FEDERAL ASSISTANCE PROGRAM

QUARTERLY PROJECT PROGRESS REPORT

GEOTHERMAL DIRECT-HEAT UTILIZATION ASSISTANCE

GRANT NO. DE-FG07-90ID 13040

REPORTING PERIOD: OCTOBER - DECEMBER 1997

JOHN W. LUND, PROJECT DIRECTOR

GEO-HEAT CENTER
OREGON INSTITUTE OF TECHNOLOGY
KLAMATH FALLS, OR 97601

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This report summarizes geothermal technical assistance, R&D and technology transfer activities of the Geo-Heat Center at Oregon Institute of Technology for the first quarter of FY-98 (October-December 1997). It describes 216 contacts with parties during this period related to technical assistance with geothermal direct heat projects. Areas dealt with include requests for general information including maps and material for high school debates, and material on geothermal heat pumps, resource and well data, space heating and cooling, greenhouses, aquaculture, equipment, district heating, resorts and spas, industrial applications, electric power and snow melting. Research activities include work on model construction specifications of lineshaft submersible pumps and plate heat exchangers, a comprehensive aquaculture developer package and revisions to the Geothermal Direct Use Engineering and Design Guidebook. Outreach activities include the publication of the Quarterly Bulletin (Vol. 18, No. 4) which was devoted entirely to geothermal activities in South Dakota, dissemination of information mainly through mailings of publications, tours of local geothermal uses, geothermal library acquisition and use, participation in workshops, short courses and technical meetings by the staff, and progress monitor reports on geothermal activities.

1.0 PROJECT SUMMARY: OCTOBER 1 - DECEMBER 31, 1997

1.1 Technical Assistance. GHC staff provided responses to 216 requests during the reporting period from 32 states (mainly California and Oregon), and 29 international contacts from the following countries: China (Hong Kong), Argentina, Italy, Turkey, Denmark, Canada, Philippines, England, Australia, France, Switzerland, Chile, Algeria, Romania, Mexico, Portugal (Azores), Sweden and Northern Ireland. A total of 91 requests/responses were by e-mail of which 28 could not be identified as to location. A breakdown of requests relative to applications are: GHP (53), general (49), resource/wells (24), equipment (16), space heating/cooling (15), greenhouses (14), electric power (13) district heating (10), aquaculture (9), resorts/spas (8), industrial (4), and snow melt (1).

A summary of activity for the 1997 calendar year as compared to previous years is as follows: in 1997 we had a total of 761 requests/responses, compared with 583 for 1996, 350 for 1995, 331 for 1994 and 348 for 1993. These requests/responses have doubled since we went on line with our web page in February of 1996. We went from an average of 86 per quarter up through the first quarter of 1996 to 178 per quarter after that time. About half of the current requests/responses are now done by e-mail. We are also see more international requests, again mainly by e-mail.

A breakdown of requests relative to applications for the 1997 calendar year are: GHP (231), general (164), resource/wells (93), space heating/cooling (53), equipment (52), greenhouses (39), aquaculture (32), district heating (30), electric power (28), resorts/spas (20), industrial (16), and snow melt (3).

1.2 R & D Activity. Some material has been collected on line-shaft submersible pumps and plate heat exchangers for the Model Construction Specifications project. The Comprehensive Aquaculture Developer Package has been started with an update of the design criteria. The revisions to the Geothermal Direct Use Engineering and Design Guidebook is nearing completion and should be to the printer by the end of January.

1.3 Technology Transfer. GHC Quarterly Bulletin, Vol. 18, No. 4, devoted entirely to geothermal activity in South Dakota, was mailed to 1622 U.S. and 382 international subscribers; Vol. 19, No. 1 is in preparation and should be published in February 1998. This next issue will be devoted to geothermal direct use equipment. Ten presentation (three of them internationally) were made and five tours conducted. We also hosted international visitors attending the International Geothermal Association board of directors meeting in Lakeport, CA. Chapter 29 "Geothermal Energy" for the 1999 ASHRAE Handbook of Applications was completed under the supervision of Kevin Rafferty. A total of 320 publications were distributed on direct use and 4 volumes were added to the geothermal library. Geothermal Progress Monitor reports include: (1) The Long Valley Seismic Activity, (2) The Geysers Effluent Pipeline Dedication, (3) Thermal Aqua Farm, (4) Reno Energy Geothermal District Heating Project, (5) Eruption of Giant Geyser in Yellowstone National Park, (6) Sea-floor Mining near Papua New Guinea, and (7) three book reviews.
1.4 **GHC staff that worked on the project include:** J. Lund (84%), K. Rafferty (92%), T. Boyd (100%), D. Gibson (95%), and P. Lienau (21 hrs.).

1.5 **Award.** Paul J. Lienau and John W. Lund received the Geothermal Pioneer Award for “outstanding achievement in the development of geothermal resources” for the Geothermal Resources Council at their Annual Meeting in Burlingame, CA.

2.0 **TECHNICAL ASSISTANCE**

The Geo-Heat Center provides technical assistance on geothermal direct heat applications to developers, consultants and the public. This assistance could include information on low-temperature (<150°C) resources, space and district heating, geothermal heat pumps, greenhouses, aquaculture, industrial processes, equipment and general material on geothermal energy. The nature of the assistance includes preliminary engineering feasibility studies, review of direct-use project plans, assistance in project material and equipment selection, analysis and solutions of project operating problems, and information on resources and utilization. The following are brief descriptions of technical assistance provided during the fourth quarter of the 1997 program.

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/01/97 Kevin</td>
<td>Re: GHP</td>
</tr>
<tr>
<td>Associated Heating</td>
<td>Wanted information concerning heat pumps specifically Climate Master. Provided the phone number to Climate Master, also informed him of our website (pub. request form). Thinking of converting a commercial building to geothermal and need info. If he had any questions contact Kevin.</td>
</tr>
<tr>
<td>PO Box 412 Eugene, OR 97440 (541) 683-2590</td>
<td></td>
</tr>
<tr>
<td>10/01/97 Raymond Duray</td>
<td>Re: Space Heating/Cooling</td>
</tr>
<tr>
<td>Bend, OR 800-508-1257 (pager)</td>
<td>Requested information on developing a geothermal home/energy efficient home in Klamath Falls. Indicated that we have a technical assistance program and also gave number of Prof. Bob Rogers in MET at OIT for a potential student project.</td>
</tr>
<tr>
<td>10/02/97 Benjamin Lee Brown</td>
<td>Re: Resource/Wells</td>
</tr>
<tr>
<td>graduate student</td>
<td>E-mail request for information on geothermal resource base and reserves. Send him information on geothermal resource base, accessible resources and energy reserves along with titles of USGS circulars 726,790 and 892.</td>
</tr>
<tr>
<td>Brigham Young University] Provo, UT e-mail: <a href="mailto:brownbn@pop.et.byu.edu">brownbn@pop.et.byu.edu</a></td>
<td></td>
</tr>
<tr>
<td>10/03/97 <a href="mailto:jeffgordonfan@hotmail.com">jeffgordonfan@hotmail.com</a></td>
<td>Re: General</td>
</tr>
<tr>
<td>email response to a request for information from a student who is doing a debate on conventional vs renewable energy. Suggested that she check our publications list on the web site.</td>
<td></td>
</tr>
<tr>
<td>10/03/97 Ben Brown</td>
<td>Re: Resource/Wells</td>
</tr>
<tr>
<td>866 N. 580 E #2 Provo, UT 84606-6908</td>
<td>E-mail request to send information on geothermal resource base. Sent two publications.</td>
</tr>
<tr>
<td>10/06/97 Bruce Masl OIT Physical Plant Klamath Falls OR 541-885-1403</td>
<td>Re: Equipment</td>
</tr>
<tr>
<td>Bruce called about how to calculate the difference between the power consumption of the existing old Trane Centrivac and a new chiller. He was trying to do it with the rated voltage and current. I suggested using 1.0 kW/ton for the old machine and 0.5 kW/ton for the new one.</td>
<td></td>
</tr>
</tbody>
</table>
10/06/97
Doug Fike
PO Box 9
Warm Springs, VA 24484

Re: Space Heating/Cooling
Direct use space heating application in Virginia. Inn @12,000 sqft, 4 cottages and 13 villas @ 2000 sqft ea. 450 ft well. Discussed systems design, placement of heat exchangers, piping type and terminal equipment for the buildings.

10/06/97
George Thompson
NM

Re: Greenhouses
He wanted to know how to credit our information that he used in the Caterpillar proposal (see last quarter's records for the project description). He suggested that the phrase "contributor to design" be used. I told him that was probably overstating the case.

10/06/97
Geyer John
J G&A
Vancouver WA
360-882-5050

Re: GHP
I called John Geyer about the schedule for my presentations at the GRC meeting and what "spin" he wanted ie: engines, utility or general. Looks like a majority of the group will not be engineers. Also got him to "grudgingly" pony up free registration.

10/06/97
Howard Ross
EGI, University of Utah
Salt Lake City, UT
801-581-5184

Re: Resource/Wells
Howard called about the potential load in the 271 collocated cities identified in the joint resource study that we did. Explained the difficulty in calculating a number. Suggested that 1 well in each of the locations with "average" production (450 gpm @ 40 delta T) be used. Conservative in the sense that all of the currently developed sites have several to several hundred wells.

10/06/97
Keith Thomas
WA
360-754-7090

Re: GHP
He called about an open loop (groundwater) heat pump system coupled to a hydronic radiant floor system, artesian well and storage tank. How big does the tank have to be?

10/06/97
Kevin McCall
SEA Standtech (?)
Reno, NV
702-358-6931

Re: Space Heating/Cooling
Industrial project on the East side of Reno along the Truckee River. 1700 acres. Site has warm water wells (3 to 4). How to use for the new tenants? Advised that it could be used in the floor slab for manufacturing type buildings for space heating. Also could be used in conjunction with heat pumps for higher temps. Is NG available?

10/06/97
Mildred Geshwiler
ASHRAE
geshwirl@ashrae.org

Re: GHP
email to M Geshwiler at ASHRAE on clarifications to the references for Ch 6 in our GSHP book.

10/06/97
Ray Fortuna
DOE
Washington, DC
Raymond.Fortuna@ee.doe.gov

Re: Resource/Wells
email response to Ray about the risk reduction program for direct use. Suggested that the private sector should be included since most of the activity we are seeing is in that area. DH is difficult for munis due to property tax limitation. Also commented that the project size could be reduced to 50k on the low side

10/06/97
Rob Centro
POB 333
Sodus Point NY 14555

Re: GHP
He is a contractor in Upstate NY. Saw the article on heat pumps (the Assoc. Press one that I was quoted in). Discussed the kind of applications that are good ones and the fact that his part of the country has all the desirable characteristics. Gave him the usual contacts IGSHPA, GHPC etc and sent package on h/p.

10/07/97
Chicara@aol.com

Re: General
Interested in finding out more on the girl scout find of a fresh water jellyfish. Sent a reply informing him we didn't have any information concerning that.
10/07/97
Sharp, Karen
Carrier Corp.
NY
(315) 432-3235
Re: General
With regards to our webpage vendor's listing they wanted us to take off their listing under Water Source Heat Pump. Also their number under Chiller's and Space Heating Equipment should be 432-6000. Made the necessary changes.

10/07/97
Wood, Michael
1801 Hooper Rd
Yuba City, CA 95993
673-3214
Re: General
Could you send any information on geothermal positive and negative. Sent him an e-mail with some information cut from the US DOE Geothermal webpage and provided links also. Received a reply - thank you very much.

10/08/97
Brian Lyman
Johnson Controls World Services
MSJ30 Subbase Bangor
Silverdale, WA 98315
Re: GHP
He is with the sub base up near Seattle. Interested in doing some 1940's vintage block buildings w/GHP. The buildings are at the end of the steam line (currently served from a central plant). Discussed the savings in a conventional setting. The steam issues may be the whole thing here. Suggested that Bill Sullivan has some good data on DOD installations.

