World Congress, 1995 (5 volumes). Florence, Italy, 18-31 May 1995 (copies can be purchased from the Secretariat of the International Geothermal Association, c/o Wairakei Research Center, Private Bag 2000, Taupo, New Zealand; fax: +64-7-374-8199; e-mail: igasec@gns.cri.nz). The next World Congress will be held in Japan in the year 2000.
2. Proceedings of the Annual Meeting of the Geothermal Resources Council, (GRC Transactions; copies can be purchased from the Council, P.O. Box 1350, Davis, CA 95617; fax: (916) 758-2839; e-mail: geores@wheel.dcn.davis.ca.us).
3. Proceedings of the Geothermal Reservoir Engineering Workshops (copies can be purchased from the Geothermal Program, Department of Petroleum Engineering, Stanford University, Stanford, CA 94305; fax: (415) 725-2099; e-mail: shaun@pangea.stanford.edu).
4. Proceedings of the New Zealand Geothermal Workshops (copies can be purchased from the Geothermal Institute, University of Auckland, Private Bag 92019, Auckland, New Zealand; fax: +64-9-373-7436; e-mail: thermal@auckland.ac.nz).
5. *Geothermics* (journal published by Elsevier Science Ltd., The Boulevard, Langford Lane,

Kidlington, Oxford OX5 1GB, United Kingdom; fax: +44-1865-843969).

6. *Geothermal Science and Technology* (to subscribe to this journal write to Independent Publishers Distribution Order Department, P.O. Box 90, Reading, Berkshire RG1 8JL, United Kingdom; fax: +44-1734-568211).

In addition, the quarterly newsletter of the International Geothermal Association (*IGA News*), as well as some issues of *Geothermics*, list articles on geothermal energy that recently appeared in national and international scientific journals.

Directories

Power Plays. Profiles of America's Independent Renewable Electricity Developers, 1995 Edition (Williams and Bateman, 1995). This report published by the Investor Responsibility Research Center (IRRS) provides information on companies developing renewable electricity technologies in the US. It has chapters on Biomass, Geothermal, Wind, Hydro, Photovoltaics, Solar Thermal, Ocean and "Multitechnology". It discusses the various technologies, their history and outlook, the industry and its projects, as well as factors affecting the future of renewable electricity.

Registry of (Geothermal) Services and Equipment (Geothermal Resources Council, 1995). This directory is included in the membership roster of the Council; it lists companies according to their services (e.g., drilling, exploration, reservoir assessment, etc.) and can also be accessed through the Internet (see below).

The World Directory of Renewable Energy: Suppliers and Services 1995 (edited by Bruce Cross, 1995). The volume includes listings of organizations and companies, and articles on biomass, geothermal, hydro and wave, photovoltaics, solar thermal and wind energy, as well as on rational use of energy, instrumentation and metering, and energy storage.

On-line systems

Energy Science and Technology Database (EDB). Possibly the largest on-line energy information system, EDB is supported by the US Department of Energy (DOE) and maintained by its Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee. It contains scientific and technical information and results of DOE-sponsored research and other information from organizations worldwide. The data is acquired through

international partnerships, such as the ones with the International Energy Agency (IEA) Energy Technology Data Exchange (ETDE) and the International Atomic Energy Agency (IAEA) International Nuclear Information System (INIS), bilateral agreements with other governments, contracts with private information organizations and professional societies, etc. EDB covers all aspects of energy production and use, including issues related to renewable energy sources, as well as legislative, regulatory and socioeconomic topics. Groups not related to DOE can access this database through commercial organizations like the DIALOG Service and STN International. For more information see Fig. 1.

In the area of renewable energy, in addition to the on-line system, OSTI publishes monthly (or bimonthly) Current Abstracts Reports on,

- Biomass Energy Research
- Electric Energy Systems
- Electric Power Systems
- Energy Storage Systems
- Geothermal Energy (Fig. 2)
- Photovoltaic Energy
- Solar Thermal Energy Technology
- Wind Energy Technology

These reports, which include expanded abstracts of journal articles and information on publications, books, software, as well as monthly reports on upcoming Energy Conferences and Symposia, are available to the public by subscription. For further details write to US Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161.

OSTI's home page on the WWW (Fig 3a) is: <http://apollo.osti.gov/html/osti/ostipg.html>.

Energy Efficiency and Renewable Energy Network (EREN). This bibliographic database on the WWW is a subset of the EDB. It is accessible through OSTI (see above) or through the address: <http://www.osti.gov/html/eren/eren.html>. It contains scientific and technical information relating to energy efficiency and energy topics (Fig. 3b) and is updated every two weeks.

