

PROPOSAL

for

**TECHNICAL ADVISORY SERVICES
RELATING TO
GEOTHERMAL RESOURCE ASSESSMENT**

Submitted to:

**THE STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM
Honolulu, Hawaii**

April, 1991

Proposer:

**Geo Hills Associates
27790 Edgerton Road
Los Altos Hills, California 94022
Telephone (415) 941-5480**

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Geo Hills Associates is pleased to respond to the State of Hawaii, Department of Business, Economic Development and Tourism (DBED) Request for Proposal for technical advisory services relating to their geothermal resources assessment program.

I. INTRODUCTION

We appreciate your interest in considering Geo Hills Associates to provide technical advisory services related to the geothermal resources assessment program of the State of Hawaii, Department of Business, Economic Development and Tourism (DBED) and the Department of Land and Natural Resources (DLNR). We are please to offer the services of our staff to assist with this exciting project opportunity.

The Geo Hills Associate staff is comprised of a highly qualified team of individuals whose experience and expertise encompasses all aspects of geothermal development including resource exploration and development, power plant design, construction and operation, as well as project management and financing. Geo Hills Associates can provide power plant engineering and operations services together with scientific and technical services related to wellfield development, including: reservoir engineering, rock mechanics, geophysical and geochemical analyses, drilling and associated drilling support services.

Our geothermal resource and power plant background covers dry steam projects, flash and binary cycle hot water projects, and hot dry rock demonstration projects. The geothermal resource wellfield facilities experience of Geo Hills Associates includes 230 MW of geothermal resource production in the Imperial Valley of southern California and in The Geysers in northern California, which supplies geothermal resource to six generating units. These facilities includes both liquid-dominated and steam-dominated resources.

Technical professionals in Geo Hills Associates have recently completed a 40 MW, dual-flash, geothermal power plant project and associated wellfield facilities and electrical transmission line. This project has successfully demonstrated our ability to discover and develop a liquid-dominated resource and to design and construct an efficient power plant. This facility was constructed adjacent to the existing McCabe Power Plant; a 10 MW binary geothermal project at the East Mesa KGRA in the Imperial Valley of southern California.

As can be seen from the above introduction, the experience and orientation of the technical professionals in Geo Hills Associates has been and remains commercial rather than scientific. This proposal constitutes a firm offer from Geo Hills Associates to DBED and DLNR. It is valid for a period of 60 days after the due date, i.e., April 26, 1991, for submission of these proposals in response to the RFP.

II. STATEMENT OF QUALIFICATIONS

II.1 General

The Geo Hills Associates staff is comprised of a highly qualified team of individuals whose experience and expertise encompasses all aspects of geothermal resource assessment, development, and operations. The two technical professionals who will be providing the technical advisory services during this contract assignment will be Dr. Jim Combs and Ms. Lauri Knox. Detailed resumes for these two individuals are presented in Appendix A. Their general qualifications will be presented in this section of the proposal.

Dr. Combs has more than 25 years of world-wide experience applying technical knowledge and managerial skills to the exploration, research, development, operations and management of geothermal resource projects from resource assessment to the construction and operation of geothermal power generation projects. He has demonstrated his ability to take a project from conception to completion. His assignments have included teaching, research, exploration, development, field operations, and technical and financial management. Dr. Combs is flexible, highly motivated, inquisitive, and a team player. He possesses good communication skills and problem solving abilities.

Dr. Combs will be the prime contractor and team manager. He will have primary accountability for completing each assignment and scope of work. He will be responsible for coordination with personnel of DBED and DLNR and will provide management interface regarding scopes of work, scheduling, and standards of performance. His experience as President and Chief Operating Officer of a geothermal service company and of a geothermal developer and operator with authority and responsibility over budget, personnel and technical matters is unique among consultants. The orientation of essentially all of his work assignments during the past fifteen years has been toward the commercial rather than the scientific aspects of geothermal resources assessment and development.