10/08/97
Bruce Masl
OIT Phys Plant
Klamath Falls OR
541-885-1403
Re: Equipment
Bruce called about the controller installation. where to install the outdoor sensor? reset ratio? Told him install the sensor anywhere that it is convenient but out of the sun. Explained the reset ratio 90 to 130 F and air temp. 0 to 60 F. Ratio should be 0.666 or 1.333 depending on how the controller is set up.

10/08/97
Chris Bovin
Klamath Falls, OR
541-884-0686
Re: Space Heating/Cooling
He is in the process of buying a home with a geothermal system and the inspector says that he needs to find somebody evaluate the system. Suggested that he call Friesen or Powley plumbing.

10/08/97
DGI
Gulf Power
GA
Re: Equipment
He called about a project that his utility is trying to promote on the Pensacola NAS, FL. The engineer is trying to use a 4-pipe system and the utility wants to use a two pipe w/unitary equipment. Can I come down there and sort things out? I suggested that his problem is not really anything that couldn't be handled by a local engineer since it is not geothermal specific.

10/08/97
Eliot Estes
Physical Plant, Oregon Institute of Technology
Klamath Falls OR
541-885-1691
Re: Space Heating/Cooling
Went out to the presidents house at Eliot's request and looked over the heating system for the basement area. Suggested that they add an outdoor temperature sensor and adjust the supply water down as the outside temp rises. This might help with the control problems that they are having.

10/08/97
Harry Braud
LA
504-673-6816
Re: GHP
Harry called to discuss the GHP meeting in SF next week. What kind of attendees? Also wanted to offer some comments on the book (Kavanaugh and Rafferty). suggested that he call Steve on the comments if they are in the closed loop stuff.

10/08/97
Howard Ross
EGI, University of Utah
Salt Lake City, UT
Re: Resource/Wells
Discussed the potential applications that might be located in the resource areas near the 271 population centers. Advised that the program should not be too heavily focused on district heating since it would be more likely that the other direct use applications would be more commonly developed.
10/08/97  
Howard Ross  
EGI, University of Utah  
Salt Lake City, UT  
hross@egi.utah.edu  

Re: Space Heating/Cooling  
email response to Howards request for help with calculating annual energy requirements for different  
applications of direct use. Provided numbers on industrial, greenhouse and space heating.

10/08/97  
Judi Steciak  
University of Idaho  
800 Park Blvd ste 200  
Boise ID 83712  
jsteciak@borah.engboi.uidaho.edu  

Re: GHP  
email response to a request for a speaker on heat pumps at the local ASHRAE luncheon in Idaho. I replied  
that we don't have a budget that allows us to travel to Idaho for lunch.

10/08/97  
Kevin Fitzsimmons  
University of Arizona  
2601 E. Airport Dr.  
Tucson, AZ 85706  
(520) 741-1990  

Re: General  
Wanted to know if we had a geothermal resource map of Nevada. He is giving a talk to aquaculture people  
in Nevada and wanted to show them some possible geothermal places. Sent him the Geothermal Nevada  
map, Collocated Nevada Map, some US maps, and the Vol. 16 No 4 bulletin. Email kevfitz@ag.arizona.edu

10/08/97  
Kevin McCray  
National Groundwater Association  
Worthington, OH  

Re: GHP  
I called Kevin to advise him of the errors that I found in the antifreeze section of the vertical borehole  
guidelines. Left message

10/08/97  
Kevin McCray  
Nat. Groundwater Assoc.  
Worthington, Ohio  
614-898-7791  

Re: GHP  
Went over the antifreeze numbers with Kevin. Faxed him the tables from the ASHRAE study and suggested  
that the data in the next printing of the guideline be changed.

10/08/97  
Larry Holzgang  
Oregon Economic Development  
Klamath Falls, OR  
541-883-7846  

Re: Aquaculture  
Larry called to discuss the brothers West Aquaculture project and the calcs for the energy use that are  
necessary for the ODOE tax credit. Talked about what we have done and what is necessary for the  
paperwork. Suggested that they contact Brian Brown PE.

10/09/97  
Dorr, Perle  
Geothermal Energy Association  
122 C Street, Northwest, Suite 400  
Washington, DC 20001  
(202) 383-2673  

Re: General  
Wants to talk at the GRC meeting regarding webpages and the US map. What are some good HTML books,  
how to get the pages recognized in the search engines, etc. Got some good feedback on the US map. Talked  
about colors used on the map.

10/13/97  
Pruett, Ed  
Pruett Industries International  
8915 Rosedale Highway  
Bakersfield, CA 93312  
(805) 589-2768  

Re: General  
Wanted to know if they could use our digital projector that I brought to use at the GRC meeting. They are  
giving a presentation during the meeting and would like to use it for their computer presentation. We let  
them use it and made sure it would work with their computer.
10/14/97
Bernhart, B. Scott
Masters student in Urban and Regional Planning
12129 Grape Way
Thornton, Colorado 80241
bernhart@aol.com
Re: General
Would you have an updated bibliography on the economics behind geothermal use? Trying to determine if there is a chance to use localized geothermal to heat small towns that are located near known sources? Sent a reply informing him of several pubs that we have. "Economics of direct use", "Geothermal Utilization for the home owner", Geothermal District Heating analysis guide", and "Engineering Cost analysis, chap 18". Also sent him "Selected Cost Considerations for Geothermal District Heating in Existing Single-Family Residential Areas."

10/16/97
pfarrance@loudoun.com
Re: Snow Melt
Email response to a request for assistance with a snow melt system on a driveway. Advised that the "geothermal" pipe that he asked about (closed loop GHP pipe I assume) would probably be OK but watch pressure. Suggested max of 500 ft individual circuits of 3/4 pipe. 3" below the surface of the concrete and tied to the mesh. Flow from bottom to top to help in air removal

10/16/97
Boz Van Houten
Breitenbush Hot Springs
OR
bozvh@teleport.com
Re: Space Heating/Cooling
Email response to a request for assistance on the redesign of a heating system at Breitenbush Hot Springs, OR. Explained the TA program and the time limitation. Suggested that if it was a big job it would be advisable for them to hire a consulting engineer.

10/16/97
Lawrence, Keith
ProSoft Custom Technologies, Inc.
klawrence@eac ltd.com
Re: General
Requested several publications. Was not able to deliver due to no mailing address submitted. Sent an e-mail reply but no response at this time.

10/17/97
Gary Phetteplace
US Army Cold Region Lab
Hanover, NH
gphet@hanover-crrel.army.mil
Re: General
Email to Gary (chair of ASHRAE TC 6.8) telling him that the final draft of Chapter 29 Geothermal Energy is going out to the committee members for a vote. Will advise him of the results.

10/17/97
Kalista
AFA Inc
Modoc Point OR
541-783-2903
Re: Resource/Wells
Faxed the water chemistry info to Kalista. She called back to ask about the data base for the low temp work. Susan Blevins told her about it. I explained that it doesn't contain any information on heavy metals.

10/17/97
Kalista
AFA Inc
Modoc Point, OR
541-783-2903
Re: Resource/Wells
They want to get information on the chemistry of the hot springs that discharge into the lake. Are concerned that it could affect their algae products. I suggested that it is very unlikely that these springs could have a measurable impact due to the dilution of the lake.

10/18/97
Hayden, Greg
ghayden@mailhost.primenet.com
Re: Resorts/Spa
Wanted to inform us that the number we had for San Juan Capistrano Hot Springs was no longer in service and there is no new number. Took the number out of the direct use webpage and sent a reply thanking him for letting us know.

10/19/97
Haley, Paula
1, Larkhill Close, Moorside
Cleckheaton, West Yorkshire, England
Casalulu@aol.com
Re: General
Please could you send me some information asap. Sent a e-mail reply asking her what kind of information she was looking for. Also provided some links to other websites which had information concerning geothermal.
10/19/97
Robert Gerard
gerardlaw@worldnet.att.net
Re: Resort/Spa
Interested in learning the locations where I can find relaxing hot springs similar to Glenwood Springs, Colorado. Sent a reply informing him of our direct use database online, and the title of several books containing hot springs information.

10/20/97
Boz Van Houten
OR
bozh@teleport.com
Re: Space Heating/Cooling
e-mail response to Boz about the Breitenbush system. I suggested that the time constraint would allow us to use GHC services more efficiently if travel was not necessary. Asked about the availability of drawings of the system. Advised that the names of engineers that could do the job are on our web site. Discussed the use of copper pipe, H2S. and solder.

10/20/97
Harris, Jack
OIT
3201 Campus Drive
Klamath Falls, OR 97601
Re: General
Came to our office with several elderhostel people. They were interested in geothermal and earthquakes. Talked a little about what our office offers and some general geothermal info.

10/20/97
Robert Collins
Enreco Pty Ltd
POB 690
Alice Springs, NT AUSTRALIA
bohnsue@ozemail.com.au
Re: Electric Power
Email response to a request from a binary power plant owner in Australia for help in locating a vendor for isopentane. They are changing their machine over from R114 to isopentane. Gave Enserch Exploration in Houston TX 972-692-4300. also suggested that they contact ORMAT.

10/20/97
Steven Kavanaugh
University of Alabama
AL
skavanaugh@coe.eng.ua.edu
Re: GHP
Email to Steve suggesting that he add the engineer of record for all of the CANETA case studies to the mailing list for the surveys of GHP system designers

10/22/97
Gary Phetteplace
Hanover, NH
gephet@hanover-crrel.army.mil
Re: GHP
Email to Gary advising him that we (OIT) should be able to accept the honorarium for the ASHRAE Short Course that I will be doing in San Francisco.

10/23/97
Frank, Patricia
1134 Sapphire St.
San Diego, CA 92109-1854
(619) 274-1987
Re: Electric Power
Writing an article for Native American Renewable Energy Education Project (NAREEP). Wanted to verify numbers she had for geothermal power production. Total installed capacity, and how much is being produced. Provided the EIA website address and sent her the WGC'95 update p. 353. Fax (619) 270-1987

10/23/97
Harris, Jack
OIT
3201 Campus Drive
Klamath Falls
Re: General
Came to our office with several elderhostel people. They were interested in geothermal and earthquakes. Talked a little about what our office offers and some general geothermal info.

10/23/97
Mansoor Judge
Solar Dynamics Inc.
1395 Lawrence Ave., W.
Toronto, Ontario Canada M6L 3C8
mansoor@followme.com
Re: Electric Power
Sent a message for Ann Fomes regarding a bulletin article entitled "Organic Rankine Cycle Israeli ORMAT Turbine". Informed him that Ann Fornes is no longer with our office and the article in question concerned an conversation between Ann and Jack Wood. Did send the article with other publications he requested.
10/24/97
Jamison, Howard
PO Box 492
Wayland, NY 14572

Re: GHP
Read about geothermal heat pumps in a local paper. Wanted some more information. Sent him the GHP survival kit and a publications listing.

10/24/97
Jenny Campos
jecampos@violin.aix.calpoly.edu
2828 Augusta Street #23
San Luis Obispo, CA 93401

Re: Greenhouse
I am a Crop Science major currently enrolled in Greenhouse Vegetable Production. I am researching heating systems for greenhouses, an across the Greenhouse Heating Equipment by Kevin Rafferty, but have been unable to access a spreadsheet comparing six heating systems. Would appreciated any help. Sent an e-mail informing her that I have sent two publications "Equipment Selection Spreadsheet and Chapter 15 "Greenhouses"

10/27/97
WIND4SQR@aol.com

Re: GHP
I could go to the library, but basically how does geothermal heat work. Would like to heat my house with it. Sent a reply concerning the Heat Pump Survival Kit on-line, plus also provided links to several other geothermal websites. Received a reply - thanks for the info, it really helped.

10/28/97
Bruce Vinson
Sacramento Municipal Utility Dist (SMUD)
Sacramento CA

Re: GHP
Bruce called about the design of pond loops for residential systems. He has one where the pipe failed and wants to correct it for the homeowner. Suggested that the stuff in Steve Kavanaugh's book would be the best. Faxed him the details.

