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FEDERAL ASSISTANCE PROGRAM

PROJECT STATUS REPORT

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GEOHERMAL TECHNOLOGY TRANSFER

GRANT NO. DE-FG-07-83ID 12478 M004

Reporting Period: May 1986

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1. PROJECT SUMMARY - MAY 1986

1.1 Program Extension. Notification was received from the Geothermal Division, USDOE on 26 May 86, that authorization for a two month extension (\$60,000) has been approved for the OIT Geo-Heat Center Federal Assistance Program.

1.2 Application Analysis Report Summary. Remco Geothermal Farms', located at Wendel, CA, greenhouse heating system has been unsatisfactory since installing the Barber/Nichols binary system ahead of the houses in 1984. This resulted in cascading 175°F water to the houses rather than the original delivery of 200°F water. Thirty (30' x 124') quonset houses can be modified using tubing, scheduled for removal from the one acre house, to increase heat load capacity from 61% to 87% at peak requirement. This will increase inside temperatures from 45°F to 60°F at design conditions. New one inch tubes and eight additional (16 total) unit heaters will heat the one acre house. Two new one acre houses can be added using similar heating to fully utilize the 600 gpm of 175°F water available.

Work on five other technical assistance projects are reported this month. A draft report on the binary generator test at Wabuska, NV has been mailed to participating groups for review and comments. Deadline for comments to be received by the Geo-Heat Center is 30 June '86, after which the report will be published.

1.3 Information Services. Technology transfer was provided to 15 sources, 88 persons attended a Direct Use Workshop at OIT representing twelve states and five foreign countries, two tours and nine talks were provided by GHC staff and information packets were sent to 12 persons.

Bulletin Vol. 9, No. 3 was mailed 9 May 86 to 1441 domestic and 127 foreign subscribers.

1.4 Progress Monitor activities are reported for Mammoth Lakes and Bridgeport, CA district heating systems, greenhouses at Wendel, and a fish farm at Paso Robles, CA.

1.5 During May the following staff worked on the project (percent of time in parenthesis): Paul Lienau (45%), Gene Culver (34%), Kevin Rafferty (55%), Cindy Caskey (21%), Joyce Pryor (32%) and the part time library assistant worked 74 1/4 hours.

2. APPLICATIONS ANALYSIS

The Geo-Heat Center works with potential users, consultants, industry, organizations, engineers and state energy offices upon request to provide direct technical and economic feasibility analyses (up to 64 man hours per project) for those actively involved with geothermal development.

2.1 Subcontractors

none utilized

California

2.2 Ramco Geothermal Farms Phil Ramsdell Auburn, CA (for Wendel Greenhouses) Provided analysis on modifications of greenhouse (30 quonset and a one acre house) heating systems to increase capacity using cascaded 175°F water from binary power plant rather than 200°F water. Letter report in Appendix.

2.3 Bridgeport D.H. Mike Smith, CEC Bridgeport, CA (a CEC project) Work has commenced on the ten private businesses. Not all fuel consumption has been received. This district heating system may be cascaded from a binary power generation plant.

2.4 Riverside Co. Bldgs. Mike Smith, CEC Lake Elsinore, CA (a CEC project) Work has not commenced past the site visit, fuel consumption and drawings have not been received.

Nevada

2.5 TAD's Binary Gen. Test Bill Blockley (Sierra Pacific Power Co.) Wabuska, NV The draft report has been completed. The report must be commented upon and approved by TAD's and Ormat before publication.

South Dakota

2.6 Philip District Heating Philip, SD Mike West, City Mgr. Supply, return and distribution piping layout has been completed and costs estimated.

Oregon

- 2.7 Parker's Greenhouse
Lakeview, OR
Andy Parker
- A site visit was made to inspect an artesian well proposed for heating the greenhouses. Inspection revealed that the flow was too little and costs of boring under the hwy to pipe water to the greenhouse would be more than making pump modifications to the existing well. Discussion with owner. No report.

3. TECHNOLOGY TRANSFER

Technology transfer involves advising and/or referrals to consultants, developers and users.

