DOE/ID/13040--T36

FEDERAL ASSISTANCE PROGRAM

QUARTERLY PROJECT PROGRESS REPORT

GEOTHERMAL DIRECT-HEAT UTILIZATION ASSISTANCE

GRANT NO. DE-FG07-90ID 13040

REPORTING PERIOD: JANUARY - MARCH 1997

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DISCLAIMER

ABSTRACT

This report summarizes geothermal technical assistance, R&D and technology transfer activities of the Geo-Heat Center at Oregon Institute of Technology for the second quarter of FY-97. It describes 176 contacts with parties during this period related to technical assistance with geothermal direct heat projects. Areas dealt with include geothermal heat pumps, space heating, greenhouses, aquaculture, equipment, economics and resources. Research activities are summarized on well pumping in commercial groundwater heat pump systems. A memorandum of understanding between the GHC and EIA is described. Work accomplishments on the Guidebook are discussed. Outreach activities include the publication of a geothermal direct use Bulletin, dissemination of information, geothermal library, technical papers and seminars, and progress monitor reports on geothermal resources and utilization.

1.0 PROJECT SUMMARY: JANUARY 1 - MARCH 31, 1997

1.1 Technical Assistance. GHC staff provided assistance to 176 requests during the reporting period from 26 states, Kenya, New Zealand, Australia, Spain, Japan and Iceland. A breakdown of requests relative to applications are: geothermal heat pumps (80), space heating (17), greenhouses (3), aquaculture (8), industrial (6), equipment (19), snow melt (2), resources/wells (23), electric power (7) and other (16).

1.2 R & D Activities. Progress is reported on the Task 2.2, Well Pumping in Commercial Groundwater Heat Pump Systems.

1.3 Technology Transfer. GHC Quarterly Bulletin, Vol. 18, No. 1, was mailed to 1557 U.S. and 351 subscribers in other countries; Vol. 18, No. 2, is in preparation and should be published in April 1997. Five presentation were given and three tours conducted. A total of 609 publications were distributed on direct use and 6 volumes were added to the geothermal library. Geothermal Progress Monitor (GPM) reports include: (1) ASHRAE Geothermal Heat Pump Activities, (2) GHP Training Centers and Websites, (3) Geothermal Plant Shutting Down, and (4) New WEBFAXX Option Delivers ASTM Standards Any Day, Any Time, Any Where.

1.4 GHC staff that worked on the project included: P. Lienau (98%), K. Rafferty (100%), T. Boyd (100%), John Lund (40 hours), and D. Gibson (94%).

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 and other technologies. The nature of assistance could include 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 1996 program:

Name	Nature
01/03/97 princeton@pipeline.com	Re: District Heating E-mail response to a request for contacts with US geothermal district heating systems and for pipe manufacturers. Sent 13 phone numbers for district heating and Rovanco, Thermacor and Perma Pipe numbers.
01/06/97 hehammer@mem.po.com	Re: GHP E-mail request for information on GHP heating of swimming pools. Explained the benefit of connecting both the home and the pool to the loop in a cooling dominated climate. Also discussed the relative capital cost of heating capacity in heat pumps and boilers.
01/07/97 Lane, Michael Ennis, MT 406-682-4793	Re: Resource Discussed Ennis Hot Springs resource which consists of 3 wells and 2 hot springs producing about 200 gpm @ 170-180F. Wants to purchase resource and use for heating swimming pool and hospital a distance of 1 mi. Discussed water rights and value which depends on the applications.
01/08/96 Busch, Mike Rt. 3 Box 80 Winona, MN 55987	Re: GHP Installing a GHP in an old school house. Needed contractor information. Discussed system types and costs/savings. Sent MN, IA and WI contractor info.
01/08/97 Cioppa, Rick 201-839-7078	Re: GHP He is a contractor - heavy equipment and wants to get into GHP. Discussed the industry and type of systems going in (a lot of vertical and open loop in NJ). Told him about certification and training - IGSHPA and the training centers @ Stockton and PA. Called again to see if there are schools for geothermal heat pump contractors in Pennsylvania. Suggested that he call IGSHPA or the Geothermal Heat Pump Consortium for contacts.
01/08/97 Dwyer, Kathleen 4 Patricia Circle Smithfield, RI 02917	Re: GHP Discussed geothermal direct-heat and ground-source heat pumps. Explained temperature requirements for the application categories and that GSHPs would be applicable in Rhode Island. Suggested she contact IGSHPA for listing of certified installers.

01/08/97 Flynn, Tom Univ of NV 100 Washington St Reno, NV 89503 702-784-6151	Re: Electric Power Discussed his feasibility study for the University to take over the Wabuska binary power plant and use effluent for a bunch of direct use applications and an educational facility. Possibility of GHC participation. Plant goes "over the cliff" soon, buy back rate goes from $0.072 to $0.018 per kWh.
01/08/97 Heggin, Russ P.O. Box 23005 Eugene, OR 97402	Re: GHP Questions about converting from electric furnace to geothermal heat pump. Home is in the Lane Electric service area. Discussed potential savings and capital cost for closed loop systems. Cautioned about duct size. Horizontal OK in mild/non-cooling peak climate.
01/08/97 Schoorlemmer, Ben 333 N Michigan Ave. Ste. 3200 Chicago, IL 60601	Re: GHP He is building a new log home in WI. Discussed system types and possibility for open loop, cautions (water quality, disposal etc). No gas in the area. Sent GHP pkg.
01/09/97 Calahan, Ed P.O. Box 969 Stevenson, WA 98648 509-427-8210 (w), 427-8788 (h)	Re: Space Heating Discussed geothermal project using recently drilled well (150F @ 300gpm) at Stevenson, WA. The project is planning to develop spas, retirement home and condos. Items considered included: pipeline 400 ft elevation increase with steel welded pipe to 125 ft and ductile iron for the distance to a storage tank. Also explained controls, water quality and material selection, and disposal considerations.
01/10/97 baquimby@cyberzone-inc.com	Re: GHP E-mail request for a service contractor to work on a GHP. Suggested that he go to the IGSHPA site for his state. Also advised that if the heat pump unit is the problem he could use any regular HVAC contractor.
01/10/97 morgan@mc.net	Re: Greenhouses E-mail request on a system to heat greenhouse with pipes buried in soil and air drawn through. Explained the realities of heating with 55F soil - high air flow , low space temperature and lots of pipe surface area.
01/10/97 Brown, Brian Consulting Engineer Ft. Klamath, OR 97626 541-783-3347	Re: Equipment Discussed the project that he is working on in Oklahoma, central chilled water system. 1.5 gpm/min/ton poor assumption with 3-way valves and old coils. System would require some retrofit to operate at low CHW flows
01/10/97 Fitzgibbon, Blair Portland High Schools 501 N Dixon St. Portland, OR 97227 (503) 916-2000	Re: Resource Requested technical reports DB4 and DB5. Comment - I am interested particular in Newberry Crater geothermal. Sent him a few articles from our library.