10/28/97
Diana Keith
Klamath Soil and Water Conservation District
Klamath Falls, OR
541-882-5483

Re: Resource/Wells
Request for information on hot springs running into rivers in the Stukel Mtn. area of the Klamath Basin. The 1970 federal clean water act requires that stream temperatures be below 65 F - however, this may be mitigated if there is natural geothermal inflows. We will provide her with access to reports on the hydrology of the Klamath Basin.

10/28/97
Mark Chilton
Elko Heat Co.
421 Court St.
Elko, NV 89801
702-738-2121

Re: District Heating
Request for contacts in Iceland concerning a proposed visit. Also, requested additional copies of the Iceland issue of the Geo-Heat Center Bulletin

10/28/97
Roy Gacasan
4863 Alta Colina Rd
Camarillo, California
805-384-0446 (FAX: 0336)

Re: Equipment
Request for information on downhole heat exchangers. Doing modeling work near Mammoth area of central-eastern California. He has a high temperature well - 260 F at 600 to 800 feet deep. Suggested that he use a convection promotor as done in New Zealand. Faxed him a summary of the NZ work.

10/28/97
Ted Clutter
Geothermal Resources Council
Davis, CA
916-758-2360

Re: GHP
Requested information on the Foundation House project in Manhattan, NY. Will use the Ge-Heat Center Bulletin article as a basis for an article for the GRC Bulletin. Sent him addresses of the key design people for the project.

10/29/97
Dale Merrick
(OIT student)
Canby, CA

Re: District Heating
Dale was in the office to discuss the slides that he should use in the presentation he is putting together to inform the residents of Canby, CA about district heating. We went through the slide program and selected 15 that would be of use. He is going to fold them into a Power Point presentation.
10/29/97
Gary Phetteplace
CRREL
Hanover, NH
gephet@hanover-crrel.army.mil

Re: GHP
Email to Gary on details of the ASHRAE and Corps of Engineers courses. Agreed on the $1200 for the Corps course. Gary will take care of getting the tickets. He needs any new overheads that I will be using for the ASHRAE course. Said I will get them out this PM.

10/29/97
O'Hara, Shane
so3eng@Bolton.ac.uk
United Kingdom

Re: Electric Power
Trying to gather as much information on Geothermal Power stations, from the general running to the possible effects draining of the hydrothermal reservoirs. Any possible addresses of UK based plants or research centers. Informed him we didn't have much info on power, but provided him links to the USDOEs, IGA, and the GRC websites.

10/29/97
Orhan Mertoglu
Orem Geothermal
Ankara, Turkey
90-312-440-57-11
email: orme-f@servis.net.tr

Re: District Heating
Supplied information for a visit by the Turkish Minister of Environment to obtain funding for further development of geothermal district heating projects.

10/29/97
Robert G. Campbell
PO Box 1792
Klamath Falls, OR 97601
541-884-2389

Re: Equipment
Personal visit to obtain information on the abandoned well at Medo-Bel Creamery in Klamath Falls. He also obtained information on the use of downhole heat exchangers. He is considering relocating his algae processing facility to the old Medo-Bel Creamery building.

10/29/97
Roy Gacasan
4863 Alta Colina Rd.
Camarillo, CA 93012

Re: Equipment
Requested recent information on downhole heat exchanger research. Found two articles in the GRC proceedings Vol 16 and one in WGC95 Proceedings.

10/30/97
Anthony Lee
BBC television
England
fax: 44-117-970-6015

Re: General
Phone request from BBC reporter concerning information on Geysers and general geothermal information. Faxed him selected pages from the USGS pub. "Tapping the Earth's Natural Heat" and some information on the location of geysers.

10/30/97
Bleak, Rosanne
4119 Jessie Lane
Nampa, ID 83686
(208) 467-4336

Re: General
Way cool good information to use in my debate for school thanks.

10/30/97
Joseph Chudzik
yuccaa@erols.com

Re: Resource/Wells
Email response to the owner of an open loop system in which the discharge well is overflowing and turning the property into a "bog". Explained the operation of the system - the heat pump doesn't pump water, only heat. Explained the typical reasons that injection well overflow - sand, scale and bacteria and the way these problems are addressed. Advised that capping the well can't hurt but if the water is coming up around the casing it won't help. Suggested checking the flow rate.

10/30/97
Ludwig, Juan
9001 Wurzbach #803
San Antonio, TX 78240
(210) 558-7920

Re: General
Requested a technical paper. Wanted to know if there was an obligation. Sent a message back informing him the publication was free and was sent out today.
10/30/97
Marshall Reed
USDOE - Geothermal
Washington, DC
e-mail: Marshall.Reed@ee.doe.gov

Re: General
Email request for general information on geothermal energy for a proposed IMAX film. Suggested using the USGS pub: "Tapping the Earth's Natural Heat".

10/30/97
Marshall Reed
USDOE - Geothermal
Washington, D.C.
e-mail: Marshall.Reed@ee.doe.gov

Re: Industrial
Email request for information on the onion dehydration plant at Brady HS, NV. Gave reference in articles in our Bulletin (15/4), a GRC paper from 1995 and a contact to Tom Flynn of Reno.

10/31/97
Chandler Swanberg
PO Box 959
Phoenix, AZ 85001
602-951-3794

Re: GHP
Request assistance for support of a proposal to DOE to help fund a preliminary research project using GHP in Egypt. We will review the proposal and support it with DOE (Marshall Reed).

10/31/97
Frank Gruber
Helena, MT
406-443-0518

Re: Resource/Wells
Inquiry concerning the value of a geothermal well on a piece of property. The well is 120 feet deep, 150 F and can pump 225 gpm. It is cased with 12 inch and 10 inch casing. Asking price is $175,000 with land. Gave him a comparable cost of property sold on the O'Connor ranch - it doubled the cost of the land from $1,000/acre to $2,000/acre.

11/02/97
Ozzy
ozzy@northernway.net

Re: GHP
In the planning stage of building a home. Just learning about geothermal heat and cooling. Not sure if it available or economically feasible in this area. Where can I find more info. Sent a reply with a link to our Heat Pump Survival Kit.

11/02/97
Larry Holzgang
Oregon Economic Development Dept
Klamath Falls OR

Re: Resource/Wells
Larry called to check on the resource available on a piece of property near the airport. Will be building a small manufacturing facility there. Discussed the use of the water in the floor for space heating. Said I would check to see what nearby wells produce and get back to him.

11/03/97
Dale Merrick
ISOT Inc
Canby, CA

Re: District Heating
Dale was in the office to discuss the slides he should use in his presentation for the folks in Canby. He is making up a power point presentation to introduce them to geothermal district heating. We went through the general slide tray and picked out about 15 slides.

11/03/97
Gilbert, Ginna
10918 Hardin Valley Rd.
Knoxville, TN 37932
(423) 690-9274

Re: General
This is a very informative place to get information about geothermal, the places in the US, and the many different uses. I am doing a research paper on geothermal energy and this is has been the best place to find great amount of info.

11/03/97
Kryger, Denise
15378 Griffin Lane
Caldwell, ID 83605
(208) 454-3879

Re: Resource/Wells
Interested in buying the property at Crystal Crane Hot Springs. Would like to use the geothermal for aquaculture or greenhouses. Talked to her about our website. Sent her several papers concerning aquaculture and greenhouses, plus the Geothermal Greenhouse Information Package. Fax (208) 454-4174
11/03/97
Roger Hulet
Oregon Institute of Technology
Klamath Falls, OR 97601
541-885-1693

Re: Greenhouses
Requested information on greenhouse construction. He would like to write a proposal to reconstruct the greenhouse on the OIT Campus. We gave him several publications dealing with greenhouses, and will help him in the future with his proposal.

11/03/97
Schalmo, Ross
Shreve, Ohio 44676
Mailr1@aol.com

Re: General
I'm doing a science project on geothermal energy and this site has a lot of info. Thanks!!!

11/04/97
Marshall Reed
Geothermal Technologies
USDOE
Washington, DC
email: Marshall.Reed@ee.doe.gov

Re: GHP
Email request for information on heat pump manufacturers that can supply equipment overseas. Referred him to our web page and the "Homeowners Guide to Heat Pumps".

11/04/97
Pat Hughes
Oak Ridge Nat'l Lab
TN
pj1@ornl.gov

Re: General
Email response to Pat's message that ASHRAE staff "didn't get to" our 1016 work statement that everybody worked so hard at. Asked if they offered a reason or indicated how many other ones fell in that category.

11/04/97
Susan and Marc Jacobi
Wisconsin
email: weaver@wweaver.com

Re: GHP
Email request for information on home heating in Wisconsin. Appears that are interested in geothermal heat pump applications. Referred them to our web page for information on heat pumps.

11/05/97
Ben Sessoms
email: ben_sessoms@htdt.com

Re: General
Email request for contacts in Iceland concerning the Heimaey eruption in 1973. Gave him four email contacts in Iceland.

11/05/97
Gary Sauer
3100 Arapaho Ave Ste 501
Boulder CO 80303

Re: Equipment
Looking for a list of vendors of geothermal equipment. Sent him the vendor list from the web site.

11/05/97
Joseph Chudzik
yuccaa@erosl.com

Re: Resource/Wells
Email response on the Chudzik system. Advised again that the installation of the cap would probably not hurt. He checked the flow and found 8 gpm. Advised him that if the unit was less than 4 tons he could probably reduce the flow some. If it is 4 tons or more leave the flow where it is.

11/05/97
Sal Pantano
Canby, CA
916-233-3232

Re: Resource/Wells
Sal is looking for somebody to do an appraisal and flow test of his resource. He checked with Subir, Cancinelli and Slawson and assoc. Suggested that these outfits are large and used to dealing with big projects. Gave him Tom Flynn and Hutter as suggestions. Toni faxed him the directions for constructing a weir to measure the flow himself.

11/05/97
Roy Gacasan
Camarillo, CA
213-763-1450

Re: Equipment
Phone discussion of research material send on downhole heat exchangers. Supplied him with a phone and email contact with one researcher in Hawaii.
11/06/97
Carl Orio
Water and Energy Systems
NH
603-362-4666
Re: GHP
Karl called about a project in NYC. Big coop housing high-rise. 26,000 tons cooling. Harvey has put money in to get the NYSETRA to look at GHP. He wants to include me in the proposal for the work. Needs resume via FAX right away.

11/06/97
Dave Dalrymple
PO Box 667
McCall, ID 83638
Re: Greenhouses
Phone request for information on greenhouse development. He has a 170 degree F well in McCall, Idaho and needed ideas of possible uses. Send several general and greenhouse specific publications.

11/06/97
Gary Phetteplace
Hanover, NH
gophet@hanover-crrel.mny.mil
Re: GHP
Email to Gary with my comments on the case studies that CANETA research has collected for publication through ASHRAE. Nothing of substance really - just a few editorial comments and some number errors. Gary will forward them to Doug.

11/06/97
Hinchcliffe
8 Crow Hill Dr.
Fairport, NY 14450
(716) 425-2788
Re: GHP
Rookie, looking to put a geothermal system in a new home. Sent reply informing him of the Survival kit online.

11/06/97
Kimberly Hollister
Lockeed/Martin - subcontractor
USDOE - ID
Idaho Falls, ID
Re: General
Phone call to gather information for a proposed geothermal training center in the US. Discussed the purpose of the center, location, length of training, and the international aspects.

11/06/97
Pantano, Salvatore
spantano@telis.org
Canby, CA
Fax (530) 233-5765
Re: Resource/wells
Faxed him drawings and instructions on how to measure flow using a weir. Received a reply on the 14th. Received the fax and please ask Kevin to send me the names and phone #’s of the guys that he gave to evaluate the value of my resource. I have misplaced the information. Thank you.

11/06/97
Phil Nichols
consulting mechanical engineer
Rapid City, SD
605-343-3986
Re: GHP
Phone call to obtain information and specifications for ground coupled heat pump loops. Sent information from the draft report for ASHRAE by Rafferty and Kavanaugh.

