

Report to
US Department of Energy
By the
Geothermal Energy Association

Final Technical Report

This material is based upon work supported by the U S. Department of
Energy under Award No: DE-FG07-97ID13565
"Support of US Geothermal Industry"

Funded by the Geothermal Technology Program
Office of Energy Efficiency and Renewable Energy

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U.S. Department of Energy
Energy Efficiency
and Renewable Energy

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EXECUTIVE SUMMARY

Through the support of the Geothermal Program of the U.S. Department of Energy, the Geothermal Energy Association undertook an effort to bring more geothermal energy on-line through outreach, education, domestic market enhancement, and market promotion assistance. During the initial period of work (October 1997 through October 1998) GEA published a series of newsletters and publications, facilitated workshops, conducted exhibits, and conducted market development activities in key foreign markets. During the remaining period of work (November 1998 through March 2003), GEA focused its efforts on market development activities in the Western US, Honduras and East Africa. In many different ways this program was successful. Key individual elements were directly successful based upon reviews or respondent questionnaires, the overall effort leveraged significant additional resources towards its goals, the undertakings were often the seed for activities that went beyond the scope or term of the immediate proposal, and the effort helped DOE and US industry expand markets and the use of geothermal energy.

Support of US Geothermal Industry: Background and Overview

Scope and Objectives

The original objective of this proposal was to provide financial assistance to the Geothermal Energy Association (GEA) for continued support of the U.S. geothermal industry in its efforts to bring more clean geothermal energy on-line throughout the world.

Background

The GEA is a non-profit organization which supports the U.S. geothermal industry by providing a variety of services to improve the worldwide business and technological environments in which the industry operates. The association promotes the development and utilization of geothermal resources; disseminates information about the advantages and potential of geothermal energy; encourages research and development to improve geothermal technology; and provides assistance for the export of U.S. geothermal goods and services.

Initially established in 1987 as the National Geothermal Association, the organization was renamed the Geothermal Energy Association in 1994. With only a part-time Executive Director until 1995, activities carried out by the association were quite limited. The U.S. geothermal industry wanted the association to be more active and opened a new office in Washington, DC in the latter part of 1995. The Washington office currently has a staff of three to execute its programs, an Executive Director, a Research Director and Business Manager. The association no

longer maintains a small support operation in Davis, California, collocated with the Geothermal Resources Council.

The GEA represents U.S. companies whose business interests include the development of geothermal resources worldwide for electrical power generation and direct-heat uses. These companies range in size from one-person consulting firms to small entrepreneurs to a few comparatively large corporations with offices in the U.S. as well as overseas. U.S. companies have played a significant role in the development of about half of the 8,000 MWe of electricity generated from geothermal energy in some 22 countries. Despite these successes, many challenges and obstacles still exist which hinder the U.S. geothermal industry from bringing more geothermal power to the world's very competitive and rapidly growing energy markets.

Activity Overview

GEA submitted to the Department of energy a 5-year proposal requesting support for the Geothermal Energy Association to continue and expand its activities in two fundamental areas: (1) Outreach, Education and Domestic Market Enhancement and (2) Export Promotion and Assistance.

Task 1. Outreach, Education and Domestic Market Enhancement

Geothermal technology is not well understood outside the geothermal community. Neither the extent to which geothermal technology is already used for electrical generation and direct use applications nor its great potential as a source of clean domestic and international energy are

recognized, even within groups which should support its importance. The purpose of the Outreach, Education and Domestic Market Enhancement Program was to promote the development and use of geothermal energy using a variety of communications media, including publications, presentations, exhibits, videos, and computers. Activities designed to accomplish this goal included (1) developing and maintaining data bases, Web pages, and other electronic data, and compiling information related to the geothermal industry and geothermal projects; (2) commissioning of special studies and reports; (3) preparing, printing, and distributing brochures and newsletters; (4) developing exhibits and displays, and participating in trade shows; (5) designing, producing, and disseminating videos, slides, and other audio-visual materials; (6) monitoring and coordinating programs and activities being carried out by the U.S. Department of Energy, other Federal agencies, and State and local governments that impact geothermal energy technology and development; (7) attending conferences, making speeches and presentations, and otherwise interacting with environmental and other renewable energy organizations and coalitions; (8) hosting of events in Washington, DC and other appropriate locations to educate Federal, State, and local representatives, the investment community, environmental groups, the news media, and others about the status and potential of geothermal energy; (9) conducting member services such as the preparation and distribution of a member newsletter and an annual membership drive, and other activities such as program planning and staff training, related to operating and maintaining a useful and viable association; and (10) performing similar kinds of activities designed to inform others about geothermal energy.