References on each category within EREN (Fig. 3c) are classified according to topics; Fig. 3d shows those for geothermal energy.

GRC On-Line Information System. The Geothermal Resources Council (GRC) has compiled information on geothermal exploration, development and production, and has developed an

information system that includes several databases (Anderson and Smith, 1994). The Geothermal Data Base has presently more than 12,000 citations (E. Smith, pers. comm., 1996) from the most important technical journals and proceedings of meetings related to geothermal resources. The Geothermal Power Plant Data Base includes outlines on most geothermal power plants worldwide. The GRC Bulletin Data Base contains all the articles of this monthly publication [at the present time up to Volume 24 (1995)]. The OIT Geothermal Heat Pump/Direct-Use Data Base and the OIT Bulletin Data Base, which are compiled by the Geo-Heat Center of the Oregon Institute of Technology (OIT), contain more than 3,800 citations on geothermal heat pumps and non-electrical uses of geothermal energy. The International Vendors List Data includes companies and individual contractors who supply geothermal goods and services, from drilling to financing; presently it has some 360 citations. Other databases are being added to this information system, like one on Geothermal Standards and another on Geothermal Statistics (E. Smith, pers. comm., 1996).

Only subscribers have access to this on-line information system. At this time, GRC is in the process of going on line on the Internet possibly through Solstice (see below). For further details contact the Council (P.O. Box 1350, Davis, CA 95617; fax: (916) 758-2839; e-mail: geores@wheel.dcn.davis.ca.us).

Solstice. The Center for Renewable Energy and Sustainable Technology (CREST) created this homepage on the WWW (<http://solstice.crest.org/>). Its purpose is to provide energy efficiency, renewable energy and sustainable technology information and connections. A multimedia encyclopedia on renewable energy (Sun's Joules) and an overview of renewable energy technologies and their applications (The Renewable Energy Exhibit) are available on CD-ROMs. For further information contact CREST, 777 N Capitol St. NE, Suite 805, Washington, DC 20002; fax: (202) 289-5354; e-mail: info@crest.org.

IGA Home Page. The International Geothermal Association (IGA) has created a home page on the WWW describing the association and discussing several topics of geothermal interest (Batchelor, 1995; Fig. 4). Presently it has some 85 "pages", including information on geothermal development in different countries, pictures, maps and links across the Internet to other sites (A.S. Batchelor, pers. comm., 1996). In the future it may be expanded to include bibliographic information now being published in *IGA News* and *Geothermics*. For

more information and to send comments on the IGA WWW site, contact Tony Batchelor (tony@geosci.demon.co.uk) or Patrick Muffler (pmuffler@mojave.wr.usgs.gov).

THERMIE. The European Community (EU) has created the THERMIE Program for the promotion of energy technologies. One of its aims is to contribute to a coordinated approach to the dissemination of European energy technology at different levels, by means of information exchanges and liaison with other European, and national programs and its participants. There are several databases relevant THERMIE and to renewable/geothermal energy technologies (Table 1), ranging from SESAME, the basic database for management of THERMIE demonstration projects to the energy-related directories listings (now including THERMIE) found on the WWW (G. Molina, written comm., 1995). For further details contact the European Commission, Directorate-General XVII for Energy, Rue de la Loi 200, B-1049 Brussels, Belgium; fax: +32-2-295-6118.

TECHNOLOGY TRANSFER

According to Mock et al. (1993), technology transfer is the process that actively seeks to match people's expressed technical needs with available and applicable devices, methods and data. Once the match occurs, it encourages the adoption and widespread use of that technology.

Many technology transfer activities involve the transmission of information from one party to another, rather than the transfer of objects. The information can be about processes and procedures, as well as about physical devices. There are many possible mechanisms for developing and sharing new technology, such as personnel exchanges, data exchange agreements, training schools, workshops, cooperative R&D agreements and technical assistance.

Numerous groups throughout the world have created technology transfer programs. For example, the DOE (US Department of Energy, 1995) and all its National Laboratories have established groups dedicated to these activities. However, they tend not to emphasize renewable energy technologies.

An exception is the program at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, where importance is given to biomass, solar and wind, but not to geothermal energy. To obtain further information about their activities, contact Mr. H. Dana Moran, Manager, Research and Technology Applications, NREL, 1617 Cole Blvd., Golden, CO 80401-3393; fax: (303) 275-3097; e-mail: morand@tcplink.nrel.gov.