11/06/97
Tom Flynn
Reno NV
702-833-0501
Re: District Heating
Called Tom back to give him some additional info on OR PUC from their web site. Discussed the plans for the Reno system. Tom mentioned that they had assumed that they could pull the water down to 80F. Suggested that this was pretty optimistic unless they had some really large industrial application.

11/06/97
Tom Flynn
Reno NV
702-833-0501
Re: District Heating
Tom is doing some work on the Reno Energy District System. Called to ask about the regulation of DH in OR. Told him that it was deregulated. Gave him the number for the OR PUC.

11/07/97
andover2@feist.com
Re: General
A high school student and need the best information you have on geothermal energy. Sent a reply asking him if he could be more specific. Also provided him with links to several websites (DOE-INE, DOE-EREN, GEO) which will help him.
<table>
<thead>
<tr>
<th>Date</th>
<th>Re:</th>
<th>To:</th>
<th>Message</th>
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<tbody>
<tr>
<td>11/07/97</td>
<td>General</td>
<td>Crutcher, Rachel Allen High School</td>
<td>Requested several technical papers. Comment - Thanks so much. This info should greatly benefit our high school's debate team.</td>
</tr>
<tr>
<td>11/07/97</td>
<td>General</td>
<td>Dave Dinse Tennessee Valley Authority Chattanooga TN</td>
<td>Several calls from ASHRAE committee members over the last few days with comments on the last draft of the chapter. All Ballots are in and the Chapter is approved.</td>
</tr>
<tr>
<td>11/07/97</td>
<td>General</td>
<td>Landry, E. J. Rochester, NY</td>
<td>Would like to know if a copy of &quot;Geothermal Direct Use Eng. &amp; Design Hndbk.&quot; is available for purchase. Sent a reply informing him the handbook is in the process of being revised. Also called sent him the greenhouse package and a publications list.</td>
</tr>
<tr>
<td>11/07/97</td>
<td>General</td>
<td>Pierre Ungemach/A-V Ventre Geoproduction Consultants Paris, France email: <a href="mailto:pu_gpc@club-internet.fr">pu_gpc@club-internet.fr</a></td>
<td>E-mail request to assist them in submitting abstract for Stanford Reservoir Engr. Conference in January. Contacted Roland Horne - and received approval for them to submit a late abstract.</td>
</tr>
<tr>
<td>11/07/97</td>
<td>Equipment</td>
<td>Roy Gacasan Camarillo, CA</td>
<td>Called requesting an address for a Dr. Koji Morita in Japan, concerning DHE research. Found his business card and faxed copy to him.</td>
</tr>
<tr>
<td>11/08/97</td>
<td>GHP</td>
<td>Rocha, Gabriel Director General - Adobes Mexicanos Londres 31-5 Col. del Carmen Coyoacan Mexico City DF, Mexico 04100 <a href="mailto:abodesmexicanos@biosys.net">abodesmexicanos@biosys.net</a></td>
<td>Would appreciate it if you could attach me the file via e-mail of the Heat Pump Information Survival Kit. It is rather complicated to go into every single page and I want to have the whole thing. Sent a reply that is was not sent up for electronic transmission and I would need his mailing address to send him a copy. Received a reply with his mailing address.</td>
</tr>
<tr>
<td>11/10/97</td>
<td>GHP</td>
<td>Stefan von Bothmer <a href="mailto:Stefan.von.Bothmer@movium.slu.se">Stefan.von.Bothmer@movium.slu.se</a></td>
<td>We run a small family company and are considering heating our greenhouse by wind and solar heating. Any info? Informed him our office deals with geothermal energy. Provided an address for CADDET Renewable Energy.</td>
</tr>
<tr>
<td>11/10/97</td>
<td>Electric Power</td>
<td>Steve Valentine TX</td>
<td>Designing a building &quot;in the middle of nowhere&quot; TX. Interested in geothermal electric power generation. Explained the limitations and requirements for a good application - temperature, size, load factor etc. Suggested that he contact the GRC for more info.</td>
</tr>
</tbody>
</table>
11/11/97
Rericha, Nick
GMI Engineering & Management Institute
Flint, MI
reri8011@nova.gmi.edu

Re: Electric Power

Our thermodynamics group was recently assigned a project which requires us to analyze a geothermal power plant. We would appreciate it if you could e-mail us any information you have on specific power plants (mass flow rates, steam properties, etc.). Provided them with the link to the GRC website and where to look for power plant information also provided them with a copy of the information for one of the power plants at Heber. Received a reply on the 18th. They found a good reference book and are using one of the power plants listed on the GRC page. Thank you!

11/12/97
Gary Schwisow
Marsing, ID

Re: Greenhouses

He is a geothermal greenhouse operator in SW ID - Tomato (or Tomato if you are the vice president). needs to put more heat on the floor to combat gray mold problem. Discussed output (will be low due to his 166 F temp). Suggested that plain PE would be a lot cheaper than the EPDM that he was thinking of. Sent manufacturers names.

11/12/97
Johnston, Janis
PO Box 3293
RM. 406, Ross Hall
Laramie, WY 82071-3293
janis@uwyo.edu

Re: Industrial

Saw the article on heap leaching by Trexler, Flynn and Hendrix. Was wondering if anyone could tell me when and how the process originated? Summarized the article and noted the references to two other publications by the same gentlemen. She asked for copies of the other two publications. Sent them to her.

11/12/97
Schaper, Marianne
United Nations, CEPAL
Casilla: 179-D
Santiago, Chile
(562) 210-2293

Re: GHP

Would you please send me a copy of your "Prospective Geothermal Heat Pump Owner Information Survival Kit"? Thanks and kind regards.

11/12/97
Tseng, Dennis
Lynbrook High School
Frungy@aol.com
San Jose, California

Re: General

I'd just like to thank you on behalf of all the oxford debate people out there who haven't done their cases until just now. Thanx

11/13/97
Atlantis Enterprises
Klamath Falls, OR
541-850-9096

Re: Resource/Wells

He is a health food (dietary supplement) manufacturer here in town using propane to dehydrate his product (algae?) wants to know where the local resources are. 6,000,000 Btu/hr peak in the process. Explained the 3 primary areas and suggested that the Klamath Hills might be best if he couldn't locate downtown to use the city system.

11/13/97
Ralph Lynn
16720 E Clinton
Sanger, CA 93657

Re: GHP

He has a couple of open loop systems on his farm. Doesn't like wasting water and asked about changing to closed loop. Explained that he could drill a second well and put the water back in the ground instead of going to an closed loop. Depending on the required well depth, it might be a lot cheaper than going closed.

11/14/97
Chris Sharpe
cssharpe@duke-energy.com

Re: General

Email messages to 4 TC 6.8 members today reminding them that I need their ballots on the ASHRAE chapter.

11/14/97
Marty
Monty's Construction
Klamath Falls, Or
(541) 882-9047

Re: Resource/Wells

Looking into getting a tax credit and need information concerning the steamer well on Old Fort Rd. Dixon Addition Lot 8. Interested in temp., depth, and flow. Faxed him two temperature logs and the drilling log.
<table>
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<tr>
<th>Date</th>
<th>Subject</th>
<th>Recipient</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/14/97</td>
<td>Re: General</td>
<td>Phetteplace Gary</td>
<td>Email to Gary (chair of TC 6.8) on the progress on the chapter. All votes in except Pat Jeff and Chris. As soon as the SI version is approved I will begin on the communist units version.</td>
</tr>
<tr>
<td>11/14/97</td>
<td>Re: Resource/Wells</td>
<td>Sal Pantano Canby, CA</td>
<td>Email to Sal with the suggestions for contacts to do the flow test/appraisal of his hot spring. Suggested Tom Flynn and Gerry Hutter.</td>
</tr>
<tr>
<td>11/17/97</td>
<td>Re: Electric Power</td>
<td>Andy Johnson MSA-TA Inc POB 4078 Butte MT 59702</td>
<td>Looking for cost data on power generation wells. He called to get a copy of our publications list. Suggested that the GRC might be a better organization for that info. Sent pub list</td>
</tr>
<tr>
<td>11/17/97</td>
<td>Re: General</td>
<td>Anna Carter Geothermal Education Office Tiburon, CA</td>
<td>Anna called looking for some slides for a publication that they are putting together. Leo Ray catfish operation and an Iceland slide that John may have. Coal pollution in China?</td>
</tr>
<tr>
<td>11/17/97</td>
<td>Re: Resort/Spa</td>
<td>Dee Dee UCSC San Diego, CA (619) 534-0851</td>
<td>Needs a contact person for Tecopa Hot Springs. The number on our website was disconnected. Told her where I obtained the information and also provided some phone numbers to some other hot springs in her area.</td>
</tr>
<tr>
<td>11/17/97</td>
<td>Re: GHP</td>
<td>Mattson, Mike 15303 NE 44th St. Vancouver, WA 98682 (503) 626-8245</td>
<td>I am in the process of planning a home with acreage. Please send more info. Sent a reply asking him if he could be more specific. He is interested in GSHP's systems. Sent a reply informing him of the Geothermal Heat Pump Information Survival Kit on-line. If any questions after view the publications, feel free to contact us.</td>
</tr>
<tr>
<td>11/17/97</td>
<td>Re: Aquaculture</td>
<td>Roger Peake California Energy Commission Sacramento, CA <a href="mailto:rpeake@energy.state.ca.us">rpeake@energy.state.ca.us</a></td>
<td>Email to Roger asking if he has gotten to reviewing the report on the California Desert Fish Farm. Haven't heard from him.</td>
</tr>
<tr>
<td>11/18/97</td>
<td>Re: Resource/Wells</td>
<td>Baryp Guyaguler Turkey e-mail: <a href="mailto:barisg@rorqual.cc.metu.edu.tr">barisg@rorqual.cc.metu.edu.tr</a></td>
<td>Email request for information on obtaining TOUGH2 computer program. Send reply on web site for information - forwarded from Marcelo Lippmann.</td>
</tr>
<tr>
<td>11/18/97</td>
<td>Re: General</td>
<td>Elisha Von Cline 3202 Lindenwood Dearborne, MI 48120 31-323-3534</td>
<td>Request for information on geothermal direct use for presentation in an energy class as the Univ. of Michigan</td>
</tr>
</tbody>
</table>
11/18/97
Eng. Carlos Bicudo da Ponte
Sociedade Geotermica dos Acores
Av. Infante D. Henrique 33 - 3 Dirt
9500 Ponta Delgada, Acores
Portugal

Re: Greenhouses
Request for contacts with companies interested in investing in greenhouse and aquaculture operations in the Azores. They will be using the waste water from a 5 MW geothermal power plant.

11/18/97
Jon McMullan
The Murland Partnership
23 Bedfork St.
Belfast BT2 7EJ Northern Ireland

Re: Space Heating/Cooling
E-mail request for information on the operation of a lithium-bromide chiller. Send two articles on the subject - one from our Guidebook and the other from ASHRAE.

11/18/97
Mary Ann Ericsson
33186 Myrna
Livonia, MI 48154

Re: GHP
Building a new home and considering using a GHP. Discussed the different system types and whether they will be on a well or not (open loop). Suggested that I send the Survival kit and she call back with any add'l questions.

11/18/97
Miklos Antics
Oradea, Romania
geofluids@rtns.ro

Re: General
Assisted in forwarding abstract and title for a paper to the Stanford Reservoir Engr. Workshop - via e-mail.

11/18/97
Prof. Victor H. Forjaz
Azores Volcanological and Geothermal Observ.
PO Box 12
S. Miguel, Acores, Portugal
Fax: 351-96.672.100

Re: Greenhouses
Request for information of development of greenhouse and aquaculture project on the Azores using waste heat from a 5 MW power plant. Sent addresses of possible places to advertise and several publications on the subject.

11/19/97
ltleval@cyberhighway.net

Re: Resource/Wells
Email response to a request for information on drilling depth and temperatures. He is using a spring to grow "wetland plants" and wants to expand. Needs to get more water. Suggested that he should get together on the phone to discuss it. Call when he gets a chance.