Task 2. Marketing Promotion and Assistance

GEA's original proposal anticipated that for at least the next 5-10 years, the major markets for geothermal goods and services would be overseas, primarily in developing countries. It is estimated that more than tens of thousands of MWe and billions of dollars of investment will be required to meet the growing power demands of these societies. The goal of the Export Promotion and Assistance Program is to provide assistance to U.S. companies seeking to generate power from geothermal resources in targeted areas throughout the world. Activities designed to accomplish this goal included (1) planning and conducting trade missions, both direct and reverse, to those countries that offer the greatest potential to purchase U.S. goods and services; (2) presenting information at foreign conferences, meetings and seminars on the status of U.S. technology and on the technical, financial, institutional and other aspects of geothermal energy development; (3) preparing brochures and videos for foreign professionals, officials, and decision-makers; (4) conducting other activities necessary to evaluate market conditions in various countries and to promote exports by U.S. companies; and (5) administering funds of the U.S. Export Council for Renewable Energy earmarked for geothermal activities.

Geothermal Energy Association

FY 1997 Proposal

On July 23, 1997, the Geothermal Energy Association requested federal funding to continue and expand its activities in these two fundamental areas: (1) Outreach, Education and Domestic Market Enhancement and (2) Export Promotion and Assistance. The approved program consisted of the following tasks:

Task 1. Outreach, Education and Domestic Market Enhancement

Subtask 1.1 General Distribution Newsletter

Subtask 1.2 Publications, Educational Materials

Subtask 1.3 Exhibits

Subtask 1.4 Facilitating Research, Industry and Market Interaction

Subtask 1.4 General Services

Task 2. Marketing Promotion and Assistance

Subtask 2.1 Market Assistance

Subtask 2.2 Program Development

Initial Period of Work: October 1997 through October 1998

On September 26, 1997, the Department of Energy notified the Geothermal Energy Association that it had been awarded funding to begin this work, and on October 3, 1997 the GEA signed the notification. During this first year of work under this agreement a full range of activities under the two Tasks above were conducted.

Newsletter

GEA launched a “Geothermal Energy News.” This was a professional newsletter covering a range of topics from a geothermal perspective. A typical issue included news on national and state events, climate change developments, international events and markets, research and business announcements, and general events of interest to the geothermal community.

The newsletter was distributed to a wide audience of senior agency officials, non-governmental organization leaders, international organization staff and professionals, press, policy makers and staff, and others in the broad Washington community. According to GEA’s media consultant, the newsletter “became a source of information for the mainstream press and others about research, technical and market developments concerning geothermal energy.” In total eight issues were published during this period with a circulation of about 5,000.

To evaluate the effectiveness of Geothermal Energy News, a one-page questionnaire was included in its last issue. A total of 39 responses were received. The response is summarized as follows.

The response indicated that most readers valued the domestic and international news most highly. Those options gained the highest scores both when asked what information the readers found most useful, and what they would like to see more information about in the future. Research information scored next highest in terms of information found useful, and legislative developments the next highest regarding future information desired.

Readers appeared to see the GEA newsletter as a means of correcting misinformation about geothermal energy, and spreading information about its benefits. The responses would suggest that the readers felt that there was a lack of accurate information available to the Washington community. A similar response was received when readers were asked about the need for information by the press. Again, the predominant response indicated that there is a widespread belief that the press has poor information about geothermal energy.

Respondents had different views about what decision makers and press needed to be informed about, however. Information about domestic market developments was seen as a priority for decision makers, while the press appeared to need more information about advances in geothermal technology.

Readers most wanted to see greater coverage of political developments affecting geothermal energy. This response may be a reaction to the passive nature with which political events had been reported.

The production aspects of the newsletter received high marks. A large majority of respondents liked the layout and colors, and most thought it was important to print it on recycled paper. A slight majority expressed no opinion about printing the newsletter with soy ink.

Overall, readers gave the newsletter high value ratings. Most wanted to see it published monthly, and a strong majority of those responding said that they would pay for the newsletter -- a good measure of its value.

Copies of all newsletters and detailed results from the questionnaire have been previously submitted.

Publications

GEA staff worked towards revising and updating “Geothermal Energy: Clean, Sustainable Energy for the Benefits of Mankind and the Environment.” A complete re-draft of this publication was circulated for comment and all comments incorporated in a new version. The final document was produced by the Energy and Geosciences Institute at the University of Utah in a large volume printing and is available on-line through GEA's web site at <http://www.geo-energy.org/RedBrochure.htm>.

GEA completed a Spanish language publication about geothermal energy, “La Geotermia.” This publication examines electricity production and direct use applications throughout the Americas, discusses environmental and climate benefits of using geothermal technologies, and directs the reader to sources for additional information in both Spanish and English. It was received with great enthusiasm when first distributed in Nicaragua at the GEA-AID-DOE Conference, and GEA republished it twice. Much of the material included in the publication was used as the basis for a recent article in the magazine *Potencia* on Geothermal Energy in the Americas. (Copies of this publication were submitted previously.)

The document was made available at GEA and other events in Central and South America, and is still available in electronic version on the GEA website (<http://www.geo-energy.org/SpanishBrochure.htm>.) Copies were also distributed to the ministries of energy in the region.

A collection of information related to geothermal energy and green marketing was developed and printed for distribution at the GEA Green Power workshop. “Green Power and California’s Future” included basic information about the comparative environmental benefits of geothermal energy. (Copies of this publication were submitted previously.)