The Renewable Energy and the Environmental Program of Winrock International includes technology transfer; the program is sponsored by the US Agency of International Development and

DATABASE NAME	BRIEF DESCRIPTION	RESPONSIBLE/CONTACT
SESAME	Energy Demonstration Project Records	Info Partners s.a. Fax. +352-3498.1234
ISSET (Information System on Energy Technology)	CD-ROM for Microsoft Windows (3.1/3.11)	ICEU, Leipzig Fax. +49-341-980.3486
CEFENE (Energy Efficient Equipment Manufactured in EU)	Database (based on 'Kompass' Directory) on CD-ROM	EUROPLAN (F) Fax. +33-93-74.31.31
Member States' and International Organisations' Programmes	Internal OPET-CS Database - In preparation	Mr. Dean Cooper OPET-CS Fax. +32-2-771.56.11
World Wide Web - CORDIS - THERMIE on the Internet	-EU RTD Information System http://www.cordis.lu/ -Information brochure on THERMIE (Calls for Proposals, etc.) http://www.ib.be/thermie	CORDIS Help Desk Fax. +352-3498.1248 E-mail helpdesk@cordis.lu

Table 1. Databases relevant to THERMIE and renewable energy technologies (from G. Molina, written comm., 1995).

the US Export Council for Renewable Energy (Bartholf and Bell, 1995). For further information contact: Ms. Ellen B. Kennedy, Coordinator for Latin America, Winrock International, 1611 North Kent, Suite 600, Arlington, VA 22209; fax: (703) 243-1175; e-mail: ebk@dcmail.winrock.org.

Additional information on technology transfer programs and activities may be obtained by searching through the WWW. Some details are given in the homepages of the various US DOE National Laboratories (e.g., <http://www.lbl.gov>; <http://www.nrel.gov>)

Geothermal Training Schools

One of the most effective methods to transfer technology is through personal exchanges, such as joint projects and in student-teacher interaction. Both happen at universities and specialized training schools.

Several organizations offer geothermal training courses for technical and scientific personnel. Among them are, (1) the United Nations University in Reykjavik, Iceland (Fridleifsson, 1995); (2) the International School of Geothermics in Pisa, Italy (Dickson and Fanelli, 1995); (3) the Geothermal Institute of the University of Auckland in New Zealand (Hochstein, 1990); (4) the Programa de Especialidad en Geotermia at the Universidad Autónoma de Baja California, in Mexicali, BCN, México (Montero-Alpirez, 1995); (5) the Geothermal Training Courses offered by Kyushu University, Japan; and (6) the Los Azufres Geothermal Training Center of the Comisión Federal de Electricidad de México.

The people to contact to get additional information about the respective courses are:

(1) Dr. Ingvar B. Fridleifsson, U.N.U., c/o Orkustofnun, Grensásvegur 9, IS-108 Reykjavik, Iceland; fax: +354-5-5688896; e-mail: ibf@os.is; (2) Dr. Mario Fanelli, CNR-IIRG, 2, Piazza Solferino, 56126 Pisa, Italy; fax: +39-50-47055; (3) Dr. Patrick R. L. Browne, Geothermal Institute, University of Auckland, Private Bag 92019, Auckland, New Zealand; fax: +64-9-373-7436; e-mail: thermal@auckland.ac.nz; (4) Ing. Jesús García Molina, Instituto de Ingeniería, Universidad Autónoma de Baja California, Blvd. Juárez y Calle de la Normal, Mexicali, BCN, 21280 México; fax: +52-65-664150; (5) Dr. Michihiro Fukuda, Geothermal Research Center, Faculty of Engineering, Kyushu University, Kasuga-Koen, 6-1, Kasuga, Japan 816; fax: +81-92-501-3026; e-mail: fukuda@cm.kyushu-u.ac.jp; and (6) Ing.

Alfredo Mañón Mercado, Jefe del Centro de Entrenamiento Geotérmico, Apto. Postal 31-C, Morelia, Michoacán, 58290 México; fax: +52-43-143970.

Meetings, workshops and seminars

A number of local and international groups organize technical meetings, short courses and seminars on renewables energy sources. Announcements are generally published in technical journals, or mailed to interested parties. Information can also be obtained through the EDB on-line system (see above). In the case of geothermal energy, announcements of meetings and courses can found in the newsletter of the International Geothermal Association (*IGA News*) and the *Bulletin of the Geothermal Resources Council* (the addresses of these two organizations were given earlier).

