HONEY LAKE HYBRID GEOTHERMAL-WOOD FUEL POWERPLANT PROJECT

QUARTERLY REPORT NO. 3
FOR
QUARTER ENDING JUNE 30, 1980

PRESENTED TO

MASTER

UNITED STATES DEPARTMENT OF ENERGY

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PREPARED BY

CALIFORNIA DEPARTMENT OF WATER RESOURCES

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HONEY LAKE HYBRID GEOTHERMAL-WOOD FUEL POWERPLANT PROJECT

QUARTERLY REPORT NO. 3

Executive Summary

This is the third quarterly status report for the U. S. Department of Energy grant to the Honey Lake Hybrid Powerplant Project Feasibility Study. This report covers the activities which occurred during the quarter beginning April 1, 1980 and ending June 30, 1980.

The Honey Lake Hybrid Powerplant would be located in Lassen County near Susanville, California. The proposed 55 megawatt power plant would be the first to generate electricity through a process using geothermal heat to dry wood waste and pre-heat the boiler feedwater. The dried wood waste will then be burned to superheat the feedwater, producing steam for the turbine which generates electricity.

A three-party agreement was signed on September 28, 1979 by the California Department of Water Resources (DWR), the Forest Service, U. S. Department of Agriculture, and GeoProducts Corporation to start feasibility studies of the Honey Lake Project. The \$2,177,000 studies are being jointly funded by the Parties and the U. S. Department of Energy (DOE). On September 15, 1979, DOE awarded DWR an initial grant in the amount of \$200,000 to help fund the first phase of the studies. That portion of work funded by the DOE grant is included in Appendix A to this quarterly status report.

The three-party agreement provides for planning and feasibility studies which will include drilling and evaluating temperature gradient wells, drilling a deep geothermal confirmation well, a wood residue resource evaluation, preliminary design of facilities, and preliminary environmental studies. The objective of the studies is to determine the technical, economic, and environmental feasibility of constructing, operating, and maintaining the proposed power plant. A general schedule for the feasibility studies, indicating a completion date of July 1981 is attached as Figure 2.

DWR and Geoproducts Corporation signed an agreement for construction and operation of the plant if it is shown feasible. The plant would be owned and operated by GeoProducts, and the energy generated would be sold to DWR to help run the pumps of the State Water Project. It is possible that local entities may take part in the project, buying up to 30 percent of the plant's output to alleviate historically high electricity rates in the area. A general schedule for project development is attached as Figure 1.

The total feasibility study budget of \$2,177,000 includes \$600,000 in costs that have already been incurred by GeoProducts prior to the three-party agreement. Of the total budget amount, \$400,000 is being funded from fiscal year 1979 funds and \$1,177,000 will be funded from fiscal years 1980 and 1981 funds.

The DOE grant of \$200,000 is for partial funding of those tasks specifically noted in Appendix A as:

1. Drilling and evaluation of temperature gradient wells
2. Wood residue supply evaluation
3. Preliminary design of power plant facilities.

The fiscal year 1979 budget amount for these three tasks was originally \$299,000 but was rebudgeted during the third quarter to \$322,070 to cover the actual expenses incurred in drilling the temperature gradient wells. The total feasibility study budget remained at \$2,177,000 but \$23,070 was transferred from contingencies to drilling and evaluation of temperature gradient wells.

GeoProducts, the DWR, and the Forest Service are providing a total of \$200,000 for fiscal year 1979 studies. Of this, \$122,070 is for the DOE supported tasks and \$77,930 is required for electrical resistivity studies, road construction and site preparation for the confirmation well, and preliminary environmental studies.

This report summarizes the status of work and accomplishments during the third quarter of the year for the tasks budgeted at \$322,070 and listed above. It also includes a report on the expenses of the project to date.

The Appendix to the report includes a project study statement of work; a copy of all Project Committee meeting minutes; a request for proposals and the proposal from the contractor selected to evaluate the temperature gradient wells and recommend a location for the drilling of a deep geothermal confirmation well; and a solicitation for proposals to prepare a preliminary design, cost estimates and economic analysis of the proposed power plant.

The temperature gradient well drilling program, wood residue study and preliminary design of power plant facilities are progressing with deliverables anticipated to be available as shown on page 12. The tasks listed above are funded in part by the DOE grant. Environmental studies, performed and funded for the project outside the scope of work under the DOE grant, have also been initiated.

PROJECT STUDY STATUS

The DOE grant was awarded September 15, 1979, and the Department of Water Resources (DWR) received funds to commence the feasibility studies on December 4, 1979. Work on the studies to date has consisted of study plan development, contract award processes for individual study contracts, obtaining the necessary permits for and drilling the temperature gradient wells, and initiation of certain wood study tasks including evaluation of the wood residue supply, determination of the chemical and physical properties of the wood fuel and evaluation of appropriate harvesting, collection and transporting techniques. The accomplishments to date, and status of each of the study tasks are discussed below.