A tri-fold brochure was produced highlighting geothermal energy and its potential, with basic government and non-profit contacts for additional information. In addition a four-fold legal-size brochure listing services available from US geothermal companies was developed. Both of these

pamphlets were made available free to interested parties upon individual request and distributed at events GEA participated in listed under exhibits. (Copies submitted previously.)

GEA also produced a “Preliminary Report” on the worldwide potential for geothermal energy. GEA staff working with Dr. Mike Wright of the University of Utah, and Dr. Marshall Reed of the Department of Energy, undertook to produce a basic document that defined the consensus position regarding international resource potential. No such estimate existed in a useable form, which created problems for a range of analysts and others.

A joint cover letter distributed a detailed questionnaire to about fifty known and pre-defined experts in the area. The questionnaire was quite extensive, and recipients were asked to donate their time and effort participating in this effort. Follow up calls were made to the addressees, and after personal contact 21 of the individuals agreed to support the effort. Several of the responses involved work by groups of people. For example, PB Power of New Zealand had their entire geothermal group work together to produce one product.

The final analysis was produced only in a preliminary version and GEA’ Executive Director Karl Gawell along with Dr. Wright and Dr. Reed participated in a question and answer session. (Background documents and Preliminary Report submitted previously.)

Exhibits

GEA, using a display owned by the Department of Energy and managed by the National Renewable Energy Laboratory, promoted public education about geothermal energy through selected exhibits. In 1977 GEA used the display at the GRC Annual Meeting in San Francisco, California.

GEA exhibited at the 3rd annual House Renewable Energy EXPO, sponsored by the bipartisan House Renewable Energy Caucus. In addition to GEA, DOE, UNOCAL, CalEnergy and Calpine also exhibited at this event. Roughly 3,000 people visited the EXPO during its one day. At the GEA booth, photo posters depicted the versatility of geothermal applications around the world, and the role of US companies in many international geothermal developments.

Another exhibit was produced for the 1998 American Association of Petroleum Geologists Annual Meeting in Salt Lake City. The AAPG meeting featured a number of geothermal papers and geothermal energy exhibits. The AAPG meeting was attended by more than 6,000 geoscience and energy professionals from around the world.

An annual education event was held on June 10th on the lawn of the State Capitol in Sacramento, known as Clean Power Day. It was designed to inform California decision makers and staff about the public and California's renewable and energy efficient technologies. GEA exhibited at the event with support from the Geothermal Resources Council located in Davis, California.

GEA also exhibited at the National Conference of State Legislatures annual conference July 20-23 in Las Vegas. The event was attended by more than 7,000 participants, including state legislators and their staff. At least one representative from each state visited the GEA booth, as well as many corporate and international attendees.

For the first time, the major world energy convention – the World Energy Congress – had a special series of presentations and exhibits related to renewable energy. GEA exhibited at the event in Houston and helped develop and present a program on geothermal energy in a concurrent “US Industry’s Days” Conference Track. The Track had five 2-hour sessions (geothermal, solar, wind, biomass and solar hydrogen) on three consecutive days. The Geothermal Session was held on Wednesday, September 16.

A program consisting of six geothermal presentations was developed and submitted to the organizing committee for approval. The organizing committee approved the program and invited speakers were mailed confirmation letters from the organizing committee. GEA's Executive Director and several member company representatives made presentations at the well-attended session.

Perle Dorr, GEA’ Outreach Director, was invited by the Chairman of the Exhibition Subcommittee for the World Geothermal Congress 200 to serve as a member of his team as a recognition of her experience and success with GEA's exhibit efforts.

Facilitation

GEA assisted the Department of Energy's Geothermal Program with development of its strategic plan. GEA staff provided comments, and encouraged a wide range of industry members to comment. In addition, Karl Gawell, GEA Executive Director, acted as facilitator for the DOE planning session held to develop the Strategic Plan in San Francisco.

The US Department of Energy, the World Bank, and GEA sponsored a half-day geothermal energy technology showcase on June 23rd to educate wide range of representatives from Washington-based groups and institutions. Participants from embassies, environmental groups, federal agencies, and Capitol Hill heard from some of the leading companies and scientists about the future outlook for geothermal technologies worldwide. GEA coordinated planning and handled administration of the event.

Congressman Vic Fazio (D-CA), Deputy Secretary of Energy Elizabeth Moler, Deputy Assistant Secretary of Energy for Utilities Technologies Dr. Allan Hoffman, and Chief of the World Bank's Global Climate Change Unity Charles Feinstein presented opening remarks. Following were presentations by Tom Sparks of Unocal Corporation on the outlook for geothermal energy in Indonesia, Jonathan Weisgall of CalEnergy discussing the domestic market, and Vince Zodiaco of Oxbow Power Corporation on the importance of government-industry cooperation in research and development.