FINAL REMARKS

The ability to obtain relevant and up-to-date information is crucial for the success of every scientific and commercial project.

Up to quite recently, most of the information was only available in printed form, and was stored in files, data banks and libraries maintained by governmental, industrial and professional organizations (and some devoted individuals). During the last few years, however, with the increased popularity of computers, the Internet and the Word Wide Web, the access to information has been made easier and faster, and the volume of data transferred has grown exponentially, and will continue to do so.

As more and more advanced information systems and technology transfer programs on renewable energy sources become available, efforts should be made to facilitate access to them by publicizing their existence and reducing the cost (if any) of using them. Creation of databases and technology transfer programs is highly desirable and recommended since it will help accelerate the development of existing resources.

One should remember, however, that in spite of a growing reliance on computer-based systems, personal contacts will continue to be important, not only to learn about the technologies and data that are becoming available and how to gain access to them, but also to identify what is needed to speed up the implementation of renewable energy projects.

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REFERENCES

- Anderson, D.N. and Smith, E. (1994) Public Information Projects of the Geothermal Resources Council and the Geothermal Energy Association. *Geothermal Resources Council Transactions*, Vol. 18, pp. 573-575.
- Bartholf, T.R. and Bell, R.H. (1995) The Establishment of a Global Network to Support Renewable Energy Projects in Developing Countries. Proceedings World Geothermal Congress 1995, Florence, Italy, 18-31 May 1995, pp. 453-455.
- Batchelor, A.S. (1995) IGA and the Internet-an Update. *IGA News*, No. 22, pp. 2-4.
- Blackwell, D.D., Steele, J.L. and Wisian, K. (1994) Results of Geothermal Resource Evaluation for the Eastern United States. *Geothermal Resources Council Transactions*, Vol. 18, pp. 161-171.
- Bliss, J.D. (1986) Management of the Life and Death of an Earth-Science Database: Some Examples from GEOTHERM. *Computers & Geosciences*, Vol. 12, pp. 199-205.
- Clark, A.L., Calkins, J.A., Tongiorgi, E. and Stefanelli, E. (1976) A Report on the International Geothermal Information Exchange Program, 1974-1975. Proceedings Second United Nations Symposium on the Development and Use of Geothermal Resources, San Francisco, CA, 20-29 May 1975, pp. 67-99.
- Cross, B., editor (1995) The World Directory of Renewable Energy. Suppliers and Services 1995. James & James Science Publishers, Ltd., 47 Kentish Town Road, London NW1 8NZ, UK, 577 p.; Fax: +44-171-284-3737.
- Dickson, M.H. and Fanelli, M. (1995) Geothermal Training at the International Institute for Geothermal Research in Pisa, Italy: Twenty-five years of activity. Proceedings World Geothermal Congress 1995, Florence, Italy, 18-31 May 1995, pp. 2935-2937.
- Fridleifsson, I.B. (1995) Geothermal Training in Iceland 1979-1995. Proceedings World Geothermal Congress 1995, Florence, Italy, 18-31 May 1995, pp. 2929-2934.
- Geothermal Resources Council (1995) 1995 Registry of Services and Equipment., GRC, P.O. Box 1350, Davis, CA 95617-1350, 12 p.
- Hamza, V.M. and Muñoz, M. (1996) Heat Flow Map of South America. Paper submitted to *Geothermics*.
- Harris, F. A. and Phillips, S.L. (1976) International Geothermal Information Exchange. The GRID Program. Lawrence Berkeley Laboratory Report LBL-5295, Berkeley, CA 94720, 18 p.
- Hochstein, M.P. (1990) Geothermal Training at Auckland (Manpower Training for Developing Countries). *Geothermal Resources Council Transactions*, Vol. 14, pp. 913-918.
- Krol, E. (1994) The Whole Internet. User's Guide & Catalog (Second Edition). O'Reilly & Associates, Inc., Sebastopol, CA 95472, 544 p.
- Lane, E. and Summerhill, C. (1993) Internet Primer for Information Professionals. Meckler Publishing, Westport, CT 06880, 181 p.
- Mock, J.E., Kenkremath, D.C. and Janis, F.T. (1993) Moving R&D to the Marketplace. A Guidebook for Technology Transfer Managers. US Government Printing Office, Washington, DC 20401.
- Montero-Alpirez, G. (1995) The Geothermal Diploma Program at The Universidad Autónoma de Baja California. A Review from 1983 to 1994. *Geothermal Resources Council Transactions*, Vol. 19, pp. 11-14.
- US Department of Energy (1995) Technology Transfer. Report DOE/TP-0001 DE95004241, 166 p.
- Williams, S. and Bateman, B.G. (1995) Power Plays. Profiles of America's Independent Renewable Electricity Developers; 1995 Edition. Investor Responsibility Research Center, 1350 Connecticut Ave., NW, Suite 700, Washington, DC 20036-1701; Fax: (202) 833-3555, 514 p.