01/10/97 Van Voast, Wayne Montana Bureau of Mines and Geology 1300 West Park Street Butte, MT 59701 406-496-4169	Re: GHP Discussed the potential of GHP use for a building on the campus at Montana State. 1908 construction, central steam and chilled water, 17,000 sqft. Discussed the realities of the construction, scheduling process - must intervene early to over come engineer resistance. Will E-mail details.
01/13/97 rbaxley@connix.com	Re: GHP E-mail response to a request for information on what kind of heat pump equipment to use in a radiant slab system. Explained water to water heat pumps and that the equipment is divided into large and small units.
01/13/97 sorourke@shawnee.edu	Re: Equipment E-mail response to a request for "equipment literature". asked them to be more specific in terms of the kind of equipment.
01/13/97 wayne@mbmgsun.mtech.edu	Re: GHP E-mail request for help with a GHP system for a campus building at Montana Tech. Explained the TA program and it's limitations. Asked if they could participate in the travel costs.
01/13/97 Dunn, Russ Klamath Falls, OR 541-884-5777	Re: Resource His well has cooled off from 185 to 140 F. Would like to have us log it. Booster pump recently installed. Made arrangements to log the well at 2:30 Tue., 1/14/97.
01/14/97 Allen, John Overseas Technical Associates 620 Brighton Court Rolla, MO 65401 573-364-0301, fax: 364-7525, jallen@rolla,net.org	Re: Aquaculture Consultant doing aquaculture engineering for a client in Turkey, referred by Lew Pratsch. Project to employ 100C geothermal fluids to raise salt water shrimp. Explained the use of plate heat exchangers for geothermal fluids and types of materials. Sent packet of info on aquaculture in the U.S.
01/14/97 Yoshida, Tak Shikosha 1526 S.E. Powell Blvd. Portland, OR 97242 503-238-7117	Re: Equipment Ed Calahan asked about production line for Tak Yoshida's project. Looked at several alternatives. Will water hammer be a problem? Welded type piping to withstand pressure at the bottom of the hill. Surge tank so as to reduce pump cycling.
01/15/96 Dunn, Russ Klamath Falls, OR 97601 541-884-5777	Re: Resource Logged Dunn well. Couldn't get below about 350 ft, looks like it has caved in at the bottom. Well has two sets of lower perforations according to the driller's report. May be operating on the smaller set, bottom ones cut off. Called Russ Dunn to let him know results. Advised that they try to limp along with it until warmer weather.
01/15/97 bgilmore@acad.bryant.edu	Re: GHP E-mail to Bryant College requesting more information on the design of their system.

01/15/97 tmartinjr@aol.com	Re: Equipment E-mail response to a request for info on cooling/power generation for the Old Faithful Geyser in Calistoga. Advise him that the drawback to space cooling w/absorption is that the equipment produces chilled water - need CHW pump, piping, coil. also condenser pump, piping., and cooling tower. Finally hot water piping and htx - a lot of cost compared to conventional equipment. Also provided info on small power plant manufacturers.
01/15/97 Allen, David Cedarville, CA 916-279-2172	Re: Resource He wants to grow frogs in Cedarville CA. Discussed indoor culture requirements for the animals and resources in the area. He has looked at 3 wells - 120F, 103 F and one in the 90's. Suggested that the hottest one would be the best if indoor temps in the 80's are needed, 40x80 ft building. He is going to a seminar soon, will get back to us on details of temp requirements.
01/15/97 Disbrow, Jim Energy Information Administration, EI-533 950 L'Enfant, SW Washington, DC 20585 202-426-1185	Re: General Discussed establishing a memorandum (MOU) with the Energy Information Administration to assist with a section on low-to moderate-temperature geothermal resources and applications for the EIA Renewable Energy Annual. The contents of the section could include: resources with maps, current use, 1996 development and projections for the future.
01/15/97 Fitzgibbon, Blair Portland Public Schools 501 N Dixon St. Portland, OR 97227 (503) 916-2000	Re: Resource Interested in the geothermal potential at Newberry Volcano. I have gotten some publications from the Geothermal Resources Council. Sent him four publications from our library concerning Newberry.
01/15/97 Tippets, Jack P.O. Box 145 Auburn, WY 83111	Re: Space Heating He was referred by George Darr @ BPA. Has property with well depth of 200' and 135 F and 75 gpm. New well last year with well depth of 510 ft, 155 F and 2500 gpm artesian. Auburn, WY is near the ID border. Discussed uses, included heated storage, greenhouses and aquaculture. Heated storage would not require expertise in plant or animal culture -seemed like a better fit for him. Discussed the way floor systems are designed - piping, spacing, material temperatures.
01/16/97 rbaxley@connix.com	Re: GHP E-mail response to request for info about heat pumps for a mushroom growing facility. Advised that the manufacturers are listed on our web site (small units). Also gave some pointers on selecting a contractor. IGSHPA contractor listing.
01/17/97 arnonet@swbell.net	Re: Equipment E-mail response to a request for information on brazed plate heat exchangers. Explained the typical geothermal application of brazed htx's in the water to water isolation duty, cost and performance limitations.

01/17/97 Fagan, Bill Klamath Falls, OR 97601	Re: GHP He has a home (just bought) with a GWHP that went bad. Unit is 18 years old and well is only producing 1 gpm. Contractor wants to replace the whole unit, rather than just the compressor. Explained that this is common practice for a unit this old. Discussed the well and remedies. Also other types of heating and the costs. Cheaper to remain with the geothermal heat pump.
01/19/97 Blevins, Susan Energy Resource Associates Alturas, CA	Re: Equipment Looking for a mechanical engineer to assemble some dehydration equipment that they have. Suggested that she contact Brian Brown, consulting ME or Michael Spector, MET Dept. at OIT.
01/20/97 Allen, David Cedarville, CA	Re: Equipment Called to ask how heat pumps would work in the frog culture system. Explained that they cost more to buy per unit of capacity and they operate on electricity - costly in CA. Suggested he exhaust all the geothermal direct use options before looking at heat pumps.
01/20/97 Jones, Ken kenjones@holli.com	Re: General My son is learning about geothermal energy in his 8th grade science class. Could you suggest possible experiments or sources for ideas. Sent an e-mail with several links to web sites which might interest him.
01/21/97 cockrell@mail.telis.org	Re: Electric Power E-mail response to a request for info regarding the potential uses of a hot spring on a guest ranch in N California. They are interested in power generation. Explained the realities of power generation, equipment size, cost , temperature requirements, low buy back rate. Suggested that some direct use would be better - like displacing the propane that they are heating with now. Suggested they drop by here next time they are in town.
01/21/97 ccollins@me-mail.rtc-cork.ie	Re: GHP E-mail response to a request for information on residential GHP (grad student in Ireland). suggested that he order a copy of Kavanaugh's residential book. Also suggested the ASHRAE handbook chapter. Sent him the h/p package and Steve's number
01/22/97 Bokavich, Casey 4512 Lynnbrook Lane B Redding, CA 96003	Re: GHP Discussed a GHP for a new home in Redding, CA. Alternate heating from wood and propane. Propane @ $1.45/gal, elec @ $0.13/kWh and wood @ $165/cord. With h/p COP of 3.5 and propane @ 92% or $10.89 $/MMBtu and $17.13 $/MMBtu. Low heating in Redding though. Did quick heat loss and DHW/cooling calc. Details in log book. Savings about $250/yr.
01/22/97 Kenny, Mike Brothers West Aquaculture Klamath Falls, OR 97601 541-883-1314	Re: Aquaculture Mike called to say that they are moving the project along but a lot slower that they thought. DEQ is asking them about injection and the flows involved. Went over the heat loss calculations and probable flows with him.

01/22/97
Lewis, Jim
Lewis Aquaculture
Lakeview, OR

Re: Aquaculture
Jim called to bring us up to date on their aquaculture project in Lakeview. They didn't get the permit to harvest brine shrimp from the lake. Environmental opposition. Looking at another site near Ontario. Can we get any information on the well (existing)? Told him no problem if he can give us location or name. Will get back to us.

01/22/97
Meyer, Vernon
US Army Corps of Engineers
Omaha, NE 68144
402-697-2648

Re: General
Vern called to see if K. Rafferty wanted to be a voting member of ASHRAE TC 6.2 (District Heating) again. Yes

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01/23/97
Pelletier, Christian
232 White Sell Street, Apt. 6
Monmouth, OR 97361

Re: GHP
Discussed geothermal heat pump technologies and marketing approaches. Sent information on marketing heat pumps.

01/23/97
Simpson, Stuart
Washington State Dept of
General Admin.
Olympia, WA

Re: GHP
Stu called about the possibility of a GHP for a 200,000 sqft high school in Washington. Costs, flow requirements. What are they doing about outside air? Key to keeping well costs down. Will get back to Geo-Heat Center.

01/24/97
Brown, Brian
Consulting M.E.
Ft Klamath, OR
541-783-3347

Re: Equipment
Brian called to discuss how to calculate boiler standby losses - % of heat or surface calculation. Suggested that the separate surface calculation is always more accurate, especially if the boiler is oversized or supplies only a small amount of energy annually.