	<u>Name</u>	<u>Date</u>	<u>Nature</u>
3.1	Ron Brown Pacific Enterprise Portland, OR	5/5	Corrosion. Discussed product that controls scale deposit and corrosion by magnetic fields. System to be tested at Oregon Trail Mushroom, Vale, Oregon.
3.2.	David Henzel Trendwest Corp. Klamath Falls, OR	5/6	Processing. Discussed comparison of potato processing using geofluids with conventional fuel. Requested assistance if extension of GHC program is approved.
3.3	Kent Colahan City of Klamath Falls Klamath Falls, OR	5/6	Equipment. Requested a referral listing of engineering firms for RTRP pipe replacement. Provided a listing of ten firms.
3.4	GAC Meeting Klamath Falls, OR	5/7	Resource. Monthly meeting of the Klamath County Geothermal Advisory Committee discussed cascading of waste geofluids and impact of injection program.
3.5	Tom Peterson Klamath Falls, OR	5/12	Resource. Discussed geothermal potential in Mt. View area; well depths, drilling risk, etc. for space heating a new home.
3.6	Ben Lunis EG&G Idaho Inc. Idaho Falls, ID	5/13	General. Requested papers on direct heat applications to be presented at GRC Annual meeting. Submitted: 1) Status of Direct Heat Projects in Western States - Lienau; 2)

<u>Name</u>	<u>Date</u>	<u>Nature</u>
		Piping Geofluids - Lienau & Rafferty; 3) Absorption Refrigeration - Rafferty; and 4) Pools, Ponds and Puddles - Keepin' 'Em Warm - Rafferty.
3.7 Bob Honeycutt Clearlake, CA	5/13	General. Provided information on marketing geothermal.
3.8 Gary Emry Boise, ID	5/16	Resource. Provided resource information on the Weiser area. Interested in district heating and ethanol plant.
3.9 Dan McCaskey Salt Lake City, UT	5/23	Resource. Interested in possible direct heat applications for Iron Co. well on 120 acre piece of ground. Total depth is 12,000 feet, flow is 1200 gpm artesian at 225-300°F. Water must be injected due to high TDS.
3.10 Bob McCluskey Geothermal Report Kirkland, WA	5/23	General. Requested papers presented at May 20-23 direct use workshop.
3.11 Kent Stewart Industrial Sales Intl. Independence, KS	5/23	Equipment. Requested information and assistance in locating 500°F well to test resilient polymer linings for pipelines. Referred to EG&G Idaho Inc. and East Mesa Test Facility for high temperature and recommended possible cost share if testing in low temperature (200°F) is desired.
3.12 Bill Smith Klamath Falls, OR	5/27	Equipment. Requested assistance in sizing heat exchanger used to separate DHW from space heating of a house and tri-plex.
3.13 Kent Colahan Klamath Falls, OR	5/27	Space heating. Discussed waste collection in and heating proposal.
3.14 Mark Dellinger Lake County Lakeport, CA	5/28	Resource. Discussed Therma Source proposal and testing of Lake County Ag Park well.
3.15 Roy Hodson KLH Engineers Ft. Collins, CO	5/29	Resource. Requested recommendation for development of the Poncha Springs resource.

4. TRAINING SESSION

A topical workshop, Update of Geothermal Direct-Use Development and Application, was held at OIT, May 20-22, 1986 with 88 persons in attendance. In addition to persons from 12 states, attendees came from Canada, England, Iceland, Italy, New Zealand and Mexico. The workshop was sponsored by the Geothermal Resource Council, PNW Section of the GRC and the OIT Geo-Heat Center. The Geo-Heat Center was primarily responsible for a training session on direct use equipment held the third day. No DOE funds were used in preparation for the workshop.

5. SPEAKING ENGAGEMENTS AND TOURS

5.1 Icelandic Rotary International group of six persons was provided a briefing and tour of geothermal developments in the Klamath Falls area on 2 May 86.

5.2 Field trip for the purpose of discussing equipment used in direct heat applications was provided to attendees (about 50 persons) at the workshop. The field trip included installations at OIT, residential DHE and the city district heating system on 21 May 1986.

5.3 OIT and Geo-Heat Center staff provided the following talks at the 20-22 May workshop:

1. Status of Direct Heat Projects in the Western US - Lienau
2. Icelandic Heating Systems - Lund
3. Basic Direct Use Economics - Higbee
4. Guidelines for Greenhouse and Pond Heating - Rafferty
5. Update of Industrial Applications - Lund
6. Panel - Lessons Learned, Klamath Falls Heating System - Lienau
7. Downhole Heat Exchangers - Culver
8. End Use Equipment for Space Heating - Rafferty
9. Absorption & Refrigeration Equipment - Rafferty

6. GHC QUARTERLY BULLETIN

Bulletin Vol. 9, No. 3 featuring direct use equipment (copy enclosed) was mailed to 1441 subscribers in the US and 127 subscribers in foreign countries on 9 May 86.

7. LITERATURE DISTRIBUTION

Information packets on resources and applications were requested by the following.