Xiong Liang-ping, Liu Jie, He Li-juan, Hu Shen-biao and Wang Ji-yang (1995) Heat Flow and Hot Spring Data Base in China and Compilation of Geothermal Map Set by Computer. Proceedings World Geothermal Congress 1995, Florence, Italy, 18-31 May 1995, pp. 479-483.

APPENDIX A

The INTERNET and the WORLD WIDE WEB

Internet (modified after Lane and Summerhill, 1993)

The Internet is a world-wide communication system linking together thousands (millions?) of computers. The network is an intricate series of smaller networks inter-operating to exchange data between computers (hosts) on the network(s). The ability of many different types of computers to exchange data, is a great strength of the Internet and the technology on which it is based. The vast majority of the computers on the Internet share a common set of computer telecommunication protocols that allow them to inter-operate. The core suite of protocols making this interaction possible is the Transmission Control Protocol/Internal Protocol (TCP/IP).

Among the activities commonly occurring in the Internet are:

- Exchange of electronic mail and data files in a wide-area environment,
- On-line "real-time" interaction with other network users,
- Participation in electronic mailing lists and conferences,
- Receipt of electronic publications,
- Access to data stored on remote computers,
- Access to remote scientific computing peripherals such as supercomputers, remote sensing equipment, graphic processors, and
- Access to a wide selection of public domain and shareware software.

World Wide Web (modified after Krol, 1994)

The World Wide Web (WWW or Web) is the newest information service to arrive on the Internet. It is based on a technology called hypertext. Hypertext is a method of presenting information where selected words in the text can be "expanded" at any time to provide other information about the word. That is, these words are links to other documents, which may be text, files, pictures, anything.

Presently, the most popular browsers (i.e., any program for reading hypertext) are Mosaic and Netscape. Versions exist for all popular operating systems: UNIX, Macintosh and Microsoft Windows.

OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, provides direction for the Department of Energy's (DOE) scientific and technical information (STI) program and maintains a centralized base of support to assist Departmental elements in planning, developing, and implementing STI activities. DOE-originated and worldwide literature and software on advances in subjects of interest to DOE researchers are collected, processed, and disseminated using computerized data-bases, publications, and other media.

This information collection, containing over three million citations, represents a major national resource of scientific and technical information. In addition to information from DOE and its contractors, DOE acquires information through its international partnerships with the International Energy Agency's Energy Technology Data Exchange (ETDE), a consortium of more than 17 countries comprised of members from several continents; IEA Coal Research; the International Atomic Energy Agency's International Nuclear Information System representing over 100 countries and international organizations; bilateral agreements with foreign governments; exchange agreements with other U.S. government agencies; and contracts with private information organizations and professional societies.

The subject scope of this information extends beyond energy, covering basic scientific studies in such areas as radiology, atomic and nuclear physics, radiation and nuclear chemistry, superconductivity, supercomputers, the environment, health and safety, waste management, nuclear medicine, and arms control.

Major DOE databases are available within the United States through DIALOG Information Services and STN International and outside the United States through formal governmental exchange agreements. DOE and DOE contractor offices can access the databases online through the Integrated Technical Information System (ITIS) maintained by OSTI.

Office of Scientific and Technical Information
U.S. DEPARTMENT OF ENERGY
P.O. Box 62
Oak Ridge, TN 37831

Energy Information Online

The Department of Energy's online information system provides access to the results of DOE-sponsored research and other research literature from worldwide sources. The energy databases contain approximately 3 million current and historical entries.

The largest, most comprehensive database, Energy Science and Technology Database, is *the* source for energy-related information. But it also contains extensive information in other vital areas—for example, computers, acid precipitation, and nuclear medicine.