01/27/97
Claxton, Brian
P.O. Box 19440
Statesboro, GA 30460

Re: GHP
Discussed geothermal heat pump technologies and sent a packet of heat pump information.

01/27/97
Crane, Sandy
Wndermere Real Estate
519 Main St.
Klamath Falls, OR 97601
541-885-4400

Re: Resource
Discussed geothermal well development at 601 Pacific Terrace, Klamath Falls, Oregon. Provided date drilled, depth, temperature, DHE length, casing length, etc.

01/27/97
Krenzel, Art
Landa, Inc.
Portland, OR
503-255--5980 x194

Re: Equipment
Discussed removal of solids from a flow stream with a TDS of 100,000 ppm at 400 psi and 450 F. Explained that at the Salton Sea they used crystallizer reactor clarifier and pH modification processes. Referred to Donald Michels, Geochemical Engineer for process control.

01/27/97 Stano, Jim Washington Mechanical, Inc. P.O. Box 32 Washington, NJ 07882 908-689-1560	Re: GHP Discussed the development of a 300-ton ground-source heat pump system for a new high school in Washington, New Jersey. Wanted cost comparisons between water loop, ground loop and groundwater systems. Sent report which contained the requested data. Referred by Ray Fortuna of DOE Office of Geothermal Technologies.
01/28/97 Elfezouaty, Igal Threepoint Ostrich Farms, Ltd. P.O. Box 884 Naivasha, Kenya	Re: Aquaculture E-mail response asking for assistance on market development and general info on agribusiness using geothermal for aquaculture .
01/28/97 Fortner, Robert P.O. Box 11755 Bainbridge Island, WA 98110	Re: GHP Building a new home and is interested in using a geothermal heat pump. He is considering a ground coupled system. Discussed the different technologies and payback. Sent information on GHPs.
01/28/97 Lewis, James Lakeview, OR	Re: Resource Called for geothermal well data located at Paisley, Oregon T-33S R-18E S-24. Provided well depth and temperature on three geothermal wells located in section 24.
01/29/97 Weaver, Michael 9859 Estate Lane Dallas, TX 75238-1962 (214) 348-6812	Re: General I'm doing a paper for school, I would like info., Please send. Was interested in geothermal for Texas. Sent him some links for more sources of information.
01/30/97 Olson, Tony Coldwell Banker Holman Realty, Inc. Campus Square Branch Office Klamath Falls, OR 97601 541-885-3100	Re: Resource Discussed resource locations and sites in the Klamath Basin. Explained the geology associated with a fault-charged system. Provided maps and examples of development for the area.
01/31/97 Sifford, Alex Sifford Energy Services P.O. Box 760 Neskowin, OR 97149 503-392-3965, fax: 503-392-3975	Re: Resources Discussed the development of a collocated resources map for Nevada, high-lighting Clark county. The map will be for an exhibit at the Jason Project in Las Vegas, Nevada where about 20,000 school kids will come through the exhibit hall. The GHC will also send 50 Bulletins on Iceland and U.S. geothermal project and resource maps.

02/02/97 Thain, Ian c/o IGA Secretariet Private Bag 2000 Taupo, New Zealand fax 64-7-374-8199	Re: General Faxed info on two GHC Bulletin articles to assist him on preparing two lectures.
02/03/96 Brown, Brian Consulting ME Ft. Klamath, OR 541-783-3347	Re: Space Heating Brian called about energy use in the Klamath County Court house. Discussed values from references ASHRAE, 42,000 Btu/sqft yr, 32,600, 42,000x0.7 (accounting for eff) = 29.9k - use 30,000 Btu/sqft yr.
02/03/96 Whitehall, Paul mchill@aol.com 800-841-6184	Re: Electric Power He has some surplus equipment from one of the Geysers plants (East Geysers), H2S abatement system (Stretford) and condenser water circulating pumps (33,000 gpm) looking for a buyer.
02/03/97 jjmcdermott@anet.bna.boeing.com	Re: GHP E-mail response to a request for help with a GHP system for a retirement home. Advised on contractor issues (certification. experience, IGSHPA site) possibility of open loop if on well, Oregon tax credit and contacts. Provided cost info on closed and open loop for comparison. Sent h/p package
02/03/97 mmast@erinet.com	Re: GHP E-mail response to a request for help with an open loop GHP with well problems. This guys problem was so similar to the other guys that I sent the same message to both of them (see mdearth@worldnet.att.net - 2/03/97)
02/03/97 mdearth@worldnet.att.net	Re: GHP E-mail response to a request for help with an open loop GHP residential that is having well problems. Advised that production rate decrease can be caused by 1 of 4 common problems: pump failure, scaling, "iron bacteria" or collapse. All are treatable and doing so may cost much less than going to closed loop. Gave closed loop prices and contractor location info.
02/03/97 maletsky@eot.com	Re: GHP E-mail response to a request for help with a heating system that circulates air through buried pipes in the soil (no heat pump). Basically repeated the same items covered in a similar message about the same type of system a few weeks ago (see morgan@mc.net - 1/10/97)
02/03/97 Allen, David Cedarville, CA	Re: Space Heating David called with more specific info on the frog culture requirements - 80 - 85 F best but OK @ 70 F. Some warm water is circulated to the animals. Concrete floor, individual pens w/ water circulating. He will be coming to KF to discuss project.

02/03/97 Lopez, Gary Santa Fe Geothermal 825 Anastasia Drive Lakeport, CA 95453 (707) 262-1803	Re: Power plants Information on producing Geothermal Power Plants in the US. There was no e-mail address so forwarded the message to the Geothermal Resource Council.
02/03/97 Simpson, Stuart WA Dept of General Admin. Olympia, WA	Re: GHP Called back with more info on the school project: Hudson's Bay HS. next to Clark College (don't use their system as h/p any more but direct cooling) plenty of water - 500 gpm, 8" wells, ventilation air????
02/03/97 Weaver, Michael 9859 Estate Lane Dallas, TX 75238-1962 214-348-6812	Re: General Requested information on geothermal for a school paper. Sent a packet of general information on geothermal energy and a publications list for additional specific topics.
02/04/97 jjmcdermott@anet.bna.boeing.com	Re: GHP E-mail response to request for help w/ GHP system for retirement home. Discussed open loop disposal options, soil conductivity for closed loop (influencing factors), undisturbed soil temp (use water wells) and advised him to get Kavanaugh's book on residential systems.
02/04/97 sachs@ghpc.org	Re: GHP E-mail to Harvey Sachs at the GHPC requesting information on the ASHRAE meeting session that K. Rafferty is supposed to speak at. A conference call that he is organizing for the training session in Boston and a password so I can get at the member portion of the GHPC web site.
02/04/97 Calahan, Ed Columbia Gorge Interpretive Center Stevenson, WA 509-427-8210	Re: Space Heating Discussed a number of issues for a new geothermal project at Stevenson, Washington near the Columbia river and on the Wind River not far from Carson H.S. Issues included: pumping from artesian flow of 300 gpm @ 150F - suggested centrifugal pump, pipeline from well head to storage tank and utilization site a distance of about 2,000 ft and elevation increase of 400 ft - suggested welded steel pipe for high pressure lower region and ductile iron for upper region, and disposal of fluids by injection. Applications could include space heat of lodge, condos, retirement center, greenhouses and spas.
02/04/97 Seabrook, Terry DOD Hdqts Ft McPhereson 1959 Walker Ave Ft McPhereson, GA 30030-5000 404-752-3322	Re: GHP Ft. McPhereson is interested in a GHP project for the base housing. Need cost and savings info to justify to DOD. Discussed the project and the one at Ft. Polk. Suggested that she contact Bill Sullivan at Sandia for his data. Sent her Kavanaugh's article from the Bulletin w/ Georgia savings data. Also his Cost containment report.
02/05/97 Adolpasen, Paul 3858 30th Ave. West Seattle, WA 98199 206-284-2864	Re: Resource Requested information on Vulcan Hot Springs for a science project. Sent well information and data from the Idaho resource assessment report.