Ms. Knox has over 13 years experience in the development of power generation systems and is an expert in geothermal power plant design, construction and operations. She has experience with the several types of geothermal power plant cycles, i.e., flash, binary and hybrid. Ms. Knox has been involved in geothermal power plant projects that also incorporated the transmission lines, gathering system and injection systems. She was the project engineer for the field testing, design development and initial operations of the first commercial use of a noncondensable gas injection system as a method of hydrogen sulfide abatement at the Coso geothermal projects. Her recent accomplishments as Project Manager for the engineering, construction and initial operations of a 40 MW geothermal power plant at East Mesa demonstrates the depth and breadth of her hands-on knowledge of geothermal project development. Additionally, Ms. Knox was involved with the OTEC efforts of Lockheed including a subsea cable. Her participation in these unique projects adds an experience factor to this consulting team that is not typically found in the geothermal industry.

II.2 Specific to Geothermal Resource Assessment

The technical professionals in Geo Hills Associates, specifically, Dr. Combs and Ms. Knox, have recently completed a 40 MW, dual-flash, geothermal power plant project and associated wellfield facilities and electrical transmission line. This project has successfully demonstrated their ability to discover, assess, and develop a liquid-dominated resource and to design and construct an efficient power plant. This facility was constructed adjacent to the existing McCabe Power Plant; a 10 MW binary geothermal project at the East Mesa KGRA in the Imperial Valley of California. During his tenure at the University of California at Riverside, Dr. Combs was instrumental in conducting the initial geothermal research effort at East Mesa and then succeeded in commercializing this hot water geothermal resource. Similar experience and assignments were instrumental in his managing the technical aspects and assisting in the development of a northwest extension of The Geysers dry steam geothermal resource which resulted in the identification of a higher temperature dry steam reservoir.

II.3 Specific to Regionally - Oriented Geothermal Resource Assessment

Throughout the past 25 years, Dr. Combs has gained a considerable amount of regionally-oriented geothermal resource assessment experience from his many assignments while a university professor and geothermal research scientist, while owning and operating a geothermal exploration service company, and most recently while working with a publically-owned geothermal company. He supervised and directed numerous Masters and Ph.D. theses which involved geophysical surveys, including temperature gradient surveys, heat flow measurements, gravity surveys, microearthquake monitoring, seismic refraction surveys, electrical resistivity programs and telluric mapping all of which were conducted primarily in the Imperial Valley and the Coso Geothermal Area, located in California. While completing his teaching and research assignments, he consulted for numerous private companies on regionally-oriented geothermal exploration as well as evaluated geothermal data and sited exploratory geothermal boreholes and wells in Arizona, California, Nevada, Utah, New Mexico, Texas, Idaho, Oregon, Washington and Wyoming. During his years in the university community, he advised and consulted with the U.S. Energy Research and Development Administration, National Science Foundation, U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Department of Defense, Air Force Office of Scientific Research and the Electric Power Research Institute on geothermal research, exploration, and development.

For several years during the latter part of the 1970s, Dr Combs provided regionally-oriented geothermal gradient/heat flow programs as a service business to evaluate and assess geothermal prospects for several geothermal companies or subsidiaries of energy companies including GRI, Unocal Geothermal, Chevron Geothermal, Hunt Energy Company, Sunedco, Phillips Petroleum, Intercontinental Energy Corp., Hunt Oil Company and Amax Geothermal. He was responsible for almost all sales, client contact and final reporting with an increase in sales from \$600,000 per year to an amount in excess of \$6,000,000 per year in three years. He was involved in all aspects of the personnel, financial and accounting matters of the geothermal exploration service company.

Additionally, Dr. Combs provided technical guidance and analysis on all aspects of the heat flow programs carried out by the company, including drilling, temperature gradient measurements, geophysical logging, and thermal conductivity determinations. He conducted extensive research in heat flow studies applied to regionally-oriented geothermal exploration and site specific geothermal development.

Throughout the 1980s and into the 1990s while working with a publically held geothermal company, Dr. Combs prepared regionally-oriented exploration plans and evaluation programs for surveying geothermal leases in New Mexico, Utah, Nevada, Oregon and California. He conducted and supervised the correlation of geological, geochemical and geophysical data for regionally-oriented geothermal prospect development in many of the western United States. He managed regionally-oriented and site specific geothermal exploration projects including geological, geochemical, geophysical and heat flow surveys with follow-up geothermal well design, drilling and production testing. With each of these assignments, Dr. Combs prepared annual budgets for exploration, drilling and property development for about 300,000 acres of geothermal leases in the western United States.