Temperature Gradient Well Drilling and Evaluation

The temperature gradient well drilling program was the first task undertaken for the feasibility studies due to the lead time required for permitting of the wells. First quarter activities included completing a geophysical and electrical resistivity study performed and funded for the project outside the scope of

work under the DOE grant. Based on the geophysical and electrical resistivity studies it was determined that up to five temperature gradient wells should be drilled between 1,000 to 2,000 feet in depth.

Additional first quarter activities included having the well sites surveyed and marked, obtaining permits or exemptions from the State Division of Oil and Gas (DOG), the Lahontan Regional Water Quality Control Board and the Lassen County Planning Commission, conducting a well site tour for the State DOG, U. S. Fish and Wildlife Service, the State Department of Fish and Game, and Lassen County officials, conducting an archeological reconnaissance survey of all impacted areas including the well sites and roads, and selecting a contractor to drill the wells.

Activities during the second quarter were related to the actual drilling of four thermal gradient holes. It was concluded by the Committee that in order to keep expenditures as close to the budgeted amount as possible, four wells would be drilled rather than five as originally intended. A brief description of the drilling activities at each hole is described below. A detailed description of the drilling activities, in addition to the presentation of the data generated, will be submitted in mid-December as part of the temperature gradient wells evaluation and deep well site selection report.

The first hole to be drilled was TG-3 as shown on the map included in Appendix B. This hole was drilled to a total depth of 425 feet. Drilling was terminated after encountering

hard rock conditions. Electrical and self potential logs were run.

The second hole to be drilled was TG-2. Several layers of intermatriculated volcanic rock were encountered in the lakebed sediments. Lost circulation led to suspension of drilling operations in this hole at 624 feet. Logs indicate that this hole bottomed in a water bearing fault.

The third hole to be drilled, TG-1, was completed at a depth of 1162 feet. Thin wall casing was installed to depth and filled with water to facilitate thermal gradient testing pending temperature stabilization. Electrical and self potential logs were run.

The fourth hole drilled was TG-5. Drilling activities were initiated in the second quarter and completed during the third quarter. This hole was completed and cased to a depth of 1320 feet. Electrical and self potential logs were run.

All results at this time remain preliminary until the temperature gradient logs are actually compiled and the wells evaluated. The logs will be run in July after the TG wells have had sufficient time to stabilize. Evaluation of the wells will be performed by a contractor during the next two quarters as part of a contract to recommend a location for drilling a deep exploratory geothermal well.

Work during the third quarter consisted of tasks by the Parties preparatory to securing a contract for the evaluation of the TG wells and for a recommendation of a deep exploratory well location. These tasks included the development of a request for

proposal (RFP) for a contractor to perform the study; mailing the RFP to qualified contractors and inviting them to visit the GeoProducts' offices to view the specific data that will be made available to them; evaluating and ranking the three submitted proposals; and selection of GeothermEx, Inc. of Berkeley, California to perform the study. The RFP and top ranked proposal are included in Appendix B.

Wood Fuel Supply and Cost Study

The wood fuel study was initiated in the second quarter under contract with the joint venture of Resource Management Service, Inc. (RMS) and Sverdrup/ARO, consultants experienced in assessing the availability and cost of forest and mill residue materials. The contract is for an amount not to exceed \$180,000 as compared to the budgeted amount of \$200,000. RMS has secured under separate contract the services of a local consultant to utilize his extensive local knowledge and experience in the study area. The contract was approved by the Committee and is not to exceed \$8,500.

Work during the first quarter consisted of tasks by the Parties preparatory to securing the contract with RMS-Sverdrup/ARO. These tasks included identifying the wood fuel study requirements, development of a detailed request for proposal (RFP) for a contractor to perform the studies, evaluation and ranking of 17 proposals, interviews with six proposer finalists, and selection of RMS-Sverdrup/ARO.

The contract requires RMS-Sverdrup/ARO to submit four documents during the course of the wood study. These four

documents include a report on the anticipated wood fuel quantification and characteristics, a report on the major alternative processing systems, and the preliminary and final study reports. Subsequent to the contract signing it was agreed by the Parties and the contractor that the interim report on wood fuel quantification and characteristics would be prepared in two volumes. One volume would present an inventory and discuss the availability of the wood fuel and the other volume would present the wood fuel characteristics.

Study activities by the contractor in anticipation of delivering by the first of October the report on wood fuel inventory and availability was initiated during the second quarter and continued throughout the third quarter. This portion of the overall study will identify and inventory the wood fuel resources in the region and will determine the available volumes by supply category and type of ownership. Two sources of wood fuels are being investigated; manufacturing based wood fuels and forest based wood fuels.