02/05/97 Belcher, Lindsay 16 Willowdale Rd. Topsfield, MA 01983	Re: GHP Requested information on geothermal energy for a 9th grade science project. Sent material on direct heat applications and resources and geothermal heat pumps. Explained that GHP's could be used in Topsfield, MA.
02/05/97 Eggers, Tim Dampney Co. 387 Dalewood Drive Orinda, CA 94563 (510) 283-9797	Re: Equipment Please add our company to your Equipment Manufactures Vendors List. Has been added to the list.
02/05/97 Felps, Marty Delta Temp, Inc. PO Box 2156 Midlothian, VA 23113	Re: GHP Have be installing earth coupled heat pumps and would like to be placed on your vendor listing. He was added to the directory.
02/05/97 Nemzer, Marilyn Geothermal Education Office 664 Hilary Drive Tiburon, CA 94920 415-435-4574	Re: General Discussed the beginnings of the Geo-Heat Center for an editorial to be in the GRC Bulletin. The conversation included a description of the Intl.. Geothermal Conference held at OIT in 1974 which resulted in the need for an exchange of information and direct use research. Thus the beginning of the GHC Bulletin and the Geo-Heat Utilization Center. Also described the Technical Assistance Program and the development of an educational outreach program.
02/06/97 award@energy.state.ca.us	Re: GHP E-mail to California Energy Commission on proposed rules for GHP. Advised that they see that the new thermally enhanced grouts are approved for use since they recommend full grouting of the hole. Suggested which committee in ASHRAE (TC 7.6) is the one for equipment performance issues. Summarized TC 6.8 activities on GHP.
02/06/97 Mfelps@msn.com	Re: GHP E-mail response to a request for listing of GHP contractors. Explained that our site lists Direct Use consultants and we direct folks to the IGSHPA site for GHP consultants.
02/07/97 Allen, Eliot Criterion Engineers Portland, OR 503-224-8606	Re: District Heating Eliot called to get information on the K Falls Geothermal district heating system. Gave him the peak design capacity (20E6 Btu/hr) and explained that with diversity it could serve a load of probably 20 % more than that.
02/07/97 Simpson, John PO Box 531 Troy, KS 66087	Re: GHP Residential GHP - costs, system types, relative utility rates determine cost competitiveness. No it isn't automatically the best thing to do. Sent GHP package.
02/10/97 Dme77@aol.com2/11/97	Re: GHP E-mail response to a request for training in open loop GHP. Advised that there were no programs that I was aware of. Suggested that he check with the GHPC and IGSHPA.

02/10/97 skavanaugh@coe.eng.ua.edu	Re: GHP E-mail message with comments on his proposal and cover letter. Suggested that he stress the development of the design methods based on the needs of the practicing engineers rather than academic.
02/10/97 Carver, Bob NY State Energy Authority 286 Washington Ave Extension Albany, NY 12203	Re: GHP Bob Carver was referred to us by Jeff Stein @LBL. He was looking for current cost information on residential installations. Discussed the sources of data and numbers in general. Sent cost containment report and GHC database info.
02/10/97 Downey, Leo NY State Office of Parks Letchworth State Park Castile, NY 14427	Re: GHP The NY State Office of Parks is building a 3000 sqft nature center building on Lake Ontario. Want it to be a "green" project. Discussed the costs and the loads/use of the building. Closed loop due to the wetland area. Cautioned him about increased water temperature in the summer if they need to do a lot of cooling. Discussed eliminating antifreeze and how it would mean much longer loops.
02/10/97 McCrea, Kevin National Ground Water Assn FAX 614-898-7791	Re: GHP Called to see if K. Rafferty could attend a meeting on vertical closed loop boreholes in Portland on Sat and Sun, Feb 15 and 16. They are under contract to the Consortium to develop a consensus standard for hole completion. Will pay expenses.
02/10/97 Vahdat, Sepehr svahdat@ois.com.au Australia	Re: Equipment Requested info on heat pipe design - using air. Responded by E-mail.
02/10/97 Williams, John WESCOR Portland, OR 503-239-4009	Re: Space Heating John called to see what is going on at the Belknap Hot Springs job. They didn't accept the heat exchangers. Suggested that he call and talk to Rick McDougal. Faxes don't get through to Rick sometimes. Told him K. Rafferty hasn't been involved since we gave them the preliminary flow requirements.
02/11/97 sachs@ghpc.org	Re: GHP E-mail message to Harvey Sachs expressing support for the inclusion of open loop systems in the 3 hr training session in Boston.
02/11/97 Dme77@aol.com	Re: GHP E-mail response to request for information on open loop GHP. Advised that he watch the water quality, disposal, keep flow low (2 gpm/ton), adequate pump sizing and tank sizing to accommodate the pump cycle time.
02/11/97 Dave City of San Bernardino San Bernardino, CA FAX909-384-5260	Re: Equipment Dave called to see if we could help him with the selection of a new metering vendor for their DH system. Discussed what the other systems are doing (moving away from energy metering). Faxed him a list of manufacturers

02/11/97 Davis, Don 1211 Division St Napa, CA 94559	Re: Resource Don Davis is the city attorney for Calistoga. They are interested in developing a resource management/monitoring program for the city. Concern is the steady withdrawl by the bottling companies and potential aquifer decline. Discussed well monitoring, aquifer testing and the experience in Klamath Falls with the same issues. Suggested that some inexpensive water level monitoring would be a good place to start. Sent info on KF history.
02/11/97 Fortner, Bob PO Box 11755 Bainbridge Island, WA 98110	Re: GHP Discussed the economics of GHP in western WA for residential applications. Mild climate and low electric rates makes it hard to compete with air source. Best in new construction w/no natural gas in the area. Sent heat pump pkg.
02/11/97 Hermach, Charles OIT-MET Department 3201 Campus Dr Klamath Falls, OR 97603 (541) 885-1333	Re: Electric Power Requested some information concerning the Geysers power plant. Sent him a couple of bulletin articles about the geysers and the effluent pipeline being built. Also printed out information on one of the power plants there from the GRC library, and provided him with a link to the webpage.
02/11/97 Sachs, Harvey Geothermal Heat Pump Consortium Washington, DC	Re: GHP Conference call w/Harvey Sachs, Gary Phetteplace, Bob Brown, Steve Kavanaugh and Doug Cane - all ASHRAE TC 6.8 members concerning the 3 hour GHP training session for the Boston Meeting. Steve, Doug and K. Rafferty will be the presenters splitting up the topics according to interest and expertise.
02/12/97 gephet@hanover.crrel.army.mil	Re: GHP E-mail message to comment on the outline for the ASHRAE 3hr short couse. suggested that we add terminology to the first part of the program.
02/12/97 Silvers, Caroline St Johns River Water Mgmt. District 7775 Baymeadows Way Ste 102 Jacksonville, FL 32256 (904) 448-7903	Re: GHP Please send information regarding "open loop" heat pumps. Sent a reply letting her know we don't have any regulations and for her to contact Dr. Karen Den Braven at the University of Idaho.
02/13/97 Davis, Don Napa, CA 94559	Re: Resource Faxed list of hydrogeologists to Davis. Including: Bohm, Bowen, Bugnig, GeothermX, Huttrer, and Therma Source.
02/13/97 Edwin Belknap Hot Springs McKenzie Bridge, OR 541-937-3186	Re: Equipment Edwin called to see what has happened with the heat exchanger order. Went over what I know with him. Discussed calls I had from Rick and WESCOR. He said that he wasn't aware of any formal order for the equipment. Faxed him the names for other htx vendors: Alfa Laval, Polaris, Elge, APV and Graham.