A panel of speakers then examined the potential for geothermal technologies to contribute to mitigating global carbon emissions. Ron Sundergill of the Union of Concerned Scientists presented a brief overview of the challenges presented by global warming, and he moderated the panel which looked at three segments of geothermal technologies. Mike Wright of the Energy and Geosciences Institute examined the potential for geothermal energy to meet electricity needs. John Lund of the Oregon Institute of Technology detailed the range of potential applications for using direct heat. Finally, Conn Abnee, Chairman of the GeoExchange, presented the outlook for geothermal heat pumps.

Dr. Marshall Reed, Office of Geothermal Technology Program Manager, wrapped up the session with concluding remarks and welcomed participants to continue their discussion over a lunch provided by GEA at its own expense.

Over 100 individuals attended the session and visited the displays about geothermal research and the geothermal industry. Displays and other materials were prepared by the DOE, GEA, the Geothermal Heat Pump Consortium, GRC and several national laboratories and GEA member companies. Laboratories participating included the Idaho National Environment and Engineering Laboratory, Oak Ridge National Laboratory, the National Renewable Energy Laboratory, the Oregon Institute of Technology, the National Renewable Energy Laboratory, the Oregon Institute of Technology, the Energy and Geosciences Institute of the University of Utah, and Brookhaven National Laboratory. GEA members providing display materials included CalEnergy, Ormat, Ben Holt, Oxbow, Unocal, GeothermEx, and EGS, Inc.

GEA originally planned to hold a workshop on small scale geothermal development, Sandia National Laboratory took the lead on the workshop with GEA assisting it. GEA did assist the National Renewable Energy Laboratory in preparing their report on the potential for off-grid small scale geothermal systems, which was used as the basis for a discussion group at the GRC Annual Meeting, for presentations at the World Bank Village Power Conference, and was presented at the Sandia workshop.

General Services

GEA cooperated with the National Energy Education Day (NEED) Project. They pursued a number of education-related activities that culminated in an “Energy Summit” in Washington DC in September 1998. Randy Howard, Vice President of GEA Board Member Company Unocal Corporation, served as a volunteer coordinator of the geothermal energy component of this project.

GEA also supported the work of the Geothermal Resources Council and the Geothermal Education Office in producing a video through the American Environmental Review. A joint GEA/GRC/GEO team reviewed and revised a draft script prepared by the producers. The video was made available for broadcast on the Outdoor Channel, the American Independent Network and other media. (Video submitted previously.)

GEA staff participated and supported the DOE Program Review in Berkeley, California. GEA produced a “Green Power” symposium for the afternoon in advance of the meeting that was

attended by over 80 participants. The symposium brought together academic, environmental and governmental experts with many of the new “green power” marketers in California and the West. Presentations were made by eighteen individuals, ranging from Hal Harvey of the Energy Foundation to Julie Blunden of Green Mountain Energy Resources, to Ryan Wiser of Lawrence Berkeley National Laboratory. This symposium was a mutual opportunity for people within the geothermal community to get to know the new field of green power marketing, and for people working in the Green Power field to learn about geothermal energy technologies.

GEA also prepared briefing materials for Assistant Secretary Dan Reicher, and Deputy Assistant Secretary Dan Adamson at their request to familiarize them with geothermal energy and the US geothermal industry. GEA also briefed the Presidents Commission on Science and Technology and prepared presentations at the World Bank Energy Week and Village Power Seminars.

GEA also worked with a range of national organizations to expand their knowledge and understanding of geothermal energy, including the Natural Resources Council of America and the Sustainable Energy Coalition. GEA’s Executive Director agreed to serve on the Board of the Renewable Energy Policy Project. GEA provided information to DOE staff including data about greenhouse gas emissions and a memo defining possible future scenarios for geothermal energy using standard statistical methods of projection and analysis. GEA worked with other geothermal organizations supported by the Department of Energy to coordinate outreach, education and other related activities, and met with the California Energy Commission which had also signed a cooperative agreement with DOE in this area.

GEA also developed a basic web-site to provide an increasingly internet-savvy public with information about geothermal energy technologies and the geothermal industry in the most cost-effective manner.

International Market Development

With support from US AID, through US ECRE, GEA participated in the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAL) seminar on “Development of Geothermal Resources in Latin America and the Caribbean. The two day seminar was convened to hear the results of a two-year study funded jointly by the UN and the European Union. During this two year period, twenty-one countries with known geothermal resources in the region were studied, including Argentina, Bolivia, Brazil, Chile, Columbia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guadalupe, Guatemala, Grenada, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Santa Lucia and Venezuela. The results for each country were presented by representatives for the ministry most responsible for geothermal energy, and each country highlighted its priority projects.

GEA’s Executive Director wrote and presented a paper at the session entitled “The Role of the Private Sector in Geothermal Development in Latin America.” (Submitted previously.) The presentation was the only paper in the two day session to highlight the role and needs of private industry, as opposed to government-to-government activities, to promote the development of

geothermal resources. The UN-ECLAC meeting was a foundation for building relations between GEA and its staff with UN programs and government officials in the region.