The analysis and evaluation of how much wood fuel can potentially be procured from manufacturing residues was completed during the third quarter. Twenty-nine manufacturing concerns were visited ranging from small independent sawmills to large manufacturing complexes. The mill management and, where appropriate the corporate management, were interviewed. This activity covered every identified potential supplier of wood residues to the Honey Lake Project.

The analysis and evaluation of how much wood fuel can potentially be procured from forest lands is progressing. This

portion of the work was initiated during the second quarter during which time the available resource data was analyzed and an inventory approach to determine the volume fuel mix of forest based fuels was structured. The contractor spent considerable time with personnel from the U. S. Forest Service, California Department of Forestry, forestry consultants, colleges and universities, and other public and private contacts in an effort to identify all available sources of information pertinent to preparing an inventory.

During the third quarter the inventorying effort went into the production stage with the following information being developed:

1. Identification of the various fuel resource types.
2. Identification of the present and future physical supply of wood fuel stratified on the basis of fuel resource type.
3. Identification of the per acre volumes of logging slash and precommercial thinnings.

The estimates of wood fuel volumes available are relative to procurement practices that are within "safe" economic, technological and environmental practices based on demonstrated practical field use. Major adjustments are being made to the gross wood fuel potential to account for terrain and site characteristics which preclude commercial logging operations. Other volume adjustments are based on existing and proposed policy, practices, legislation, investment, and environmental considerations on the national, state and local level.

Honey Lake Project Committee members made a trip to the contractor's offices in Birmingham, Alabama during the third quarter in an effort to gauge the study progress. The members reported that inventory techniques are excellent and that the finished product will meet the needs of the program.

During the second and third quarters the contractor completed and submitted a draft report of the wood fuel characteristics. The report was reviewed and detailed comments were transmitted to the contractor for inclusion in the report. The final draft will be submitted in August. This report will be used as a tool by the engineering contractor for the design of the power plant fuel receiving, storage, drying and combustion systems. For each of the wood fuel types identified by the inventory study, the wood fuel characteristics report will identify the heating values, drying characteristics, soil/rock contamination, storage degradation and combustion emissions.

RMS-Sverdrup/ARO initiated studies during the third quarter designed to detail the most appropriate means of harvesting, preparing, and delivering the 300,000-400,000 dry tons of wood material required each year to support boiler firing. The concepts, machinery and equipment, and operating procedures will be defined for the various fuel types to be harvested. A draft report will be submitted in July.

During the third quarter the Forest Service began conducting time and motion studies of hammermill conversion equipment. Hammermill machines can replace conventional chippers converting round wood to chips. This system offers the potential

for greatly reduced processing costs. As a part of the studies Forest Service Regional Field Office personnel visited the midwest to observe equipment in operation. The studies are being coordinated with RMS-Sverdrup/ARO and will provide valuable information to the project. The studies are being financed by the Forest Service.

Preliminary Engineering Design and Cost Estimate

The third major study to be performed under the DOE grant is the preliminary engineering design and cost estimate study. The original intent of the Parties was to let a contract on this study concurrent to the wood supply study. Upon further consideration of the important interface between the wood study and the conceptual design and cost of the power plant facilities, the Parties elected to have a substantial portion of the wood study completed prior to soliciting bids for the engineering and design work.

The Parties developed a request for proposal for the engineering contract during the second quarter and mailed it to potential bidders on May 23, 1980. The RFP is attached as Appendix C. Current plans call for the contractor selection process to begin in July with a contract to be signed by September 1.

PROJECT SCHEDULE

At present, the studies funded in part by the DOE grant are following a revised schedule to facilitate communications between contractors. The required deliverables are anticipated to be available on the following schedule:

July 20

3rd Quarterly Report.

September 1	Wood Study Report on Wood Fuel Technical Information and Properties.
September 1	Wood Study Report on Harvesting, Collection and Transportation Systems.
October 1	Wood Study Report on Wood Fuel Inventory and Availability.
October 20	4th Quarterly Report.
December 1	Interim Engineering Report.
December 15	Temperature Gradient Well Evaluation and Exploratory Well Location Recommendation Report.
January 1	Summary Phase I Project Report.

COST MANAGEMENT

DOE advanced \$120,000 (60 percent of the total grant) to the DWR under the auspices of grant number DEAG03 - 79ET27244 on December 4, 1980. All DOE funds for the Honey Lake Project Feasibility Study have been managed by the DWR. All project study expenses have been approved unanimously by the Parties in accordance with the Feasibility Study Tripartite Agreement among the Parties. All project actions by the Parties are made by a Project Committee (Committee) with membership of a representative from each Party. All Committee actions are documented in the Committee meeting minutes. Copies of all Committee meeting minutes through June 30, 1980, are included in this report in Appendix D.

The costs of the study work completed as of June 30, 1980 are shown in the following section. All dollar amounts are preliminary, subject to an internal audit.