02/13/97 Lane, Michael Ennis, MT 406-686-4793	Re: Space Heating Discussed hot spring in Ennis, Montana and the feasibility of supplying a nursing home with geothermal energy. The nursing home currently pays about $5000/mo for electric heat. Due to the fact that the nursing home is about 1 mile from the hot springs other heating loads need to be considered. Estimated about one-third of the hot springs 200 gpm at 180F would be needed for the nursing home.
02/13/97 Troy Micron Electronics troyb@cyberhighway.net	Re: Industrial Happened across the ORE IDA article and wanted to know if this was a new development. Let him know the article was written in 1979 and was about the preliminary study. Sent him an e-mail summarizing the final report submitted by CH2M Hill concerning the project.
02/13/97 Uetz, Linda E 6834 Hwy 12/29 Elkmound, WI 54739	Re: GHP They have a large farm house in WI heated with oil and want to switch to GHP if economical. Gave her some typical costs for the two systems in the heating mode. Explained actual costs would be dependant on relative electrical and fuel oil costs. Discussed ductwork requirements and the difference between fossil fuel and heat pump delivery temperatures.
02/14/97 rpeake@energy.state.ca.us	Re: GHP E-mail to Roger Peake at the CEC with comments on the proposed CEC rules on vertical boreholes. Discussed grout effects and the need to approve thermally enhanced grouts, use of Kavanaugh's residential simulation program to develop performance indicies for CA climates, inclusion of run time for monitoring in protocal.
02/14/97 skavanaugh@coe.eng.ua.edu	Re: GHP E-mail to Steve Kavanaugh to see if it is OK to copy tables 3.1 and 3.2 for distribution at the vertical borehole meeting in Portland this weekend. Tables relate to the thermal effect of grout on heat transfer.
02/14/97 boba@energy.ca.gov	Re: General E-mail message suggesting that it might be a good idea for them to have a link to our site in the geothermal section of their site (CEC website).
02/14/97 Lewis, Jim Lakeview, OR fax: 541-947-2659	Re: Resource Requested information on the geothermal well used to space heat Maywood Industries building. Sent well log, pump test and general information about how geothermal is used and the savings.
02/14/97 Vallejos, Francis 1709 Etna Street Klamath Falls, OR 97601	Re: Greenhouses Discussed using geothermal energy to heat greenhouses. Provided information on Liskey Farms and geothermal heating systems for greenhouses.

02/16/97 Gray, O'Neal Rearden Investment Corporation PO Box 795489 Dallas, TX 75379 (972) 417-8889	Re: Resource Company is searching for a site in Colorado or New Mexico with geothermal energy available. Sent a message informing him of several of our webpages (Direct Use and Collocated sites) where there is potential.
02/18/97 pjl@ornl.gov	Re: General E-mail message to Pat about the need to contribute comments on the ASHRAE chapter 29 in time for the May 30 deadline.
02/18/97 award@energy.state.ca.us	Re: GHP E-mail message to CEC about additional comments on the proposed vertical borehole regs. Suggested that the passage placing responsibilty for grout dryout on the system designer was unrealistic - should be dropped.
02/18/97 Ciancanelli, Gene Cascadia Exploration Corp. 3358 Apostol Rd. Escondido, CA 92025 619-489-0969	Re: Industrial Called requesting info on industrial use of high temperature resource on SE flank of Medicine Lake Highlands, CA. He has property to develop. Sent info on onion dehydration, barley malting, refrigeration and other industrial use papers.
02/20/97 rennerj@inel.gov	Re: General E-mail to joel Renner to update him on Center activities. Summarized TA work and ASHRAE committee tasks.
02/20/97 Burkhard, Sanner Inst. Angew Geowissenschaffen Universitat Gieszen Germany 641-99-36124	Re: Snow Melt Requested infor on pavement deicing, sent serveral articles.
02/20/97 Lozano, Miguel Angel Centro Politechico Superior de Ingeneins Maria de Luna, 3 50015 Zaragoza, Spain	Re: General Requested paper on "Direct Heat Utilization of Geothermal Resources" and other relevant articles.
02/21/97 gephet@hanover-crrel.army.mil	Re: GHP E-mail message to Gary to let him know that I don't have any problem with signing the letter he proposes to put together on the training session for Boston.

02/21/97 Ashcraft, Mary Century 21 4775 S. 6th Street Klamath Falls, OR 97601 541-882-8990	Re: Resource Wanted information on a geothermal well located at 2105 Auburn Street, Klamath Falls. The well was drilled in 1940 to a depth of 109 m and temperature of 96C.
02/24/97 celticfrye@msn.com	Re: GHP E-mail response to request for info on lake loop residential GHP. Advised that we have a package of info to send but that it focuses on open and closed loop. Suggested that the lake loop approach works best (savings) in cooling dominated climates.
02/24/97 Jones, Fred IGSHPA Stillwater, OK 800-626-GSHP	Re: GHP Fred called to see if K. Rafferty want to be on the IGSHPA Training Committee. Told him that I couldn't attend enough of the meetings to make it practical.
02/24/97 Macke, Richard PO Box 1658 Sisters, OR 97759	Re: Space Heating He is interested in a floor heating system for a construction project in Sisters OR. Discussed piping installation, spacing, control and layout. Gave him some piping vendor names.
02/24/97 Mr. Hamada and Mr. Toya Geothermal Co., Ltd. 6-10-28, Nishi-Shinjuku Tokyo, Japan 81-3-3346-1101	Re: District Heating Arranged discussions of geothermal district heating and tours of the OIT and city district heating systems. Also, arranged for tours of GHP installations in Portland, Oregon and Stillwater, Oklahoma.
02/24/97 Weld, RJ Reno, NV 702-677-8240	Re: Resource Wanted geothermal resource information for the southern portion of Baja Mexico. Checked our data and told him that the only thing I could find was the Cerro Prieto - nothing in the southern portion.
02/25/97 rentahusba@aol.com	Re: GHP E-mail response to a request for info on residential GHP. Explained that the economics is a function of the local rates for electricity and whatever competing fuel is used. Best situations are in new construction, northern climates and no natural gas. Suggested that heating savings can be calculated using brief method in survival kit.
02/26/97 Isgrig, Kelly PO Box 21424 Eugene, OR 97402	Re: GHP Wants to put in a radiant floor GHP system. Explained that it couldn't do all the cooling and that controls are more complicated than with water to air systems. Important to keep floor covering to minmum to reduce required water temperatures.
02/27/97 Rourke, Dennis Klamath Falls, OR 97601	Re: Resource Discussed geothermal aquifer locations and sizes. Water chemistry of the aquifer was provided. Provided reports and descriptions of geothrmal aquifers.

02/27/97
Stenzler, Amy
4824 Overton Hollow
Fort Worth, TX 76109
mandm@flash.net

Re: Electric Power
Doing a research project on geothermal energy. Sent her a couple of bulletin article concerning power generation, plus supplied her with links to the GRC library, and a few other concerning geothermal power.

02/27/97
Wells, Bob
P.O. Box 11324
Reno, NV 89510

Re: Resource
Supplied address of CFE people in Mexico who would know about geothermal resources on Baja, California.

02/28/97
Cengel, Yunus
University of NV Reno
Reno, NV

Re: Equipment
Questions about geothermal absorption applications for the Reno DH project. They got a bid from TRANE on the chillers and thought it was high. Explained the market for absorption is small. Suggested that they consider a central chilled water plant with thermal storage. This would reduce the size of the chillers required and eliminate the problem of trying to retrofit absorption into buildings designed for electric plants.

02/28/97
Flynn, Tom
Univ of NV
Reno, NV

Re: District Heating
They are making progress on the Wabuska project. State is interested also. Said that the Reno Energy project proposal has gone to the staff of the NPC - Judy Karrick.

02/28/97
Oxborrow, Mike
U.S. Forest Service
P.O. Box 3623
Portland, OR 97208-3623
503-326-2756

Re: Space Heating
The U.S. Forest Service is building a new 40,000 sq. ft office building in Lakeview. Discussed geothermal resource for direct-heat application and geothermal heat pumps. Sent maps, well data, resource report and several papers on ground-coupled and groundwater heat pumps.