Also with support from US AID, through ECRE, GEA International Director, Anne McKinney, participated in the Third Hemispheric Meeting of Energy Ministers, January 14-16, in Caracas, Venezuela. This meeting, co-sponsored by DOE, was the preparatory meeting for the Presidential Summit of the Americas. DOE Secretary Pena attended and spoke at the meeting, and GEA staff helped DOE staff at the Ministers Meeting to support Secretary Pena and ensure that the statement from the Conference included language supporting geothermal energy and US interests.

In conjunction with the Instituto Nicaraguenses de Energia (INE) of Nicaragua, the U.S. Department of Energy, and the U.S. Agency for International Development, GEA planned and held a “Central American Geothermal Energy Conference: from June 10—12, 1998 at the Camino Real Hotel in Managua, Nicaragua. The Conference opened with Vice-President Enrique Bolonos and Minister of Energy Jaime Bonilla speaking of their vision of Nicaragua. They both looked in the future towards a country generating much more energy from renewable resources, including 400MW of geothermal energy according to their national outlook. Deputy Assistant Secretary of Energy, Allan Hoffman, spoke on the U.S. Department of Energy’s technical cooperation with INE and its commitment to developing more renewable energy in Central America. (Detailed final agenda submitted previously.)

The first day included a panel of participants from Central American countries. Each discussed the policies employed by his/her country and their plans to encourage more geothermal development. Privatization, pricing and regulatory reforms in the energy sector were among the topics discussed. A discussion of the Central American Energy Integration Project and an overview of geothermal prospects in Central America followed the panel.

Financial and development issues were covered in the afternoon including; how to make a PPA financeable, the government role in private geothermal development, the prerequisites of a private sector developer, and the role of the IDB in financing geothermal projects in Central America. A discussion of the Climate Change treaty and how Central American countries can benefit from this treaty proved to be of interest to both Americans and participants from the region.

June 11 consisted of presentations on geothermal development in Nicaragua, with the second half of the day focusing on technical issues. Slim hole drilling for small-scale geothermal development, small geothermal plants, and direct use applications were discussed as well.

On Friday, Conference participants visited the Momotombo geothermal plant. Nicaragua has since competitively awarded the contract for expansion of this plant to a US company.

GEA Members making presentations at this conference were:

- Overview of Geothermal Prospects in Central America, Subir Sanyal, GeothermEx
- Prerequisites for Private Sector Investment, Derrick Stilwell, Calpine Corporation

- New Developments in Geothermal Technologies, Tsvi Meidav, Trans-Pacific Geothermal
- Geothermal Exploration Activities in the Sarulla Contact Area, North Sumatra, Indonesia, Pat Dobson, Unocal
- Reservoir Engineering and Maintenance, Subir Sanyal, GeothermEx
- Slim Hole Drilling for Small-Scale Geothermal Development, John Pritchett, Maxwell Technologies
- Small Geothermal Plants, Andrew Getraer, Geothermal Power Company
- Direct Uses of Geothermal Energy, Larry Green, Geothermal Development Associates
- Welcoming and Introductory Remarks, Karl Gawell, GEA

In advance of the conference, GEA prepared materials for the Department of State, CEQ, EPA and DOE to highlight the potential for geothermal energy in Central America. Meetings were held with an inter-agency climate committee, the DAS for Environment of the Department of State, and phone conversations were conducted with the Chair of the President's Council on Environmental Quality and the Assistant Administrator of the EPA followed up with written communications. The purpose of these communications was to secure high-level support for the conference in Nicaragua.

International Program Development

GEA held an International Market Development planning meeting in Berkeley, California on August 24, 1998 to acquire guidance and direction in approaching the international market for geothermal energy from a wide range of industry and government participants. Participants

included industry members, academia, laboratory researchers, DOE personnel, and staff of the California Energy Commission.

In preparation for this meeting, GEA developed a survey and distributed it to its members. A surprisingly strong response was received, with two-thirds of GEA members responding. The responses were tallied and these results served as the basis for the meeting discussion.

At the meeting, GEA started with the results to prioritize countries and regions which industry members see there will be significant power development, geophysical exploration and equipment and infrastructure needs. Following this, the participants discussed how GEA could best assist US companies in these markets.

Also, in advance of this meeting, GEA polled other trade associations about the type of activities they were undertaking to promote sales in international markets, and the results of this poll was presented at the meeting.

The planning meeting examined the efforts of other trade organizations to provide training and professional education to foreign nationals involved in geothermal development, either from their government, utility, or private concerns. The group was very interested in the WEATS (Wind Energy Applications Training) model initiated and supported by DOE. The group discussed how to establish a similar training program in the US. The group consensus was that this would be a valuable approach of benefit to both the industry and government interests, and it was suggested that GEA develop a draft proposal to submit to the US Department of Energy, US AID,

California Energy Commission or other possible funding source. (Questionnaire results and other materials submitted previously.)

GEA maintained contact and cooperative discussions with US AID, US ECRE, US DOE and the World Bank staffs in Washington.