11/19/97
Jim Fogerty
Sierra Valley, AZ

Re: GHP
Dave Anderson referred him to us. Pastor of church in Sierra Vista AZ. 200 person congregation. 110 F in the summer. Could they bury a pipe in the soil and draw air through it into the building. Explained the limitations and suggested that they invest the money they would spend on the buried pipe in a more efficient system. Discussed GHP.

11/19/97
Michael Weitlauf
KY
mweitlauf@mail.kytc.state.ky.us

Re: GHP
Email response to a question about using a buried pipe to draw air through and into a house to provide heating or cooling. Went through the usual explanation about the limitations and problems. Referred him to FAQ that covers this issue in to Survival Kit.

11/19/97
Mislavsky, Alex
19 Kimberly Way
River Edge, NJ 07661
(201) 967-7566

Re: General
Requested several technical papers. This is for our Debate Team research. The topic is alternative energy, and my partner and I chose geothermal heat as an alternative. Thank you. Credit will be given when we use quotes in our debates. e-mail ragnarok@cybernex.net
<table>
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<tbody>
<tr>
<td>11/19/97</td>
<td>Rich Peoples</td>
<td>Email response to an engineer in TO GAS INDUSTRY about GHP for his home. He asked about changing over an air to air to GHP. Advised him of new Paradigm unit from Climate Master which is made just for this. He was interested in do it yourself. Suggested that to split system might be easier to install but to package unit would have longer life.</td>
</tr>
<tr>
<td>11/20/97</td>
<td>Reynaldo Corral</td>
<td>Re: Electric Power</td>
</tr>
<tr>
<td>11/20/97</td>
<td>Steve Kavanaugh AL</td>
<td>Re: GHP</td>
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<td>11/20/97</td>
<td>Steve Kavanaugh AL</td>
<td>Re: GHP</td>
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<tr>
<td>11/21/97</td>
<td>Bill McLeod Elko, NV</td>
<td>Re: District Heating</td>
</tr>
<tr>
<td>11/21/97</td>
<td>Doug Scott Minden, NV</td>
<td>Re: Space Heating/Cooling</td>
</tr>
<tr>
<td>11/21/97</td>
<td>James Mallay Carson City, NV</td>
<td>Re: Aquaculture</td>
</tr>
<tr>
<td>11/21/97</td>
<td>Tom Flynn Reno NV</td>
<td>Re: Aquaculture</td>
</tr>
<tr>
<td>11/22/97</td>
<td>Jeri Alger <a href="mailto:jalger@ashrae.org">jalger@ashrae.org</a></td>
<td>Re: GHP</td>
</tr>
<tr>
<td>11/24/97</td>
<td>Ellick, Neil Altoona, PA 16602-4827</td>
<td>Re: GHP</td>
</tr>
</tbody>
</table>
11/24/97
Peter Birkle
IIE - Cuernavaca
Mexico
e-mail: birkle@iie.org.mx

Re: General
E-mail request for assistance on Stanford Workshop in January. Forwarded request to Roland Horne at Stanford.

11/24/97
Tak Yoshida
Portland, OR
503-238-2518

Re: Equipment
Tak called to say he had gotten to zone change for resort development as of Tue. Needs some names of engineers to design to pipeline. Said I would fax some Portland area consultants.

11/25/97
Kyle Guzlas
220 Grove Ave.
Prescott, AZ 86301
e-mail: aconnor@mwaz.com

Re: GHP
E-mail request for information on geothermal heat pumps. Mailed packet of information.

11/25/97
Steve Kavanaugh
AL
skavanaugh@coe.eng.ua.edu

Re: General
Email to Steve advising him that I need his camera ready diagrams for chapter. (ASHRAE handbook of Applications chapter 29 Geothermal Energy) I will do to unit conversions.

11/25/97
Tak Yoshida
Portland, OR
503-238-2518

Re: Equipment
Fax to names to Tak for to pipeline job. Gave him CBGK, Balzhiser and Goss.

11/26/97
Jeri Alger
jalger@ashrae.org

Re: GHP
Email to Jeri at ASHRAE with editorial comments on Chapter 6 of Kavanaugh/Rafferty GHP book.

11/26/97
Jeri Alger
jalger@ashrae.org

Re: GHP
Email to Jeri about to changes required on Chapter 6 of to Kavanaugh/Rafferty GHP book. Advised her that to figures are grossly out of phase with to text. Other changes are minor editorial stuff.

11/27/97
Roger Hulft
OIT Physical Plant
Klamath Falls OR
541-885-1693

Re: Greenhouses
Roger would like to get to OIT greenhouse back up is working on a proposal to get to funding. Needed some background on to type of heating system to use and to hardware requirements. Made to sales for heating unit and equipment, controls.

12/01/97
Lionel Arruffat
France
Lionel.Arruffat@etud.insa-tlse.fr

Re: GHP
Email response to a request for information about to names of GHP equipment manufacturers. Advised him that to info is on to web site under to Survival Kit area

12/01/97
Matteo, Moreni
EPFL-Swiss Federal Institute of Technology, Lausanne
Civil Engineering Dept. Soil Mechanics Lab.
Lausanne, Switzerland 1015
4-(121) 693-2303

Re: Equipment
M a research assistant. Was wondering if you have heard of foundation piles used as heat exchangers. I am very interested in to thermal effects to heat exchanger has on to concrete pile. Would you have any info on this subject. Replied back with we don't know of any research. To Geothermal heat Pump Consortium might have some info, also you might want ot contact Ladislaus Rybach. Provided addresses.
<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
<th>Email</th>
<th>Subject</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/02/97</td>
<td>Gene Gudmunson</td>
<td><a href="mailto:spa-hot-springs@worldnet.com">spa-hot-springs@worldnet.com</a></td>
<td>Re: Greenhouses</td>
<td>He is putting in a greenhouse at his hot springs and called to get general info on to application. Discussed system types and crops that other growers are using. Discussed to importance of having a knowledgeable grower involved. Suggested that we send to greenhouse developer's package and then have further discussion.</td>
</tr>
<tr>
<td>12/02/97</td>
<td>Sofia Santos</td>
<td><a href="mailto:sofiasantos@random.com">sofiasantos@random.com</a></td>
<td>Re: Resort/Spa</td>
<td>Request for information on obtaining reservations at to Greenbrier at White Sulphur Hot Springs Resort, WV. Gave her two phone numbers and rates for a single room.</td>
</tr>
<tr>
<td>12/02/97</td>
<td>Tom Flynn</td>
<td><a href="mailto:thomas.flynn@random.com">thomas.flynn@random.com</a></td>
<td>Re: Resource/Wells</td>
<td>Tom called to talk about calculating annual energy displaced for a resource. Wanted to use 500xGPMxdeltaT. Suggested that it would be more accurate if a load factor was included since few applications use energy 100% of to time. Discussed to typical values. He is working on to Kelly Hot Springs.</td>
</tr>
<tr>
<td>12/03/97</td>
<td>Gary Phetteplace</td>
<td><a href="mailto:gephet@hanover-crel.army.mil">gephet@hanover-crel.army.mil</a></td>
<td>Re: GHP</td>
<td>Several email messages over to last few days to Gary dealing with details of to seminar in Tampa. Use of to Kavanaugh/Rafferty book, status of ASHRAE's work on it. Is Bill Sullivan going to participate in it? Airline tickets?</td>
</tr>
<tr>
<td>12/03/97</td>
<td>Jim Phetteplace</td>
<td></td>
<td>Re: Equipment</td>
<td>Jim called to discuss to Yoshida project in Washington. He said that none of to engineers were interested due to small size of to project - a pipeline. Asked if we could do to design. Told him that we don't do that but suggested that Brian Brown might be able to do it. Jim thought that to distance would be a problem there. He will check around in to Portland area some more.</td>
</tr>
<tr>
<td>12/03/97</td>
<td>Lionel Arruffat</td>
<td><a href="mailto:insa@random.com">insa@random.com</a></td>
<td>Re: Equipment</td>
<td>Requested information or some address for manufacturers on geothermal heat pumps. Sent a reply with URL's for our Vendor Listing page, to GHP and IGSHA.</td>
</tr>
<tr>
<td>12/03/97</td>
<td>Larry Holzgang</td>
<td></td>
<td>Re: Resource/Wells</td>
<td>Faxed to well data to Larry for to site near to airport. Looks like water in to 85 to 90 F range in a depth interval of 100 to 300 ft - a lot of variation though. Wells closest to to site are to most encouraging. Told him that with a bare floor this temp could maintain a reasonable temp in to space for a factory.</td>
</tr>
<tr>
<td>12/04/97</td>
<td>Frank Patnca</td>
<td><a href="mailto:trishfrank@aol.com">trishfrank@aol.com</a></td>
<td>Re: Electric Power</td>
<td>Called regarding to article she was writing. Asked if we could review what she had written, she would greatly appreciate it. She faxed us a copy and John looked it over and added comments. Faxed to paper back on to 8th with to comments. Fax (619) 270-1987. email <a href="mailto:trishfrank@aol.com">trishfrank@aol.com</a></td>
</tr>
<tr>
<td>12/04/97</td>
<td>Richard McGrain</td>
<td></td>
<td>Re: GHP</td>
<td>Request for information on geothermal heating. Since to request was from Illinois, we assumed that it was for geothermal heat pump information. Sent Survival Kit.</td>
</tr>
</tbody>
</table>
12/05/97  
Eduardo Velasco and Emigdio Espinoza  
CFE  
Los Azufres  
Mexico  
tel/fax: 52-43-15-32-46

Re: Industrial  
Visit by two representative from CFE, Los Azufres, Mexico. We met with them and provided them information and publications on fruit drying, timber drying, spas, and DHE. Also gave them a tour of to OIT and RF heating systems.

12/05/97  
Higbee, Chuck  
Tiller, OR

Re: General  
Talked regarding to graphics he would be using for to Economic Chapter of to Guidebook. He would save to file as a QuatroPro file, so we can use it.

12/05/97  
Wolf, Larry  
OIT  
3201 Campus Drive  
Klamath Falls, OR 97601

Re: General  
Talked to Dr. Wolf and his brother. Explained what we do in to office and general geothermal.

12/06/97  
Mike L'Ecuyer  
Geothermal Heat Pump Consortium  
Washington, DC  
lecuyer@ghpc.org

Re: GHP  
Email to Mike about to publications that I said I would send him. To ASHRAE paper that Pat Hughes wrote is to only one which compares to available design methods for closed loop systems.

12/06/97  
Kedaid Fatma Zohra  
Bat. Eq. Rue Amar Souiki Elbiar  
Alger  
Algeria 16030

Re: General  
Request for information on attending universities in to US and how to have international transcripts evaluated. Sent information on World Educational Services. Met this person at a geothermal district heating meeting in Cesme, Turkey.

12/08/97  
Trisha Frank  
1134 Sapphire St.  
San Diego, CA 92109  
619-274-1987

Re: General  
Reviewed alternative energy/geothermal article prepared for Native Power a project by to Native American Renewable Energy Education Project, Energy and Resources Group, U of CA, LBL. Reviewed article and made numerous suggestions for changes and additions.

12/09/97  
Hanyu, Yuichiro  
1835 Loyola Dr.  
Burlingame, CA 94010  
(650) 692-5830

Re: Resort/Spa  
Wanted to confirm our reservation at Furnace Creek Ranch. Sent a reply that we are not them and they will need to contact them directly by phone.

12/10/97  
Adamis, Paul  
Oregon State University  
Corvallis, OR  
adamusp@ucs.orst.edu

Re: Resource/Wells  
Wanted some information regarding to well and spring database we had for Oregon. Referred him to Gerald Black who completed to database for Oregon to get to complete report. Also e-mailed him to database files.

12/10/97  
Gonzalez Rivera, Daniel S.  
m124664@uach.mx  
Mexico

Re: Greenhouse  
Looking for information about growing tomatoes in greenhouse conditions. Provided some URL addresses to publications concerning greenhouse tomatoes that we used in our greenhouse package.
Re: District Heating
E-mail request for information on geothermal district heating systems in to US - especially those around 60°C (140). Send e-mail answer and mailed several publications describing our district heating systems in to US. They may visit to US in early 1998.