03/01/97
BKCello2@aol.com

Re: General
Doing a science project on the use of geothermal energy to make a model boat or other vehicle run. Informed him that geothermal is not a mobile system. He would have to use some other system to power the boat.

03/01/97
Doherty, Timothy
voyageur@worldnet.att.net
Fax (612) 323-2715

Re: Industrial
Do you have any information regarding Ice Arenas that use geothermal. Sent him some information about Selkirk Arena from a publication from Cadena and it makes reference to 4 others.

03/04/97
gephet@hanover-crrel.army.mil

Re: GHP
E-mail message with comments on the training session for ASHRAE Boston. Suggested that subpotable (sewage) coverage won't fit into the time available, UIC and NPDES are different in each state - refer to Den Bravens stuff. Should include pumps and htx in the spec stuff.

03/04/97
Haring, Lewis
710 Highview Dr
Wycoff, NJ 07481

Re: GHP
He is a PE in NJ and wanted information on GHP for residential applications. Discussed open/closed and equipment performance, pumping requirements for open, costs, etc.

03/04/97 Harris, Greg 4087 Sutton Rd Gainsvile, GA 30506	Re: GHP Discussed residential GHP.
03/04/97 Thain, Ian thain@xtra.co.nz New Zealand	Re: Industrial Requested design information for a geothermal concrete paving stone curing room - preliminary design provided by email.
03/05/97 sachs@ghpc.org	Re: GHP E-mail message with comments on the training session for Boston. Same general comments as the message to Phetteplace. Also suggested that we not give attendees the impression that they will get everything they need to design a system from a 3 hour program.
03/05/97 9319883@student.ui.ie	Re: GHP E-mail response to request for comments on the design of GHP system for house. Commented on the relative cost and complexity of radiant floor water to water system vs water to air system. Sizing based on cooling or heating load - resistance backup.
03/05/97 Mercer, Meredith Oregon Depth. of Transportation 129 Transportation Bldg. Salem, OR 97310 503-986-3332	Re: Snow Melt The Oregon Dept. of Transportation will be replacing the pavement and bridge deck with heating coils for snow melt in Klamath Falls. The original system, installed in 1948, consisted of iron pipe which has corroded and had to be shut-down during this past heating system due to leaks. Discussed the geothermal well and its capacity and types of tubing material available.
03/06-97 Allen, John Overseas Technology, Ltd. Rolla, MO 573-364-0301	Re: Aquaculture Overseas Technology, Ltd. is involved in the design of a geothermal aquaculture project near Tuzla, Turkey. The GHC has provided a number of papers on the design and operation of projects using geothermal energy. Discussed the possiblity of using downhole heat exchangers, which would be impractical due to the number of wells required. They planning to grow sea shrimp in raceways constructed with blocks, 10m x 100m and housed in a greenhouse type structure.
03/06/97 gephet@hanover-crrel.army.mil	Re: GHP E-mail message with my idea for the outline for the training session portion on GWHP.
03/06/97 Westerbeke, Anne PO Box 28 Litchfield, CA 96117	Re: Greenhouses She has property near Wendell CA and is interested in nursery, hydroponics using a geothermal greenhouse. Wanted to know about heating equipment and structure. Discussed past projects and the pitfalls - expertise in plant culture, market etc. suggested that she review our publications on the topic first.
03/07/97 schwabbie@webtv.net	Re: GHP E-mail response to request for info on lake loop resid GHP. Gave usual comments on the best applications for GHP. Suggested that the lake loop should substantially reduce the first cost.

03/07/97 Oxboro, Mike US Forest Service Portland, OR	Re: Space Heating With the Forest Service in Portland, Re: new office building in Lakeview. Said that the engineer is backpedalling on the use of GHP or direct use. Suggested that a computer modeling of the building to get the loads would be a good start to determine feasibilty. Then the costs and savings could be better judged. Advised that it is an uphill battle when the engineer is against it.
03/10/97 kalli52019@aol.com	Re: GHP E-mail response to a request for info on residential lake loop. Provided information on the nature of pond heating from solar and the resultant need for depth in a cooling application. Suggested that he get Kavanaugh's book on resid systems.
03/11/97 sachs@ghpc.org	Re: GHP E-mail message reminding Harvey that he needs to get going on the symposium for San Fran ASHRAE. I should be able to get him my paper by the end of April.
03/11/97 Finn, Donald Geothermal Energy Institute New York, NY 10021	Re: GHP He called to ask about something called the Geo Column. Discussed the market for GHP and how DX fits into it. Explained that DX has some serious environmental downside (refrigerant and oil in ground) , reliability drawbacks - tubing and fittings and a very small portion of the market. Upside is the potential for better performance - unaware of data though.
03/12/97 Fluharty, Erin 21609 Camper Circle Tilghman, MD 21671	Re: General Responded to letter asking questions on the advantages and disadvantages of geothermal energy, effects on the environment, etc. for a research paper.
03/12/97 Jordan, Ben Atlantis Enterprises Klamath Falls, OR	Re: Industrial He has a company here in KF that dehydrates food using propane for fuel. Interested in geothermal. In the old Ford tractor bldg on Hwy 39. Doing alfalfa, barley, vegtables, discussed the TA program and how we could help. Resources around tha area and the well on his property. Said he would visit the office to discuss it more.
03/13/97 gka3946@silver.sdsmt.edu	Re: Resource E-mail response to a request for information on scale removal in a geothermal well used for municipal water supply. Suggested that the folks at Univ of Utah have a lot more geochemistry expertise than we do. Gave him Mike Wright's address.
03/13/97 Leland, Rob 209-536-9056	Re: Resource He is looking for a hot spring near the Carlsbad Caverns in NM. Check the New Mexico database and found nothing really hot. No springs, only a well - Clayton Well 31 C.
03/14/97 skavanaugh@coe.eng.ua.edu	Re: GHP E-mail reminder to Dr. Kavanaugh and Dr. Murphy that I need their changes to the Chapter so I can put together a draft for the June meeting.

03/14/97 Anderson, David GRC P.O. Box 1350 Davis, CA 916-758-2360	Re: General Requested a speaker on direct use at a UNOCAL workshop for employees. The workshop will be in Huntington Beach, CA, near John Wayne Airport, 25-35 people, May 1-2, 1997. HVAC workshop on GHPs at the end of April in Truckee, CA - purging, duct work, selection of equipment and heat load calcualtions.
03/14/97 Lynch, Jim Shortridge Plumbing and Piping 1360 Industrial Ave Petaluma, CA 94952	Re: GHP He is a contractor and wants to get into GHP. Told him about IGSHPA and the training center in Davis. Gave him the GEA number.
03/16/97 Buchanan, Meg OIT LIbrary 541-885-1965	Re: Space Heating She just bought a house in the hillside area and wanted to know about contractors to install a geothermal system. Explained that it would probably be a combination of 2 contractors - drilling and plumbing (or HVAC) depending on the type of heating system she had. Called her back later to suggest that she might look into connecting to an existing system to reduce costs.
03/16/97 tmontazzol@aol.com	Re: GHP Are there any state or federal rebates available for installing a direct-expansion unit. Sent a reply that as far as we knew there is nothing federal, but contact their State Energy Office for information.
03/17/97 drtinc@compuserve.com	Re: GHP E-mail response to a request for help in deciding whether savings predicted for a GHP system (country club) are accurate. Advised that the decision should be based upon the energy use of new high efficiency air source, gas and GHP not new GHP to old inefficient system. Heavy influence of utility rates. Bigger savings in heating than cooling.
03/17/97 rusdusty@intrepid.net	Re: GHP E-mail response to request for info on GW GHP. Offered cautions on water quality (hardness,iron and H2S), disposal and lower flows that for closed loop systems due to pumping energy.
03/17/97 caw131@psu.edu	Re: GHP E-mail response to a request for help with a GHP system for a school. They want to use radiant floor with a GW system. Advised that the water temp will have to be higher than the 60 F they have assumed - more like 100 F. Also use a heat exchanger between GW and bldg loop. Buffer tank may be required in bldg loop. One large heat pump or several small ones depends on loads.
03/17/97 jdevoll@startext.net	Re: GHP E-mail response to a request for info on GHP retrofit. Advised that we don't have anything specifically on retrofit but we do have some general info to send on GHP. Sent h/p pkg.