III. CONTRACT SCOPE OF WORK

The Geo Hills Associates staff of Dr. Jim Combs and Ms. Lauri Knox anticipate developing a detailed contract with DBED and DLNR. The background data and information that was provided in the RFP was quite informative and both of the technical professionals have a familiarity with the geothermal resources that are being developed by private industry in Hawaii. However, they deem it important, in conducting the work for these technical advisory services in sufficient detail to meet the objectives of DBED and DLNR, for the professional team to be able to make an early visit to the geothermal sites and discuss the projects with the private industry developers.

After this site visit and after reviewing the available literature and reports, Dr. Combs and Ms. Knox will be prepared to complete the development of a detailed contract with DBED and DLNR that will include the items listed below. Simultaneously, they will prepare an initial budget to complete the contract scope of work and initiate the anticipated work effort and products as outlined in the next section.

The orientation of the technical advisory services will be commercial rather than scientific. The final objective of these services will be to assist the State of Hawaii to provide the stimulus to sustain a viable geothermal industry that is needed to see the timely development of this economically attractive, renewable, environmentally advantageous, indigenous energy resource. Therefore, the technical professionals of Geo Hills Associates will:

- assist DBED and DLNR in establishing priorities among available resource assessment methods, including (as examples): exploratory drilling; core-sampling and well-testing; surface and aerial surveys; and regional mapping. Guidance that Geo Hills Associates provides in this regard will be sensitive to budget constraints.

- assist DBED and DLNR in planning the direction of and managing the SOH program and in evaluating available exploratory drilling methods, with cost effectiveness and successful geothermal resource assessment being the major criteria.
- assist DBED and DLNR in designing and planning appropriate well tests, surface and aerial surveys, and/or mapping projects. Geo Hills Associates will provide advice and a technical interface on appropriate instrumentation and equipment, methods and procedures, personnel, contractors, and budget estimates and scopes of work.
- assist DBED and DLNR by providing technical guidance relative to the geothermal/cable project master plan and EIS which is presently being prepared by the consulting firm ERCI.
- assist DBED and DLNR by providing technical guidance relative to planning and design of the geothermal cable project by the consortium and HECO.
- assist DBED and DLNR to make reasonable judgements and to reach objectives, scientifically supported, and conclusions about the extent and characteristics of geothermal resources, recognizing that such judgements and conclusions may serve as the basis for public policy and/ or investment decisions.
- advise DBED and DLNR on well-field design and management in order to assist them in adopting appropriate policies, standards, and design criteria to avoid over production and premature depletion of geothermal resources.

IV. ANTICIPATED WORK EFFORTS AND PRODUCTS

The following will be several of the work assignments and deliverables that will be provided by the technical professionals of Geo Hills Associates

- attendance upon request at key meetings of State interagency technical and policy committees involving DBED, DLNR, other State agency officials, and, on appropriate occasions, representatives of involved institutions such as the University of Hawaii and USGS.
- preparation, as needed, of written reports addressing specific aspects of or problem concerning resource assessment work in progress and making specific recommendations.
- submission, on or before December 1, 1991 (approximately one month prior to the start of the 1992 legislative session), of an interim draft written report on geothermal resource assessment, consisting of the following information: (1) a status report on the State's geothermal resource assessment program; (2) a description and brief analysis of available data and information from all public and accessible private sources; and (3) a summary of reasonable judgments and objective conclusions which

the consultant is able to make from the available data and information about the extent and nature of geothermal resources.

- submission, at least 45 days prior to the end of the one-year contract term, of a draft annual report on geothermal resource assessment including the following kinds of information: (1) a status report on the State's geothermal resource assessment program; (2) a comprehensive analysis of available data and information from all public and accessible private sources; (3) a summary of reasonable judgments and objective conclusions which the consultant is able to make from the available data and information about the extent and nature of geothermal resources; (4) a discussion of the accomplishments of the consultant in assisting the program during the contract term; and (5) recommendations with regard to future needs, priorities, and plans. DBED will work cooperatively with the consultant during the early part of the contract term to develop an outline for this report in order to make it as meaningful as possible. The report should address each of the elements covered by the foregoing scope of work.
- submission, at least 5 days prior to the end of the one-year contract term, of a final resource assessment report, incorporating any changes suggested or required by DBED.