Re: Industrial
Send information by FAX on geothermal lumber drying - as requested at a meeting at GHC last week. They are planning to design and build a lumber drying facility for commercial use at Los Azufres.

Re: Greenhouses
Requested assistance on design of heating system for existing greenhouse. Advised to use smaller tubes, directly under planter boxes since resource temperature was on 90°C. Supplies cut flowers, herbs and vegetables for nearby resort near Chico HS (just north of Yellowstone)

Re: Space Heating/Cooling
Email response to a request for help with a space and domestic hot water heating application. They are expanding and want to heat a new 60 x 80 building. Also having trouble with temperature control on to existing domestic hot water system. Advised that I needed to water temperature for to floor slab design. Asked for a diagram of to DHW system so that I can figure out how to fix it.
<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Message</th>
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<tbody>
<tr>
<td>12/16/97</td>
<td>Re: Electric Power</td>
<td>E-mail request for information on geothermal power generation for an EE university student (SIAST) in Moose Jaw, Saskatchewan, Canada. Listed reference and gave web site addresses for more information.</td>
</tr>
<tr>
<td>12/16/97</td>
<td>Re: Resource/Wells</td>
<td>Wanted information concerning chemistry for northern California and southern Oregon. Wanted to know general mineral profile. Provided him with names and addresses for to low-temperature reports for Oregon, California, and Colorado.</td>
</tr>
<tr>
<td>12/16/97</td>
<td>Re: GHP</td>
<td>Email response to a request for Direct Use/GHP info. Advised him of location of a warm well near his building site. Gave him section, subsection data. Also discussed potential for open loop based on a normal temperature well. Suggested that for a single home to open loop would probably be a better way to go than to risk of a deeper direct use well.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: Greenhouses</td>
<td>He is working on modification of a greenhouse system in Santa Barbara CA and found out about our greenhouse equipment selection spreadsheet. Just wanted to supporting info.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: Space Heating/Cooling</td>
<td>Calculations for floor slab system for Surprise Valley Mineral Springs. Got an email from Curt Rose. Has 17 gpm and wants to heat 60 x 80 building. 1 ft/sqft, 4800 ft of pipe, @600 ft per loop that is 8 loops. approx 2 gpm/loop. OK if to water temp isn't too high.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: GHP</td>
<td>He is working on to Arco Arena system in Sacramento. Piping failure in to header connections. Saw my name in to ASHRAE schedule for to GSHP short course. He didn't think that a system with pipe buried in to ground would work. Discussed these in comparison to open loop systems. He designed to Siskyou County jail system.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: Aquaculture</td>
<td>He is working on plans for an aquaculture operation with his brother in law. Have talked to us before. Called about contacts for resources in to CA OR area. Said I could FAX him a list of contacts. Also advised that to local developers (Brothers WEST Aqua) that we have been working with have brought in a well that produces more than they need. Will sell water to others. Gave him to number.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: Electric Power</td>
<td>He is a manufacturer of some kind of machine that produces electricity (?) on a very small scale (3kW). Looking for funding to develop it. Explained to GHC and what we do and suggested that he probably would be better off contacting DOE directly.</td>
</tr>
<tr>
<td>12/17/97</td>
<td>Re: GHP</td>
<td>Email to Steve advising him that I have finished to 3 item for to newsletter (Outside to Loop). will be transmitting it via email as soon as Toni has it all together.</td>
</tr>
</tbody>
</table>
12/17/97
Stu Simpson
Washington State Dept of Gen Svgs
Olympia, WA
360-902-7199

Re: GHP
Stu called to discuss a possible GHP application in Bainbridge IS WA. 63,000 sq ft, no gas oil or propane. Looking at air to air heat pumps as to alternate. Talked about mild climate and low cost of air to air. Could be a good application though. What about he budget.

12/18/97
Abel H. Pesce
JEFE Departamento de Geoterapia
Inst. de Geologia - y Recursos Minerales
Av. Julio A. Rosca 651 - 8th Piso - Sector 10-1322
Buenos Aires, Argentina

Re: Aquaculture
Aquaculture information requested at to ECLAC meeting in Santiago, Chile in November. Sent several of our publications. They are developing an aquaculture project (Malaysian shrimp) in Argentina.

12/18/97
AC4NCB@aol.com

Re: Resort/Spa
Looking for more information on Castle Hot Springs, AZ. Do you have information concerning cost, camping, etc? Sent a reply informing him we did not have that type of information.

12/18/97
Dr. Enzo Ducci
Consultant for ECLAC (SEPAL)
Via Cenina 185
Capolona 52010 (AR) ITALY

Re: Aquaculture
Request for information on aquaculture - from to ECLAC meeting in Santiago, Chile in November. He is assisting with a Malaysian prawn development in Argentina.

12/18/97
Eliot Estes
OIT Phys Plant
Klamath Falls, OR
541-885-1690

Re: Equipment
Went over to log of OIT well #1 with Ray. Found static level about to same (+/- 10 ft) as original. Called Eliot and suggested that if they want to use to same motor that they tell to vendor that they have a 520' pumping level, 15' wellhead loss and 60' to to top of to tank. Let to vendor size a flow to to 75 hp available. Add two lengths of column for safety.

12/18/97
Fernando Trujillo
EcoTermia
Onofre Jarpa 10107-G
La Reina, Santiago
Chile

Re: GHP
Request for information on geothermal heat pumps - at to ECLAC meeting in Santiago, Chile in November. Provide him with several publications

12/18/97
JB Singh
jape7@erols.com

Re: GHP
Email response to JB about his proposal to to Consortium. He wants to use our book (Kavanaugh/Rafferty) in to seminars he is proposing to do for to GHPC. Wanted to know when it will be available and what to price will be. Advised him that is up to ASHRAE but that they are hoping to have it out in Jan.

12/18/97
Juan Rojas Erazo
Geologo Senior - ENAP CL
Ahumada 341
Santiago, Chile

Re: General
Requested general information on low temperature geothermal development and use - at to ECLAC meeting in Santiago, Chile in November.

12/18/97
Mary K. McClellan
Project Finance Specialist
International Institute for Energy Conservation
750 First St. NE - Suite 940
Washington, DC 20002

Re: General
General information on to GHC requested in to ECLAC meeting in Santiago, Chile in November.
12/18/97
Orhan Mertoglu
Orme Geothermal
Hosdere Cad. No. 1907-8-9
06550 Cankaya/Ankara, Turkey
fax: 90-312-440-57-38

Re: District Heating
Requested information on travel to Klamath Falls and to Yellowstone for manager of Orme Geothermal, a Turkish district heating company and for Turkish Minister of Environment. Looked up schedule for them and sent invitation to visit GHC for a tour of our district heating systems.

12/18/97
Paul Stewart
1320 Pacific Terrace
Klamath Falls, OR 97601
541-884-7438

Re: Equipment
Request for information on how to solve a problem of corrosion of downhole heat exchangers. Sent information and articles, and recommended sealing to top of to casing as to best. Other solutions included isolation unions and sacrificial anode protection. Also, look up drilling log for his well.

12/18/97
Robb Barnitt
14 Townsend St
Waltham, MA 02154
e-mail: Rbarnitt@aol.com
phone: 781-647-9606

Re: General
E-mail request information on graduate programs in geothermal. Referred him to Stanford, SMU, and CA-Riverside in to US. Also sent information on to Geothermal Institute in Auckland, NZ and to UNU at Reykjavik, Iceland.

12/18/97
Skye Klutts
e-mail: skye@scottsbluff.net

Re: General
E-Mail request for "negative" information on geothermal development and use for a research paper. Not sure what he wanted by referred him to articles from GRC transactions and WGC95 proceedings. Gave him some general examples such as competition with NO, gases being released, subsidence, land disturbance, etc. Pointed out to him that to impact of geothermal was far less when compared to fossil fuel development - and for that reason we tend not to dwell on to "negative" aspects.

12/19/97
Eva Magalay
CVPC Main Campus
6200 Dumaguete City, Negros Oriental
Philippines
e-mail: vea3@hotmail.com

Re: Electric Power
E-mail request for information on geothermal production and safety in geothermal plants. Gave her contacts at UNOCAL, Ormat and Fuji Electric Co.

12/19/97
Marnell Dickson
IIIG
Pisa, Italy
marnell@iirg.pi.cnr.it

Re: General
Email response to publishers of a book that I contributed a couple of chapters to a few years ago. They want to update and republish. Advised them that same material will be published (in updated form) in our GHC design guide this year. Suggested that I didn't see any reason to publish to same thing twice.

12/22/97
termancy@webtv.net

Re: GHP
Email response a request for information on an open loop GHP tied to an artesian well. Advised that water quality is important (HZS, sand, hardness). Gave him location of manufacturers on our site. Advised that he needed to make sure that he was getting an extended range unit. Also make sure that to well has sufficient pressure to provide adequate flow through to heat pump.

12/23/97
Marcelo Lippmann
LBL, Bldg 90-1116
Berkeley, CA
e-mail: mlippmann@lbl.gov

Re: Aquaculture
E-mail request to review translations of a geothermal paper written by Abel Pesce of Argentina on aquaculture and greenhouses. Send comments back to him.

12/27/97
Schalmo, Ross
RSlam@aol.com

Re: General
Doing a science project on geothermal energy. Was wondering if you had any more information on geothermal energy. Sent a reply and provided him with some other geothermal webpage sites. If he could be more specific about what he is looking for we could help him.
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<tbody>
<tr>
<td>12/29/97</td>
<td>Dan Daily</td>
<td>Re: General</td>
<td>Requested approval to use material from our recent Quarterly Bulletin on South Dakota. Gave permission and faxed additional material of to Williston Basin and contacts for geothermal heat pumps.</td>
</tr>
<tr>
<td>12/29/97</td>
<td>Harvey Everett</td>
<td>Re: GHP</td>
<td>Email response to a request for help with a pond loop that is having problems. To system was installed in very shallow water and it is sometimes exposed partially due to water level changes. He asked about going to open loop. Advised that it might be worth trying to move to loop out to deeper water if possible. Provided to usual discussion on cautions for open loop systems. Gave him a rule of thumb of 2 gpm/ton for open loop.</td>
</tr>
<tr>
<td>12/29/97</td>
<td>Nilgun Basarir</td>
<td>Re: District Heating</td>
<td>Request for assistance with travel plans to Klamath Falls, Yellowstone and Orlando for representatives of Orme Jeotermal of Ankara, Turkey and for to Minister of to Environment, Dr. Imren Aykut. Gave recommendations and approval of schedule for early February. We will give them a tour of to OIT and city district heating systems on to 3rd of Feb.</td>
</tr>
<tr>
<td>12/30/97</td>
<td>Harvey Everett</td>
<td>Re: GHP</td>
<td>Email response to Harvey on my message to him. He asked about to impact of to plastic piping on to performance of to system. Wouldn't copper be better. I explained to although there is a 100 to 1 difference in to thermal conductivity of to material, when to other thermal resistances in to overall heat transfer are taken into account, to difference is much smaller (about 3 or 4 times). Also copper is subject to much high fouling losses than plastic.</td>
</tr>
<tr>
<td>12/30/97</td>
<td>Clarence Madden</td>
<td>Re: Space Heating/Cooling</td>
<td>Email response to a request for help with a possible space heating application in Aguanga,CA. Explained to TA program and our capabilities.</td>
</tr>
<tr>
<td>12/31/97</td>
<td>Garvelink, Steve</td>
<td>Re: Resorts/Spa</td>
<td>Was looking at to Map of to US Geothermal Resources Area and I would like to know if there are any hot springs in to Alabama/Georgia Tennessee/North Carolina areas. Replied with to name and address for three places.</td>
</tr>
<tr>
<td>12/31/97</td>
<td>Jeffery Tucker</td>
<td>Re: Electric Power</td>
<td>He is developing some kind of mining operation on an island in to Pacific and wondered about to possibility of using geothermal to provide to required power. Discussed to size of his needs and to load factor. Sounds like he would be better off conventional especially if he will have continuous access to shipboard power. Gave him to GRC number.</td>
</tr>
<tr>
<td>12/31/97</td>
<td>Tom Flynn</td>
<td>Re: Space Heating/Cooling</td>
<td>Tom called to say that he had been talking to to owners of Wally's Hot Springs and that they are in to process of designing 150 time shares for construction at to site. Tom suggested that they use to geothermal to heat them and they weren't even aware that it could be done. He will pass our name along to them.</td>
</tr>
</tbody>
</table>
3.0 **R & D ACTIVITIES**

The direct use research development objectives are to aid industry in resource and technical development problems, and to investigate and analyze methods or approaches to reducing the cost of designing, developing and operating low- and moderate-temperature geothermal projects. The following is a summary of work recently completed by Kevin Rafferty, our staff mechanical engineer.