Second Period of Work: November 1998 to March 2003

After the initial period of work, GEA agreed to concentrate its efforts on market development, both in the United States and overseas. With limited funding available, the use of federal funds in the most highly leveraged area appeared appropriate. Three major activities were conducted during this period: a Reno Workshop, the Honduras Outreach mission, and the East Africa Development Initiative.

Reno Workshop

In January of 2000, Secretary of Energy Bill Richardson and U.S. Senator Harry Reid announced a new initiative, GeoPowering the West, to promote the use of geothermal resources as an alternative energy source in the west. In order to advance the goals of this initiative, GEA and the Department of Energy agree to cosponsor a workshop in Reno, Nevada.

Nevada was chosen because as a state it has the highest potential for new electricity production from known geothermal resources. Thus, Nevada represented what geothermal energy could if it was properly recognized and developed. GEA accepted the responsibility to take the lead in organizing the workshop and coordinated planning and administration for the event.

Karl Gawell held several conference calls with industry members, DOE officials, researchers, and others to plan this session. The group of participants became a “core team” for the event, and

the breadth of this team ensured that a wide range of interested parties would be represented at the workshop. The core group included experts from private geothermal businesses, state energy officials, U.S. DOE officials, representatives from national laboratories (INEEL, NREL, Sandia), education sector, and Senator Harry Reid's staff. This group worked through a regular series of conference calls facilitated by GEA, and usually chaired by an official from the DOE geothermal technology program.

In May 2000, GEA hired Karen Seho as the Director of Business Relations to manage this activity. Ms. Seho took over the task of facilitating the conference calls with the core team. She also took the initiative to formulate the program agenda as well as manage the logistics for the meeting. Ms. Seho was assisted by additional staff members of GEA including Daniela Stratula who designed the workshop's website and program materials, and Ms. Sarah Rosen who handled the administration of the workshop.

The Geothermal Energy in Nevada workshop was scheduled to take place on July 26, 2000 at the Jot Travis Student Union, University of Nevada, Reno. The core team was used to develop the workshop agenda, ensure a high caliber of speakers, and define all aspects of the event. As the agenda developed, a list of speakers in different possible panels was assembled. Also, a mailing list of those individuals who should be informed about the workshop was developed. A one page flyer was distributed to this group, which included over 500 individuals or organizations.

When the program and speakers were determined, Senator Harry Reid sent an invitation letter to each asking them to participate in the event. GEA staff followed up with each person. In

addition, GEA prepared a special web site at www.geotherm.org for the conference, which included information on the workshop and registration forms. After the workshop, the web site posted the final agenda, workshop evaluation results, the final registration list, speaker materials and biographies, and other information as available.

Exhibit space was also planned for the event. Eight exhibitors prepared displays, including NREL, INEEL, DOE, Sandia, Ormat Corporation, POWER Engineers, Empire Farms, and the University of Nevada Reno (together with the Nevada Bureau of Mines and Geology).

Over 180 participants attended the day long event. They heard panel presentations on: An Overview of Geothermal Resources, Industry and Key Policies in Nevada, Benefits and Opportunities for Geothermal Energy Development in Nevada and the West; Developing Geothermal Energy in the West, and Regional Perspectives on Expanding Geothermal Energy Production.

Response to the session was simply overwhelming. It made it obvious that there was significant interests in Nevada in working cooperatively to develop the state's geothermal resources, but there had not been an opportunity before this workshop to bring together all of the different parties. There was a strong consensus that similar workshops should be sponsored in other Western states to serve as a catalyst for local cooperation towards expanding the use of geothermal resources. (Documents and agenda submitted previously.)

Honduras Outreach

In February, 2001, Honduras held its first renewable energy meeting, the “First Renewable Energy and Energy Efficiency Technology Fair.” It was organized by the Direction General de Energia of the Secretaria de Recursos Naturales u Ambiente (SERNA) for February 22-25 in San Pedro Sula, Honduras.

GEA participated in the fair, along with the Department of Energy. Marcelo Lippmann of Lawrence Berkeley Laboratory attended representing DOE, and Tsvi Meidav of Trans-Pacific Geothermal represented GEA.

Both Tsvi Meidav and Marecello Lippmann cooperatively staffed an information booth provided by the Office of Wind and Geothermal Technologies. Printed materials on different aspects of geothermal energy were distributed to the public and a 26-minute video in Spanish produced by the Geothermal Education Office and DOE was shown almost continuously.

Some 150 participants from industry and government attended a technical session held during the fair. Tsvi and Marcello made presentations on geothermal energy. Tsvi’s presentation was made on behalf of the GEA Board of Directors. His presentation had been distributed in draft form for review and comment in advance to all 17 members of the GEA Board. His presentation familiarized the audience with the benefits associated with the development of geothermal resources, i.e. cost competitiveness, energy independence, local job creation, and low impact on

the environment. Proceedings from the event were made available on the SERNA webpage at www.serna.gob.hn.