03/17/97 angela@comsys.net	Re: GHP E-mail response to a request for info on GHP economics. Advised that the economics are heavily influenced by the local electric and competing fuel rates. We can help calculate savings if she can get the local numbers.
03/17/97 Kenny, Mike Brothers West Aquaculture Klamath Falls, OR 97601 541-882-1314	Re: Aquaculture Mike called to ask about the total volume of water that their system would discharge in a year for a DEQ inquiry.Details of calcs in logbook. Final numbers included in letter to Mike Kenny (in correspondence).
03/18/97 sachs@ghpc.org	Re: GHP E-mail with the abstract for my paper for the San Fran ASHRAE meeting . Topic is pumping issues in GWHP commercial systems.
03/18/97 eh60ip@apcnet.com	Re: GHP E-mail response to a request for help in addressing regulators concerns over a GHP system. Concern is leeching of metals from heat pump htx and discharge to sewer. Explained construction materials of heat pumps (same as other plumbing componemts) and likelihood of leaching is no greater.
03/19/97 mnemzer@aol.com	Re: District Heating E-mail message w/comments on their graphic for district heating. Change label on the central plant. Explained what a central plant includes. Need supply and return lines to each building.
03/19/97 cherry_ridge@msn.com	Re: GHP E-mail response to request for GHP info forwarded by Joel Renner. Explained the terminology of GHP and the other sites w/info. IGSHPA for contractor locations.
03/19/97 Nemzer, Marilyn Geothermal Education Office Tiburon, CA MNemzer@aol.com	Re: District Heating Reviewed a geothermal district heating diagram for a slide show, suggested it show a central plant (heat exchangers, circulating pumps, expansion tanks, etc) separate from the injection and production wells.
03/21/97 lburg@msa.nwsearle.sea06.navy.mil	Re: GHP E-mail response to request for publications. Suggested that the ones he requested would not address residential GHP. Suggested that we send him a draft of the survival kit and Kavanaugh's Cost Containment.
03/21/97 sachs@ghpc.org	Re: GHP E-mail message to request that the GHPC web site establish a link to our site under "other sites of interest"

03/21/97 Caspers, Todd & Tyler Severin Rockwell School 210 S. 2nd Rockwell, IA 50469	Re: General Requested information on geothermal energy in terms of how it is used and the effects on the environment. Sent five publications.
03/21/97 Ciancanelli, Eugene Cascadia Exploration Corp. 3358 Apostol Road Escondido, CA 92025 619-489-0969	Re: Industrial Discussed industrial applications for resource site near the Medicine Lake KGRA. The site is about 1 mi. from the discovery well with a reservoir temperature of 530F. Estimates resource temperature of at least 500F on site. Applications being considered include potato processing, onion dehydration, and rice drying.
03/21/97 Keegan, Garrett Civil Engineering Services Inc. 465 South Man St., P.O. Box 639 Brewer, ME 04412-0659	Re: GHP Requested an article published in Energy Sources, "Geothermal heat pump performance and utility programs in the United States." Sent the article and other information on GHPs.
03/26/97 Powelles, Gary Powllles Roofing 223 N Spring Klamath Falls, OR 97601 541-882-0758	Re: Resource Discussed geothermal well at 1500 Esplanade. Provided well log, pump information, water chemistry and temperature - depth profile. Also, explained options for disposal of effluent. He is considering purchasing the property for expansion.
03/27/97 Sween, Todd Ontario, OR 541-372-5587	Re: Aquaculture Discussed geothermal sites for aquaculture in the Klamath Falls and Lakeview areas. He has worked with Bill Engler, Pacific Aquafarms, Imperial Valley and Kent Seafarms, Twin Falls, Idaho. Will visit the GHC on April 1. Referred by the Oregon Dept. of Economic Development.
03/28/97 Ellison, Tom Northwest Contracting 4308 Nicholas Road Port Angeles, WA 98363 360-457-8881	Re: GHP Discussed conversion of an office complex (6,000 sq. ft) from air-source heat pump to geothermal heat pump. The ASHP unit has had repeated compressor failures. The project will consist of 2-3 ton, 1-2 ton and a 4 ton lap pool (15'x75') units. Explained groundwater and ground coupled type systems.
03/28/97 Luitweiler, Bob P.O. Box 28808 Bellingham, WA 98228 360-714-1043	Re: General Discussed binary cycle power and direct use geothermal. Writing a book on renewable energy. Sent general information on the direct uses of geothermal energy.
03/28/97 Niemeyer, Michael michael5@hcn.hcnews.com	Re: GHP Can the lateral line for a septic tank and a geothermal heat pump be placed in the same trench. Referred him to Karen Den Braven at the University of Idaho.

03/29/97	
Denny, Wayne P.O. Box 2356 Susanville, CA 96130 916-251-0670	Re: Aquaculture Discussed geothermal resources in Susanville, Wendel and one near Canby for the development of an aquaculture project. He plans to raise catfish. Provide contact for Kelley Hot Springs near Canby, which is up for sale.

03/31/97	
Axelsson, Gudni Orkustofnun Grensasvegur 9 IS-108 Reykjavik, Iceland 354-569-6000	Re: Resources Discussed both direct use and electric power development of geothermal resources in the U.S. Specifically, geophysics, monitoring and injection wells. Provided a tour of the OIT geothermal heating system and the City geothermal district heating system.

03/31/97	
Woodside, Kirk Microplast USA	Re: Electric Power Interested in more information on the geothermal power plants OESI ORMESA 1. Referred him to the Geothermal Resource Council and supplied him with a link to their page.

3.0 R & D ACTIVITIES

The direct use research and development objectives are to aid industry in resource and technical development problems. To investigate and analyze methods or approaches to reducing the cost of designing, developing and operating low-temperature geothermal projects. The following is a summary of work recently completed on pumping issues for commercial geothermal heat pumps

3.1 WELL PUMPING IN COMMERCIAL GROUNDWATER HEAT PUMP SYSTEMS

Sub-Task 2.2, Pumping Energy Evaluation for Groundwater Heat Pump Systems has been completed. A brief summary of the findings follows:

Key to efficient well pumping design is the consideration of three major power consuming components of commercial groundwater heat pump systems: well pump, heat pumps and building loop pump. Careful consideration of the interaction between these components and their impact upon system performance is necessary in order to minimize operating costs for the building owner.

The research considered well pump head analysis, well pump power requirements, optimum water flow requirements for the loop pump and comparison to ground-coupled heat pump system performance.

Well pump head in a GWHP application consists of three major components: lift, surface requirements and injection head. The vertical distance between the pumping level and the ground surface constitutes the "lift" portion of the well pump head. Surface head loss includes the losses in piping, the isolation heat exchanger and associated fittings and accessories. The report discusses the use of injection for disposal and how to calculate the injection pressure. If the water level remains below ground level at design flow conditions, there is no additional well pump head associated with injection.

Well pump power requirement is a function of flow, head and efficiency. Based on an overall well pump (and motor) efficiency of 60%, well pump power consumption varies from <50 W/ton (@ 1 gpm/ton and 100 ft head) to nearly 375 W/ton (@ 3 gpm/ton and 400 ft head).

Avoidance of excessive well pump power lies in a design procedure which rests upon total system performance rather than simply heat pump unit performance.

Optimum system performance is obtained when the power consumption of the well pump, loop pump and heat pumps is minimized through careful design. At a given loop flow rate, heat pump performance is largely a function of loop water temperature. In most GWHP applications, the groundwater flow will be less than the building loop flow for optimum design. Information on total system performance for three water temperatures (50°, 60° and 70°F) at various well pump heads and flows were developed to show the designer that he has some latitude in loop flow selection. Figure 1 shows example curves for cooling duty with 60°F groundwater.