V. ACCESSIBILITY AND RESPONSIVENESS

Dr. Jim Combs is a principal in Geo Hills Associates and will be personally assigned to this project. He will be available from July 1, 1991. Ms. Lauri Knox is available on a part-time, as needed, basis from July 1, 1991. Present and anticipated work loads during the contract performance period (July 1, 1991 through June 30, 1992) should allow Dr. Combs and Ms Knox to devote as much as one-half of their time (i.e., about 20 hours per week) to the DBED and DLNR technical advisory services, as required. More intensive efforts, up to full time, can be accommodated for periods of one to two weeks as necessary.

Based on the information provided in the section on Contract Scope of Work and the section on Anticipated Work Efforts and Products, it is not expected, however, that a half-time effort will be required overall. Nevertheless, depending on the needs and scope of work periodically outlined by DBED and DLNR, both individuals have flexible schedules and the ability to respond in a timely manner to requests to provide reports and attend key meetings as requested by DBED and DLNR.

Geo Hills Associates personnel will be available to work on this contract for the entire one year term. Anticipating an excellent working relationship between DBED and Geo Hills Associates, and the successful completion of the initial scope of services, a contract extension for a second year will be welcomed.

VI. BILLING RATES AND EXPENSES

The cost for the technical advisory services relating to the geothermal resource assessment to be provided by the professionals of Geo Hills Associates is based on the hourly rates as presented in the table below.

<u>PERSONNEL</u>	<u>HOURLY RATE</u>
Dr. Jim Combs	\$125.00
Ms. Lauri Knox	\$75.00
Word Processing	\$25.00
Drafting	\$50.00

The hourly rates include routine clerical assistance, computer usage, regular postage, and local telephone calls. Out-of-pocket expenses such as copying, long distance telephone (outside 415AC), fax charges, overnight mail, Federal Express, reproduction, etc. will be billed separately at cost. For this contract, travel costs will be billed in accordance with the State of Hawaii travel allowance guidelines with a service charge of 10% added.

Geo Hills Associates will bill DBED on a monthly basis. The invoice will indicate the number of hours worked by each individual with a brief description of their work and the services provided. The expenses and travel costs for that period will be included with copies of appropriate receipts attached to the invoices.

It is presently not practical to estimate the expenses that might be incurred relevant to our work tasks. However, Geo Hills Associates is agreeable to the establishment of a maximum cost ceiling in the cost-reimbursable contract. Ultimately, the cost for the scope of services provided will be commensurate with the fundamental resource assessment goals of the State of Hawaii and the contract scope of work defined by DBED and DLNR to meet their needs for technical assistance and advice.

Geo Hills Associates understands and agrees that ten percent of the contract amount may be retained by DBED and DNLN until final completion and acceptance of all services to be performed under the contract.

VII. DISCLOSURE OF CONFLICT OF INTERESTS

The technical professionals, Dr. Jim Combs and Ms. Lauri Knox, do not have any real or potential conflicts of interest, including any work in progress or recently completed nor any contracts entered into, with any private firms involved in geothermal exploration or development in Hawaii. Neither of them, nor the owners of Geo Hills Associates, nor any of its employees, have any affiliation with such private firms, including relationships such as board or committee memberships. If an apparent conflict of interest should arise during the term of this contract, Geo Hills Associates will advise and discuss with DBED and DNLR the situation prior to making a commitment to the third party.

VIII. APPENDIX A

RESUMES

Included in this Appendix are the resumes of the individuals who will be providing the technical advisory services relating to the geothermal resources assessment program of the State of Hawaii, the Department of Business, Economic Development and Tourism (DBED), and the Department of Land and Natural Resources (DLNR). The individuals are as follows:

Dr. Jim Combs

- Prime Contractor
- Team Manager
- Geophysicist/Geologist

Ms. Lauri Knox

- Mechanical Engineer