<u>Name</u>	<u>Date</u>	<u>Nature</u>
Mark Dellinger Geo. Coord. Lake Co. Lakeport, CA	5/6	Letter regarding well test and suggestions for further testing.
Kent Colahan City of K. Falls Klamath Falls, OR	5/6	Letter recommending ten consulting engineers to be contacted for geothermal work bids.
Lyle Griffith LaGrande, OR	5/6	Letter regarding possible alternatives to buried pipe due to high water table at Hot Lakes.
Alex Sifford ODOE Salem, OR	5/6	Copy of same.
Lyle Griffith LaGrande, OR	5/7	Video on Hot Lakes.
Larry Iest Boise, ID	5/7	Publication Request form, Harney Basin study, aqua and agri papers, direct use information.
USDOE Tech. Info. Center Oak Ridge, TN	5/9	Copies of last five Bulletins.
Don Alt Alt Construction Wadsworth, NV	5/13	Bulletins, DHE, Heat Pump and Direct Use papers.
Gary Emry McClure & Emry Boise, ID	5/19	Letter, Publication Request Form, feasibility study on College of Idaho, Agribus paper, three Bulletins, site data base book for Idaho, GHC brochure.
Mike Jones Woodston, KS	5/28	Letter regarding information on current geothermal development, Publication Request Form, GHC brochure, papers "Geothermal Elect. Power, The State of the World 1985" and "Status of Direct Heat Projects in Western States", back Bulletin.

<u>Name</u>	<u>Date</u>	<u>Nature</u>
R.C. McCluskey Kirkland, WA	5/28	Packet of papers from Workshop.
Kent Murray CEC Sacramento, CA	5/30	Letter with list of FRP pipe manufacturers.

8. PROGRESS MONITOR

8.1 Mammoth Lakes District Heating System Design Receives Steering Committee Review. The design of the Mammoth Lakes district heating system is based on 131 end-users who can consume a maximum of 51.57 million Btu/hr, which is the design load for the plant. Minimum demand may be as low as 5-10% of this. The peak demand requires a circulation of 1720 gpm of 200°F water which returns at 140°F. The circulating fluid will be heated by geothermal fluid estimated to be produced at a temperature of 330°F and rejected at 150°F.

A steering committee consisting of members from Mono County, City of Mammoth Lakes, Union Oil, Ben Holt Company, and the OIT Geo-Heat Center are in the process of reviewing the third task report of the design which is being prepared by Ben Holt Company. The purpose of the steering committee is to review the four tasks and provide guidance as work progresses. Task 1 consisted of investigating heat loads for 30 of the 131 planned buildings for the system; Task 2 covered retrofit costs and operating costs, based on heat loads, current equipment, and preliminary retrofit designs chosen in Task 1; and Task 3 considered design of the distribution system and heating plant. Task 4 will consider three options for supplying geothermal fluids: 1) cascading effluent from the Casa Diablo binary power plant to be piped about three miles to Mammoth Lakes; 2) drill new wells in the city; and 3) cascade effluent from a proposed Union Oil Co. power plant. The California Energy Commission is providing funding in support of the Mammoth Lakes district heating system feasibility study.

8.2 Bridgeport District Heating System Proceeding with Development. Design of the Bridgeport district heating system, being developed by Koepf and Lange, Inc., is based on heating 13 public buildings at a peak demand of 644 gpm of 180°F water which returns at 160°F in a 7600 foot loop. Geothermal would be produced from "Big Foot", a production well (198°F) about 4300 feet from a recently drilled injection hole. Unfortunately, low permeability in the injection hole will require it to be deepened or resited. This hole was to be used to accept fluids from a pump test of Big Foot.

Recently, a conditional use permit was granted to the Bridgeport PUD for construction of the pipelines. The PUD is developing the project under a grant from the California Energy Commission and have hired Lahonton, Inc. as project managers.

8.4 Paso Robles Fish Farm Uses Geothermal to Increase Growth Rate of Catfish. Dick Klosterman raises catfish in tanks fed by water from two wells, one of which pumps 1200 gpm at a steady 117°F from a depth of 1000 feet. This enables him to maintain a constant water temperature of 85°F and raise a catfish from an egg to a pound and a half in eight months, about one third the time it takes in conventional aquaculture operations. Klosterman has been a proponent for low temperature geothermal since the early 1970's. He claims that the economic potential of low temperature resources is 15 to 20 times that of high temperature power generation resources. Klosterman runs Aquafuture, Inc. from a hillside near Paso Robles, California (Geothermal Report).