According to Dr. Lippmann, “the exhibit was a hit! We could have used twice the printed materials. We informed the audience about the advantages of geothermal energy, the large geothermal resources of Central America and the technical capabilities of DOE and US industry. Seven companies talked to us about developing power plants and direct use applications in their countries.” (Dr. Meidav statement and trip report by Marcello Lippmann submitted previously.)

East Africa Market Development Initiative

Following up on the GEA International Market Planning session in Berkeley, GEA began working with Stephen Hirsh to develop a proposal for an East African geothermal conference. This effort complemented work GEA was performing outside of this agreement to promote the development of a World Bank “Upstream Geothermal Facility” to promote new development.

Mr. Hirsh prepared a conference proposal based upon his unique knowledge of the region, its geothermal resources, and the geothermal industry. GEA joined in meeting with officials from the Department of State, Department of Commerce, Department of Energy, and US AID to encourage and determine their interest in sponsoring such an event. There was a considerable interest express at the Department of State in supporting the Conference, particularly given the US governments stated interest in supporting market-based economic development in Africa. (Conference proposal attached.)

GEA staff also began preparing additional materials to support this conference. We prepared updated information on the full range of US companies and federal and state government agencies interested in supporting geothermal projects in developing countries. This involved contacting a wide range of companies and institutions, ascertaining their interest in of programs for such development, obtaining current contact information, and defining their areas of expertise. GEA also prepared basic materials regarding how to address the uncertainties of resources assessment in such countries, building upon the preliminary report it had developed earlier with Dr. Wright and Dr. Reed. As a focus for our efforts, we packaged this information as an “International Directory” which was provided extensive contact and other information to the eventual sponsors of the Conference. A copy of the pre-conference draft is available on GEA's website at: <http://www.geo-energy.org/Publications/InternationalDirectory.pdf>. (Copy attached.)

Unfortunately, the Department of State was not able to financially support the proposal, despite considerable interest. The US Trade Development Agency, however, was eager to step in and take the lead. After significant discussions, program development, and the active recruiting of a “support team” from DOE, State, and related agencies, TDA proposed to contract with GEA for the conference.

Despite significant preparation by Mr. Hirsh, Karl Gawell of GEA, and GEA staff, the TDA contract was not approved by the GEA Board due to concerns about the adequacy of resources for a successful effort. The Board encouraged Mr. Hirsh to work with GRC or the Business

Council for Sustainable Energy, both of which had significant federal support for such activities to complement the TDA funds, which may make them able to complete the task successfully.

The Business Council for Sustainable Development took over the proposal, and GEA forwarded to them all of the materials and work completed by Mr. Hirsh and GEA staff for use in the Conference. GEA agreed to be a sponsor of the conference, and cooperated throughout its continued development and execution to ensure the support and participation of US industry.

While originally targeted by GEA to take place in 2002, the BSCE conducted the Conference as part of an East Africa Geothermal Week was held from April 7-11, 2003 in Nairobi, Kenya. (See Document Attached and visit the web site at <http://www.bcse.org/bcse-eagmac.html>.) The Conference was widely considered a success, and was used as the launching point for a new World Bank fund to support geothermal development. This fund works generally along the lines proposed by GEA in a separate report to the Bank.

Geothermal Training Program

Working with Steve Hirsh and the University of Nevada, Reno, GEA continued to examine the prospects of developing a US Geothermal Training Program modeled after the highly acclaimed WEATS program supported by DOE.

A series of conference calls were held with interested GEA members to review and comment on materials. Also, Steve Hirsh met with and discussed the idea in detail with the WEATS

program founder, and its current operators. He also worked with Jim Taranik of the University of Nevada at Reno to develop a feasible geothermal counterpart. As a result, Steve developed a concept paper for a Geothermal Excellence Center. This would be a two week training program similar to the WEATS program but tailored to the geothermal industry and community. As outlined had the support of a significant segment of US industry and appeared to be based upon realistic operating parameters. At this time, while no further action has been taken on this proposal, the University of Nevada at Reno has expressed its interest in pursuing this idea further. (Document attached.)

Evaluation

In many different ways this program was successful. Many of the individual elements were directly successful, the overall effort leveraged significant additional resources towards its goals, the undertakings were often the seed for activities that went beyond the scope or term of the immediate proposal, and the effort helped DOE and US industry expand markets and the use of geothermal energy.

The newsletter was clearly a success, and we believe it helped address the related problems of the Washington Community both lacking information and having misinformation about geothermal energy. The results of the poll included in the last edition of the newsletter clearly showed that it was valuable to its recipients, and most indicated their willingness to pay to continue receiving it.

Independent corroboration showed the success of GEA's international market development efforts. A review of international market activities conducted for DOE by BCS, Incorporated under Contract No: DE-AC01-97CE35050 showed that industry members viewed GEA's international activities as having the highest value to them of any federally supported activity in this area. The report states, "Industry representatives were asked to rate the value of various assistance services currently available to the geothermal industry and to indicate whether they have used those activities." ("Recommendations on International Activities for the Office of Geothermal Technologies," BCS, Incorporated, page 9.) In the three categories of assistance rated (general, financing and technical) GEA activities rated highest in value in both the general assistance and technical assistance categories, and were indicated as being the most often used by respondents. (BCS, Exhibit 7, page 10.)