3.1 **Model Construction Specifications - Subtask 2.1.** Some preliminary material has been obtained on line shaft submersible pumps and plate heat exchangers. Materials on well specifications will be reviewed and summarized.

3.2 **Comprehensive Aquaculture Developer Package - Subtask 2.2.** The aquaculture pond heat loss design portion of the package has been updated and rewritten as part of the Design Guidebook. Data is being gathered on the industry, the temperature and habitat requirements for common species, current market price information and typical operation cost for aquaculture operations.

4.0 **GEOTHERMAL DIRECT USE ENGINEERING AND DESIGN GUIDEBOOK**

All the chapters for the guidebook, except Chapter 18 on Regulatory and Commercial Aspects, have been revised, formatted, and have a first review. All the drawings have been completed, scanned and incorporated into each chapter. Some additional editing will be done before submitting the final copy to the printer. We estimate a final completion date of the end of January.

5.0 **TECHNOLOGY TRANSFER**

The Geo-Heat Center staff prepares and publishes information and educational materials on direct-heat applications of geothermal energy that include: a Quarterly Bulletin, technical papers, computer programs and progress monitor activities. In addition, a geothermal technical library, and tours of geothermal facilities in the Klamath Falls area are made available to the public.

5.1 **Geo-Heat Center Quarterly Bulletin.** Bulletin Vol. 18, No. 4, devoted entirely to geothermal activity in South Dakota, was distributed in December to 1622 domestic and 382 foreign subscribers. Bulletin Vol. 19, No. 1 is in preparation and will be published in February. Articles will include:

2. “Downhole Heat Exchangers” by Gene Culver and John W. Lund
4. “Geothermal Piping” by Kevin Rafferty.
6. “Material Selection Guidelines” by Peter Ellis

5.2 **GHC Webpage Updates.** The Geo-Heat Center provides a webpage maintained by Tonya Boyd: http://www.oit.edu/~geoheat consisting of over 1700 files, including all the articles from the Quarterly Bulletin since Vol. 16, No. 4. Links are provided to other geothermal web sites. The following information is on usage for the period 10/24/97 to 12/31/97 (a full quarter’s data will be available next reporting period, as the OIT system was upgrade during this quarter, thus data from the entire period were not available):

<table>
<thead>
<tr>
<th>Total Users:</th>
<th>7,727</th>
<th>Average users per day:</th>
<th>112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hits:</td>
<td>19,483</td>
<td>Average hits per day:</td>
<td>282</td>
</tr>
</tbody>
</table>
Average time user spends with our website: 11 minutes

User Sessions from to US: 5340 69%
Users from international: 1246 16%
Unknown users: 1141 15%

Total users during the weekday: 6151 80%
Total users during the weekend: 1576 20%

Users during work hours: 4041 52%
Users after work hours: 3686 48%

5.3 Technical Papers, Presentations and Tours

1. Kevin Rafferty made three presentations at the GEA West Coast Heat Pump Conference held during the GRC Annual Meeting in Burlingame, CA. His topics were: “Anti-freeze Issues,” “Design of Commercial Closed Loop Systems,” and “National Closed Loop Bore Hole Completion Standards.” Approximately 50 persons attended this meeting. He also made a day-long presentation on “Open Loop Design” at a US Army Corps of Engineers training session in Tampa, Florida attended by approximately 20 persons.

2. Kevin Rafferty, along with co-authors Bill Murphy of the University of Kentucky, and Steve Kavanaugh of the University of Alabama, completed and had accepted Chapter 29 “Geothermal Energy” for the 1999 ASHRAE Handbook of Applications. Rafferty was chair of the subcommittee charged with the task of preparing the chapter.

3. Kevin Rafferty in cooperation with Steve Kavanaugh of the University of Alabama have completed the writing of the first issue of a geothermal heat pump newsletter “Outside to Loop” which is in the process of being printed. This newsletter, of a technical nature, will be sent to interested engineers and designers of geothermal heat pump systems.

4. Tanya Boyd made a presentation at the GRC Annual Meeting on the Geo-Heat Center web page in the Direct Use session. She demonstrated the content and use of the web page using a “data show.”

5. John Lund attended the International Geothermal Association Board of Directors meeting in Lakeport, CA and the GRC Board of Directors meeting at the GRC Annual meeting in Burlingame, CA. He hosted several of the IGA board members in Klamath Falls and arranged for their transportation to Lakeport and Burlingame. He chaired the Direct Use session at the GRC Annual meeting and presented a paper on “Geothermal Research at the Geo-Heat Center, Oregon Institute of Technology.” He also made a presentation on “Direct Use of Geothermal Energy” at the Geothermal Education Office training session for grade school and high school teachers during the GRC meeting. During the opening session he presented to GRC’s first Special Citation Award in honor of Baldur Lindal for his “significant contribution to the geothermal industry through his life’s work.” The award was accepted by his widow, Asdis.

6. John Lund presented three papers at international meetings. At the International Course on Geothermal District Heating Schemes held in Cesme, Turkey, he presented a paper on “Design and Performance of Direct Heat Exchange Geothermal District Heating Schemes” (written by Robert Harrison of Great Britain) and “Geothermal District Heating” (co-authored with Paul Lienau). He also discussed the development and experience with various district heating systems in the U.S. This meeting was attended mostly by persons from the European Community. At the United Nations Economic Commission for Latin America and the Caribbean (ECLAC or SEPAL in Spanish) meeting in Santiago, Chile he presented a paper on “Direct Use Heat Utilization of Geothermal Resources.” This meeting was attended entirely by geothermal representatives from Central and South America.

7. John Lund chaired an Education Committee meeting of the GRC in Richmond, CA. Among other items discussed was the formation of a Geothermal Training Center similar to those at the Geothermal Institute in New Zealand and the United National University in Iceland. A “white paper” on the subject has been prepared by John Lund.
8. John Lund and Tonya Boyd have been working with co-editors Susan Hodgson and Raffaele Cataldi on the paper for the geothermal historical book: "Stories from a Heated Earth, Our Geothermal Heritage." This volume is being funded by GRC and IGA. The 35 international papers should be published in fall.

9. Tours of the OIT geothermal system, private home heating system and the city of Klamath Falls district heating system were given to (1) eight students from Central Oregon Community College in Bend, (2) eight students from Lane Community College in Eugene, OR, (3) six international visitors attending the IGA Board of Directors meeting (Poland, Romania, New Zealand, Turkey and Iceland), (4) a Chinese visitor from the Institute of Geology, Chinese Academy of Sciences, Beijing, and (5) two engineers from CFE, Los Azufres geothermal field, who also received technical assistance on the design of fruit dehydration and lumber drying facilities.

5.4 Geothermal Library. During the period of October 1 to December 31, 1997, 4 new volumes were added to the library. The library now has a total of 5306 volumes cataloged.

5.5 Information Dissemination. The GHC provided publications to individuals according to the following topics:

<table>
<thead>
<tr>
<th>Topics</th>
<th>No. Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geothermal Heat Pumps</td>
<td>50</td>
</tr>
<tr>
<td>Space Heating/Cooling</td>
<td>5</td>
</tr>
<tr>
<td>District Heating</td>
<td>15</td>
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<tr>
<td>Greenhouses</td>
<td>19</td>
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<tr>
<td>Aquaculture</td>
<td>21</td>
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<td>Equipment</td>
<td>30</td>
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<tr>
<td>Resources/Wells</td>
<td>18</td>
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<tr>
<td>General</td>
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</table>

6.0 GEOTHERMAL PROGRESS MONITOR

6.1 California

Long Valley Seismic Activity

A restless Earth has shaken Mammoth Mountain 8,000 times this year, possibly signaling a coming volcanic eruption, scientists said recently. Speaking at the American Geophysical Union meeting, earthquake and volcano experts said an ancient volcanic region in the eastern Sierra, south of Mono Lake, is in the midst of the most intensive seismic activity seen in a century. The area is the location of the Casa Diablo binary power plants and a popular ski resort.

Most of the 8,000 earthquakes, measured at magnitude 1.2 or greater, have occurred since July. Recent weeks have been especially active: on Nov. 22 alone, 944 quakes were recorded. The most powerful one of the year occurred Nov. 30 and was magnitude 4.9. The epicenter was about two miles from the town of Mammoth Lakes and broke some glass.

Scientists can say with confidence that somewhere beneath the surface of the ground, molten rock is moving. The big question is whether and when it will come to the surface. The Long Valley caldera is the product of a volcanic eruption about 760,000 years ago. Having ejected magma, the Earth's surface sank more than one miles, forming an oval crater about 20 miles long by 10 miles wide. The last major eruption was 100,000 years ago.

Besides the earthquake swarms, the moving underground magma is evident in a swelling hump in the middle of the caldera. Scientists report that the caldera floor has risen by 30 to 31 inches since 1979, the start of the seismic activity; and by more than 2 inches in the just the past six months. Other indications of activity are emissions of carbon dioxide gas along the flanks of Mammoth Mountain that have killed large swaths of trees. There has also been some increased thermal output in the Hot Creek Gorge.

To swarm since the summer ranks as the third most-active since May 25-27, 1980, when four magnitude-6 quakes rocked the region without any eruption, and January 1983, when two magnitude-5.3 quakes struck without an eruption. The current swarms do not add up to much more than a 5.2 quake, according to Dave Hill, the chief Mammoth and Long Valley caldera scientist for the U.S. Geological Survey in Menlo Park. Another magnitude-4.3 quake hit on December 29, about 5 miles SSW of the Mammoth Mountain ski resort at a depth of 5.3 miles.
Although the area remains in what is called condition “green,” which describes quake activity that poses no immediate risk, the swarm nearly put the region into the more serious condition “yellow” on Nov. 22-23, when the quakes of magnitudes 4.8, 4.6 and 4.5 struck, and again on Nov. 30, when the magnitude-4.9 struck. Hill says Long Valley is “the top priority” in the nation’s volcano program because of the swarm. (Herald and News, Klamath Falls, Friday, Dec. 12, 1997, Tuesday, Dec. 30, 1997, and The Sunday Oregonian, Portland, Dec. 14, 1997 - by Edie Lau).

To Geysers Effluent Pipeline Dedication

Dedicated on October 16, 1997, the world’s first waste-water-to-electricity system became one of America’s premier examples of genuinely sustainable development. The waste water from three communities is recycled through a geothermal steam field to create enough electricity to sustain the communities’ power needs indefinitely into the future. A 29-mile pipeline carries 7.8 million gallons per day of treated waste water effluent and make-up water from Lake County, California treatment plants to three Geysers geothermal steam suppliers: Unocal Corporation, Calpine Corporation and the Northern California Power Agency (NCPA). These steam suppliers operate secondary pipelines that distribute the effluent to geothermal injection wells. Power plants operated by NCPA and the Pacific Gas & Electric Company (PG&E) receive steam supplies created by the effluent injection. Depending upon steam recovery rates from the injected effluent, the project will result in a gain of approximately 70 MW in power output. This will equate to as much as 625,000 MWh of clean, low-cost electricity generation annually for the originating communities and million of other California consumers. In addition to these energy benefits, the project will also provide a long-term, environmentally-superior method of waste water disposal for the originating communities of Clearlake, Lower Lake, and Middletown; and help create and retain jobs that depend on effective waste water systems and a viable geothermal industry.