Energy Science and Technology Database contains information from worldwide sources in all subject areas of interest to DOE researchers. Coverage includes

- All aspects of energy production and use—for example, energy sources (fossil, nuclear, and renewable); energy conservation; environmental effects and pollution; advanced energy systems
- Basic studies in biology, chemistry, engineering, geology, and physics, as related to nuclear science
- Nuclear science and technology—for example, radiation and nuclear chemistry, nuclear fuels and reactors, and radioactive waste management
- Biomedical sciences—for example, nuclear medicine, radiotherapy, tracer studies, radiopharmaceuticals
- Unclassified nuclear weapons and explosions—detection, effects, and proliferation
- Supercomputers and applications of computer systems in energy research
- Legislative, regulatory, and socioeconomic aspects of energy

Literature cited in the database is selected by subject area for inclusion in DOE Current Awareness Publications.

Department of Energy and contractor personnel may access the current subset of the Energy Science and Technology Database through the Integrated Technical Information System (ITIS), DOE's in-house retrieval system. For more information, contact ITIS Access, OSTI, (615) 576-1222.

The Energy Science and Technology Database is also available through DIALOG and STN:

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Fig. 1: Energy Science and Technology Database

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ABOUT THIS PUBLICATION

Geothermal Energy (GET) announces on a bimonthly basis the current worldwide information available on the technologies required for economic recovery of geothermal energy and its use as direct heat or for electric power production. This publication contains the abstracts of DOE reports, journal articles, conference papers, patents, theses, and monographs added to the Energy Science and Technology Database during the past two months. Also included are U.S. information obtained through acquisition programs or interagency agreements and international information obtained through the International Energy Agency's Energy Technology Data Exchange or government-to-government agreements. The digests in *GET* and other citations to information on geothermal energy dating from 1974 are available for online searching and retrieval on the Energy Science and Technology Database. Current information, added daily to the Energy Science and Technology Database, is available to DOE and its contractors through the DOE Integrated Technical Information System. Customized profiles can be developed to provide current information to meet each user's needs.

PROGRAM ACTIVITIES

The Office of Utility Technologies is sponsoring or jointly sponsoring a series of eight current awareness publications to keep researchers knowledgeable of the latest scientific and technical information in the area of renewable energy sources. The publications are

Biomass Energy Research
Electric Energy Systems
Electric Power Systems
Energy Storage Systems
Geothermal Energy
Photovoltaic Energy
Solar Thermal Energy Technology
Wind Energy Technology

AVAILABILITY

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GEOLOGY AND HYDROLOGY OF GEOTHERMAL SYSTEMS

GEOTHERMAL EXPLORATION AND EXPLORATION TECHNOLOGY

LEGISLATION AND REGULATIONS

ECONOMIC, INDUSTRIAL, AND BUSINESS ASPECTS

ENVIRONMENTAL ASPECTS

PRODUCTS AND BY-PRODUCTS

GEOTHERMAL POWER PLANTS

GEOTHERMAL ENGINEERING

DIRECT ENERGY UTILIZATION

GEOTHERMAL DATA AND THEORY

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Fig. 2: Geothermal Energy. Bimonthly report published by OSTI/DOE.

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(a)

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Subject Category: Geothermal Energy

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- Environmental Aspects
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- Geothermal Power Plants
- Geothermal Engineering
- Direct Energy Utilization
- Geothermal Data and Theory
- Health and Safety
- Waste Management

(d)

Fig. 3: The Office of Scientific and Technical Information on the WWW

International Geothermal Association

Welcome to our Home Page

These pages are under continuous development - new pages are being added all the time

This page was last updated on 31 December 1995, also look at the [The IGA Gallery](#) for new pictures from New Zealand and our new [tables of world wide geothermal power production](#) and a [table of geothermal activity in Europe](#)

The pages are tested using Mosaic ver 2.0, early versions of Mosaic and Netscape may produce unexpected results!!

Keywords Geothermal Energy Electricity Direct-use Heatpumps Resources Renewable Power



International Geothermal Association

What's on this page

- What is Geothermal Energy?
 - World Wide Production of Electricity from Geothermal Energy *your browser must support Tables*
 - A Table of Geothermal Activity in Europe *some countries need better information*
 - IGA and the Internet, *articles from IGA News*
 - How to contact IGA, **Become a member today and help us promote the only 'new' renewable source of energy capable of producing baseload energy**
 - Scope and Objective
 - Purposes
 - Membership Profile
 - Membership Benefits
 - IGA Milestones
 - World Geothermal Congress
 - The Stanford Geothermal Reservoir Engineering Workshop, Jan 1996
 - IGA Board of Directors, 1995-1998 *new*
 - Links to other IGA pages
 - Links to other pages with Geothermal interests
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-

Fig. 4: IGA Home Page on the WWW.

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