Summary of 3rd Quarter Expenses and Total Expenses
Honey Lake Hybrid Powerplant Feasibility Study

1. Task 1 - Drilling and Evaluation of Temperature Gradient Wells
1979 Budgeted Amount: \$103,000 Rebudgeted Amount: \$126,070*

<u>Expenses</u>	<u>1st and 2nd Quarter</u>	<u>3rd Quarter</u>	<u>Total</u>
a. Archeological survey, permits, surveying, insurance, well logs, road construction	\$ 7,574.08	\$ 1,661.50	\$ 9,235.58
b. Drilling and materials	63,049.91	35,360.77	98,410.68
c. Contract Administrator on site	9,109.68	8,177.83	17,287.51
Total Expenses, Task 1	<u>\$79,733.67</u>	<u>\$45,200.10</u>	<u>\$124,933.77*</u>
% of Rebudget Expended			99%
Task 1 Funds Remaining			\$ 1,136.23

2. Task 2 - Wood Fuel Resource Evaluation
1979 Budgeted Amount: \$143,000

<u>Expenses</u>	<u>1st and 2nd Quarter</u>	<u>3rd Quarter</u>	<u>Total</u>
Resource evaluation	\$ 29,252.03	\$ 36,040.69	\$ 65,292.72
Task 2 Funds Remaining			\$ 77,707.28

3. Task 3 - Preliminary Plant Design and Cost Estimate
1979 Budgeted Amount: \$53,000

<u>Expenses</u>	<u>1st and 2nd Quarter</u>	<u>3rd Quarter</u>	<u>Total</u>
A contractor has not been selected	0	0	0
Task 3 Funds Remaining			\$ 53,000

4. Expense Summary

	<u>1st and 2nd Quarter</u>	<u>3rd Quarter</u>	<u>Total</u>
Expenses incurred by contractor in performance of Tasks 1, 2 & 3	\$108,985.70	\$ 81,240.79	\$190,226.49
Task 1, 2 & 3 Funds Remaining			\$131,843.51

- * Actual expenses have exceeded the original budgeted amount. The Committee rebudgeted \$23,070 in the total feasibility study budget from Contingencies to Drilling and Evaluation of TG wells to cover the actual expenses. (See Committee Meeting Minutes of June 16, 1980 attached in Appendix D.)

General and Administrative expenses (staff expenses and overhead for Request for Proposal, contractor selection, contract preparation, permit process and program management) \$ 46,303.71 \$ 25,445.89 \$ 71,749.60

5. Funding Share Breakdown

	<u>DOE</u>	<u>DWR</u>	<u>FS-USDA</u>	<u>GeoProducts</u>	<u>Total</u>
a. 1st and 2nd Quarter cost sharing for Tasks 1, 2 & 3	\$ 38,220.53	\$ 17,693.08	\$ 35,379.01	\$ 17,693.08	\$108,985.70
b. 1st and 2nd Quarter cost sharing for G & A	20,818.73	6,371.25	12,742.48	6,371.25	46,303.71
c. 3rd Quarter cost sharing for Tasks 1, 2 & 3	19,288.86	15,490.04	30,971.85	15,490.04	81,240.79
d. 3rd Quarter cost sharing for G & A	8,513.18	4,233.80	8,465.12	4,233.79	25,445.89
e. Funds expended for other than DOE supported tasks	0	4,601.09	9,202.17	4,601.07	18,404.33
f. Total Funds expended	86,841.30	48,389.26	96,760.63	48,389.23	280,380.42
*g. % of Budgeted Funds expended	43.4%	96.8%	96.8%	96.8%	70.1%
h. Funds remaining	\$113,158.70	\$ 1,610.74	\$ 3,239.37	\$ 1,610.77	\$119,619.58

*Based on Fiscal Year 1979 Feasibility Study Contributions of

DOE	\$200,000
FS-USDA	100,000
DWR	50,000
GeoProducts	50,000
	<u>\$400,000</u>

PROJECT BRIEFINGS

DOE was briefed twice during the third quarters. The first briefing occurred on April 1 in Carson City at which time the Parties presented a description of the project and on-going studies to the DOE Region IX Geothermal Resources Development and Commercialization Meeting. The second briefing of DOE personnel took place on May 6 in San Francisco. The Parties presented a general description of the feasibility study progress to date. The wood study and temperature gradient well contractors presented details of their respective work tasks.

Subsequent project briefings will be held as desired by DOE.

Figure 1
GENERAL SCHEDULE
HONEY LAKE HYBRID GEOTHERMAL-WOOD RESIDUE POWER PLANT PROJECT

Figure 2
GENERAL SCHEDULE
HONEY LAKE HYBRID GEOTHERMAL-WOOD RESIDUE POWER PLANT PROJECT
FEASIBILITY STUDY