Construction of the effluent pipeline and associated waste water treatment plant improvements total approximately $45 million. The public/private financing plan uses county waste water funds, federal and state financial assistance, and Geysers operator’s funding. The Geysers operators will also spend an additional $7 million on secondary distribution and injection facilities within the geothermal steam field.

The main effluent pipeline will be owned and operated by the Lake County Sanitation District to a point of delivery near Hwy 175, Unocal, Calpine and NCPA will own and operate the final segment of pipeline and the pump stations up to The Geysers. NCPA will use the effluent-based steam in its own power plants, and PG&E will purchase effluent-based steam from Unocal and Calpine for its power plants (from material developed by Mark Dellinger and Eliot Allen).

NCPA General Manager Michael McDonald introduced speakers at the dedication, including Lake County Supervisor Karen Mackey, Calpine Corp. Vice President Larry Krumland, Unocal Corp. Geothermal Division Vice President Randy Howard, California Energy Commission Executive Director Steve Rose, California Congressman Vic Fazio, Representative Val Dolcini, and California First District Congressman Frank Riggs.

Mark Dellinger, the Lake County Special Districts Energy & Resources Manager, was presented with the Special Achievement Award at the Annual GRC Meeting in Burlingame, for his work on the pipeline. Ted Clutter, Executive Director of the GRC, in presenting the award said: “I am pleased to make this presentation to Mark Dellinger for his perseverance over the past eight years to help make the Southeast Geysers Effluent Pipeline & Injection Project a reality. An untiring promoter, he worked intensely with the diverse interests that ultimately built the 29-mile pipeline that now delivers resource-sustaining injection water to The Geysers.” (GRC Bulletin, Nov. 1997).

Thermal Aqua Farm

Ocean Rich Fisheries, a geothermal Tilapia farm, is located on to west shore of the Salton Sea near Thermal, CA. Founded in 1989, Ocean Rich is one of to oldest Tilapia farms in to Salton Sea area. It has changed ownership several times. The property covers 70 acres, has about one half mile of shoreline, and at to highest point is only 7 feet above to level of to Salton Sea. There are about 20 small ponds in addition to tanks of various sizes and description. Geothermal wells varying in temperature between 85 and 117 degrees F are the source of water and heat. In the past, the facility was used to grow Tilapia, bass and catfish, but the present Vice President, Reay Dewandel, is concentrating on Tilapia. His Tilapia are sold in the live fish markets of the Los Angeles and San Francisco area. (California Aquatic Farming, Fall 1997 - Colin Bornia).
6.2 Nevada

**Reno District Heating**

U.S. Energy Systems, Inc., (Nasdaq: USEY) announced on December 3 that the Reno Energy Geothermal District Heating project in which the Company holds a note convertible into a fifty percent equity interest has received Compliance Order approval from the Nevada Public Utilities Commission. In a separate action, the project was granted its Special Use Permit from the Washoe County Planning Commission. The Company has participated in the funding of the developmental stages of the project since its inception last year.

When completed in mid-1999, Reno Energy will be one of the largest district heating facilities in the nation and also one the largest in the world. In its initial phase, Reno Energy will pump geothermally heated hot water to the South Meadows Business Park and the Damonte Ranch Development which initially will comprise approximately 40 million square feet under roof, and which are located within a three mile radius of Reno Energy’s geothermal well resources. The hot water will be used for heating, hot water supply, industrial process heat, and chilled water production.

The Reno Energy project can use excess geothermal heat from two geothermal electric power plants owned by the Company and two other geothermal electric power plants owned by Steamboat Development Corp., and equity owner in Reno Energy. In order to assure sufficient supplies of geothermal heat for the project in both its initial and future phases, the Company is also participating in the acquisition of an additional 120 acres of geothermal fields with substantial heat resources adjacent to the proposed facility.

Mr. Richard H. Nelson, President and CEO of the Company says “... it will be of significant benefit to the environment, especially in light of growing concerns over global warming. Environmental experts have estimated that the pollution avoidance from clean, green heat delivered from Reno Energy will be the equivalent of taking 40,000 cars off the streets in Reno.” (PR Newswire and U.S. Energy Systems, Dec. 3, 1997).

6.3 Wyoming

**Giant Geyser Eruptions**

Nearly dormant for 20 years, Giant Geyser has erupted 33 times this year. Giant has erupted every three to four days during the past two months, a rate match only between 1952 and 1955. After the 1959 Hebgen Lake earthquake, Giant rarely erupted and Grotto became more active --typical of shifts in the areas thermal energy. Giant is located in the Upper Geyser Basin, about a mile southwest of Old Faithful. It produces a tower of water up to 250 ft., twice the height of Old Faithful. The eruptions usually last for more than an hour, spewing about one million gallons of boiling water. Giant’s awakening coincides with a renewal of activity in the nearby Splendid Geyser, which has been dormant through most of this century. The Splendid, Giant and nearby Daisy Geyser, which also has shown increased activity, could be linked through the underground tunnels and vents responsible for much of Yellowstone’s thermal activity. (Oregonian, Nov. 16, 1997).

6.4 Papua New Guinea

**Sea Floor Mining**

For the first time, miners have laid claim to rich deposits of gold, silver and copper in the deep sea, foreshadowing a possible rush to open the oceans for metals and a possible fight with conservationists. The mining claim was made by Australians in the territorial waters of Papua New Guinea and covers an area of nearly 2,000 square miles. About a mile down, the site boils with volcanic hot springs whose rocky outcroppings are laced with iron, zinc, copper, silver and gold in high concentrations.

The miners say early assays show the claim holds the richest volcanic deposits ever found at sea and estimate their likely value at billions of dollars, enough, they say to justify the considerable cost of extracting them. Sample ores contain as much as 26 percent zinc, 15 percent copper, 7 ounces of silver and about 1 ounce of gold to the ton - all unusually high grades by terrestrial standards. The richness of the deposits, experts say, means that less processing on land will be needed to separate out the different metals and turn them into ingots.
Nautilus Minerals Corp., a Papua New Guinea company run by Australian businessmen and working with Australian government scientist, has been granted title to 1,974 square miles of the Bismark Sea in the territorial waters of Papua New Guinea, a tropical archipelago of the South Pacific. The two claim sites are located off the north-east coast of Papua New Guinea and south of the islands of New Hanover and New Ireland.

If the region's deep hot springs turn out to be as rich and widespread as surveys and samples indicate, the company plans to start taking preliminary hauls of 10,000 tons each in the next two years and large commercial loads in the next five years.

A key question is whether potential earnings can cover the high cost of raising the metals. The miners point to the general opening of the deep by advanced technologies - including robots, sonars and giant claws lowered from ships - and say profitability is likely. Deep mining they add, will eventually go global. "This is an industry that's going to turn conventional on-shore mining into a dinosaur," say A. Geoff Loudon, the chairman of Nautilus. "The world's big companies are going to get with this or disappear." He noted how the petroleum industry started on land and increasingly is moving into deep waters, spawning tons of new gear that seabed miners can exploit.

Analysts unconnected to the New Guinea venture are divided on its merits, with ocean experts tending to be excited and environmentalists wary. Ecologists see the claim as an assault on a poorly explored region of natural wonders. Some argue that protective steps are vital, and others would ban sea mining. The deep volcanic hot springs fascinate many biologists because they team with blind shrimp, giant tube worms and other unfamiliar creatures. The hot springs are also important in evolutionary studies and are increasingly seen as the possible birthplace of all life on Earth. The seabed miners acknowledge the ecological issues and say they will be careful to avoid wide destruction of the habitat, even while conceding that some creatures will die. "It's a valid concern, and it's something we're going to be very sensitive about," says Loudon. (Oregonian, Dec. 21, 1997 - William J. Broad, New York Times News Service).

6.5 Book Reviews

The Geyser's Album: Five Eras of Geothermal History. This is a beautiful new 52-page book form the California Division of Oil, Gas and Geothermal Resources, authored by Susan Hodgson (1997). It presents a panorama of geothermal events at The Geyser's in northern California, covering five historical eras overlapping in a mosaic of time. It is an intriguing story about man's interaction with geothermal energy in this unique resource area - including a wealth of photographs and information never before published. The eras covered are (1) untouched wilderness, (2) the time when Indians in the region first found the area 12,000 years ago, (2) organized tourism that began around 1848 and ended in 1980 when the last remnants of The Geyser's were razed, (3) the age of electric power development to light The Geyser's Resort starting in 1921 and ending in the early 1930's, and (5) modern power development which began in 1955, when the first modern steam well was drilled in the area. Copies are available for only $5.00 each from the California Division of Oil, Gas and Geothermal Resources, 801 K Street, MS-20-20, Sacramento, CA 95814-3530, telephone: 916-445-9686.

Charging Ahead - The Business of Renewable Energy and What It Means for America, by John J. Berger, A John Macrae Book, Henry Holt and Company, NY (1997) - $30.00. This is 399-page book covering alternative energy, including nine chapters on solar power, five on wind power, two on bioenergy, one on geothermal energy, and several general chapters. Chapter 20 - Underground Power - covers "Geothermal's Rocky Road." The chapter is primarily devoted to geothermal power generation, covering the early history of development in New Zealand, Italy and The Geyser's. The Geyser's section describes work by B.C. McCabe, Joseph Aidlin and Carel Ote. "The Salton Sea Challenge", "Foreign Development Opportunities" and "Hot Rocks" are also discussed. Geothermal is described as "An Underutilized Resource", as "... the use has been slight nationwide, due in part to relatively low levels of federal research-and-development support and to low-cost fossil fuels.... Globally, geothermal energy exists in vast quantities, including many locations throughout the United States, especially in the West and abroad. However, only a small part of the resource base can be developed economically because of current technology limitations. If one day the limitations are overcome, American would have an energy supply far beyond its needs." The chapter also address the environmental benefits of geothermal power as compared to fossil fuel sources, and that it can provide base load as well as peaking power, "...an important feature relative to other non-base load renewables." "Yet with all these attractive features and the potential for expanded capacity, geothermal energy has not been a major national research priority." This is what we have been preaching for years!!

Mineral and Thermal Groundwater Resources by Marius Albu of Romania, David Banks of Norway and Harriet Nash of the UK, Chapman & Hall, London and New York (1997). This is a 447-page book with an exorbitant price of $150. Part One covers the history, use, and origins of mineral and thermal waters, thus it is not limited to geothermal fluids. Several chapters are devoted to exploring for, modeling and exploiting mineral water sources, along with concerns for the environmental issues and conservation of the resource. Part Two deals with case studies from Iceland, England, Lithuania,
the north Caucasus area of CIS (the former Soviet Union), Norway, The Czech Republic and two areas of Romania. All of these areas have made use of mineral waters and some have developed spas based on the therapeutic use of these fluids. It does have geothermal applications in two chapters on “Thermal Water Systems,” which address the problems of scaling and corrosion, drilling and borehole construction, transport, heat recoverability, heat regeneration, and resource management. It also discusses geophysical and geochemical investigations and analysis, and the estimation of the potential yield of and quantity of heat stored in a resource. The section on Iceland discusses the Reykjavik and Svartsengi district heating systems in detail, and would be of interest to geothermal readers, however, there is very little engineering design information elsewhere in the book. A great number of geothermal experts are referenced in the book, both U.S. and international scientists. Of course, the chapter on Norway deals with cold water resources, but they do bottle and export the natural spring water. Many of the chapters use fairly complicated mathematical analysis such as numerical modeling of groundwater systems and there are some fairly involved chemistry discussions, including geothermometry. This is an excellent book for those interested in developing a bottled mineral water source or therapeutic spa for commercial purposes, for either cold and hot water resources, however the reader does need a technical background in order to appreciate some of the material. It is a well written book, and covers both the historical perspective as well as providing assistance for the future developer and entrepreneur.