The activities under this contract clearly leveraged significantly greater funding from other federal and state agencies and the private sector. The many exhibits involved support from other agencies and particularly significant contributions of time and effort by GEA members companies. The facilitation efforts were directly aimed at engaging the time and effort of private companies in DOE and other federal and state activities. The Green Power Marketing Workshop, for example, involved seventeen different companies and organizations who participated, provided staff and distributed materials. GEA's market development and international activities typically involved dozens of other participants, including US and international agencies, private companies, and foreign governments providing financial support, personnel, presentations and materials. For the Nicaragua Conference, DOE's support under this contract was clearly only a fraction of the direct resources involved in the effort demonstrating a significant leveraging of DOE funds.

Another gauge of success is the ability of activities to continue after federal support. Or, in other words, were federal funds used effectively as “seed” funds rather than maintenance support. This agreement clearly provided important seed funding in a number of areas. The exhibit work conducted under this contract is now being conducted by the Geothermal Education Office, GEA’s efforts to engage the National Conference of State Legislators continues through NCSL’s active involvement with DOE’s GeoPowering the West initiative, the Reno Workshop was the prototype of efforts DOE is now supporting throughout the Western States under its GeoPowering the West initiative. GEA’s efforts to initiate an East Africa Geothermal Conference became the seeds of a very major East African Geothermal Week April 7-11, 2003 sponsored by the Business Council for Sustainable Energy, US TDA, the United Nations Environment Program and the Global Environment Facility. Furthermore, the World Bank’s continues to develop a package of financial incentives for new development based largely upon GEA’s work.

In international markets affected by work under this agreement, US companies have succeeded in continuing geothermal projects and development work everywhere GEA has undertaken activities. In Nicaragua, Chile, Honduras and Kenya US firms proceeded to either project feasibility work or full project development shortly after activities supported by GEA were conducted. While we cannot claim a direct connection, we believe that the activities supported by this agreement laid the groundwork for US companies to successfully compete.

For many of these activities working with a non-profit trade association presented several distinct advantages. As a trade association GEA has to ensure that it represents the full range of

industry members and not any one company. Thus when panels or presentations were made either they presented individuals recruited widely from industry, or the individual presentation was made with input from a wide range of companies and results were reported back to a diversity of interests. As an example, Tsvi Meidav's presentation in Honduras was written in advance and distributed to the entire GEA Board for review and comment. Also his trip was publicized in the GEA newsletter, and the trip report made available to a wide audience. In this and other circumstances, the consent of the geothermal community (through GEA's Board) that an individual could represent them was a prerequisite.

The bottom line: Both in the United States and internationally, the efforts undertaken under this agreement were a highly leveraged, cost-effective uses of federal funds that succeeded in promoting the expanded use and development of geothermal resources and initiated valuable activities that beyond the scope and term of this proposal.

Documents Attached to this Final Report:

1. Geothermal Excellence Center Concept Paper
2. Pre-Conference Draft “International Directory”
3. East Africa Workshop Proposal
4. East Africa “Geothermal Week” agenda from the Business Council for Sustainable Energy

Documents Previously Submitted as Report Attachments:

Geothermal Energy Newsletters

Newsletter Evaluation Form

Compiled Results of Newsletter Evaluation Response

“Green Power and California’s Future” Booklet

Green Power Conference Speakers List

Assistant Secretary’s Briefing Materials

UN ECLAC Presentation

“Geothermal Energy” tri-fold brochure

“Geothermal Industry Services” brochure

Spanish Language Brochure: “La Geotermia”

Potencia article

World Energy Congress Seminar Brochure

Prepared Statements for World Energy Congress Seminar

Clean Power Day Sponsor List

Geothermal Showcase invitation

Geothermal Showcase Agenda

Geothermal Showcase Attendance List

Vince Zodiaco Statement

Comparative Carbon Emissions Graphic

Memo and attachments to Allan Jelacic re: geothermal power projections

American Environmental Review Video

“Preliminary Report: Geothermal Energy – The Potential for Clean Power”

Questionnaire and Background Materials for the Preliminary Report

Geothermal Off-Grid Power Invitation and Agenda

Geothermal Off-Grid Power Report by Anne McKinney

Managua, Nicaragua Conference Agenda

Managua, Nicaragua Conference Participants List

International Markets Questionnaire and Results

Training Seminar Memo

Reno Workshop Conference Call Participant List

Reno Workshop Conference Call Agendas

Reno Workshop Program Agenda

Flyer and Brochure for Reno Workshop

Letter of Invitation from Senator Reid

Follow-up Letter from GEA to speakers for Reno Workshop

Speakers Biographies for Reno Workshop

Media Contact List for Reno Workshop

Exhibitor Information and Final Registration List for Reno Workshop

Speaker Presentation Materials and Conference Packet for Reno Workshop

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