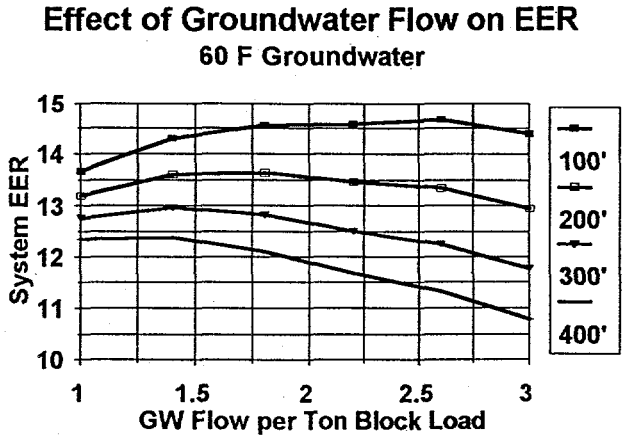

Figure 1. Well pump power requirements as a function of flow and pump head.

Properly designed groundwater heat pump systems are characterized by peak load performance comparable to, or in some cases superior to, ground-coupled systems. To achieve this performance, it is necessary to select the groundwater flow with total system performance in mind. In addition, the flow should be based upon peak block load and not installed capacity.

4.0. MOU with EIA

The Energy Information Administration (EIA) is establishing a memorandum of understanding (MOU) with the Geo-Heat Center to provide resource and utilization data on geothermal direct-use projects.

The objective of the MOU is to further public understanding of direct-heat uses of geothermal energy, to confirm the universe of related applications, to standardize the methodology for collecting direct-use geothermal data, and to link EIA's and Geo-Heat Center's World Wide Websites on the Information Highway.

The existing Geo-Heat Center direct-use database will be updated by contacting owners, operators and State Energy Offices to determine the state of current projects and to find out about any new developments. Geo-Heat Center information will be incorporated into the EIA's Renewable Energy Annual and Annual Energy Review.

5.0 GEOTHERMAL DIRECT-USE ENGINEERING AND DESIGN GUIDEBOOK

Since 1989, when the 1st edition of the Guidebook was published and 1991 when the 2nd edition was reprinted, new information and data have been developed that will improve and update 11 chapters of the Guidebook. The 2nd edition is no longer available and the Guidebook will not be available until the update is completed and the 3rd edition printed.

Work on the Guidebook during this reporting period included: Chapter 1 - update of the direct-use database; Chapter 15 - collected information for greenhouse construction materials, temperatures for certain crops and researched crop prices and labor costs. Reviewed Chapters: 15 Greenhouses, 16 Aquaculture, 10 Piping and 11 Heat Exchangers for errors.

6.0 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.

6.1 Geo-Heat Center Quarterly Bulletin. Bulletin Vol. 18, No. 1 was distributed in January to 1557 domestic, and 351 foreign subscribers. Bulletin Vol. 18, No. 2 is in preparation and will be published in April. Articles include:

1. "An Information Survival Kit for the Prospective Geothermal Heat Pump Homeowner" by K. Rafferty,
2. "Well Pumping Issues in Commercial Groundwater Heat Pump Systems" by K. Rafferty,
3. "Reno Industrial Park Geothermal District Heating System" by P. Lienau
4. Geothermal Pipeline

6.2 GHC Webpage Updates

Completed updating the direct-use section including new information on greenhouses. Finished adding introductions for the technical papers/reports in the request form so people had an idea of the contents. Added GHC Quarterly Bulletin, Vol. 18, No. 1.

A new section will be added that will contain information for the prospective geothermal heat pump owner.

6.3 Technical Papers, Presentations and Tours

1. Discussion and Tour. Mr. Hamada, Geothermal Co., Ltd. and Mr. Toya, New Energy Foundation, Tokyo--discussion and tours of geothermal district heating systems and geothermal heat pumps. Tours were arranged for the city and OIT geothermal district heating systems and heat pump installations in the Portland/Vancouver areas and Oklahoma City.

   Discussions centered on national and state policies for GHPs (role of GHPs in the energy policy, utility and private enterprise involvement), history of development, enforcement structure, and results and future aspects of GHPs, and governmental regulations. Technical questions involved flow diagrams, plant design, specifications, working fluids, control systems, anti-corrosion measures, cost and profitability, and effects on the environment.

2. Technical Paper. A technical paper titled, "Overview of Geothermal Direct Use R&D at the Geo-Heat Center" was presented at the DOE Geothermal Program Review 15, March 25-26, 1997. Topics covered included the development of a geothermal district heating system for the Reno Industrial Park (264 MW_T), geothermal district heating in residential areas and greenhouse peak heating strategy.

3. Presentation and Tour. Energy Management students (13) from Lane Community College were provided a presentation on geothermal energy and a tour of OIT and city geothermal district heating systems (2-3-97).

4. Presentation. Presentation to 8th grade girls (22) from Klamath Falls, Modoc and Alturas, CA, which included an introduction to geothermal energy and what kind of careers are possible (3-4-97).

5. Discussion and Tour. Dr. Gudni Axelsson from Iceland National Energy Authority was provided a tour of the OIT campus and city geothermal district heating systems. Discussion centered around geophysics of well testing and monitoring of the Klamath Falls aquifer and Icelandic systems.

6.4 Geothermal Library. During the period of January 1 to March 31, 1997, six new volumes were added to the library. The library now has a total of 5281 volumes cataloged.

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

Topic	No. Publications
Geothermal Heat Pumps	371
Space Heating	13
District Heating	10
Greenhouses	11
Aquaculture	10
Industrial	4
Equipment	21
Resources/Wells	21
Other	144
Total	609

7.0 GEOTHERMAL PROGRESS MONITOR

7.1 ASHRAE Geothermal Heat Pump Activities

Among the many organizations working to develop information on geothermal heat pump systems is ASHRAE, or American Society of Heating, Refrigeration and Air Conditioning Engineers, a professional organization whose members consist largely of engineers involved in Heating, Ventilation and Air Conditioning (HVAC) design, manufacturing, research and education. The Society is the primary source of design and application information for engineers involved in the HVAC industry. Through a variety of publications, ASHRAE makes this information available to its 60,000 members and the public.

Within the organization, approximately 100 Technical Committees (TCs) oversee the development of design information, research and standards in their respective areas of expertise. The primary committee for geothermal heat pumps (called ground-source heat pumps within ASHRAE) is TC 6.8 Geothermal Energy. For many years, this committee has been actively developing information for designers of commercial geothermal heat pump systems. Among the more important products of these efforts are:

Chapter 29 - Geothermal Energy, ASHRAE Handbook of Applications

The ASHRAE Handbooks (a 4-volume set) are the most widely used source of design information for practicing engineers. These volumes are updated on a 4-year schedule. The current Geothermal Chapter is contained in the 1995 volume, and updating and improvements are underway in preparation for the 1999 issue.

Contained in the chapter is information on the design of direct use geothermal (100 - 300°F), open loop (groundwater) and closed loop (ground-coupled) heat pump systems for commercial applications. This information focuses on the ground loop portion of the systems. Information on the building loop and heat pump equipment is contained in other chapters of the ASHRAE Handbook series.

Commercial/Institutional Ground-Source Heat Pump Engineering Manual

This manual was prepared by CANETA Research and published by ASHRAE in 1995. It contains information on design and installation for ground-coupled (closed loop), groundwater (open loop) and surface-water GHP systems. The vertical ground-coupled design methodology presented in this manual is the one developed by CANETA Research. This manual focuses on ground-coupled systems and provides somewhat less coverage of groundwater and surface water systems.

TC 6.8 is currently reviewing a second design manual for future publication by ASHRAE. This manual contains the design method developed by Dr. Steve Kavanaugh (University of Alabama) for vertical ground-coupled systems, and an expanded coverage of groundwater systems.

Commercial Ground-Source Heat Pump Systems

This document (referred to within ASHRAE as a Technical Data Bulletin) is a collection of papers previously published in the *ASHRAE Transactions* on the topic of commercial systems. It contains 15 papers on such issues as cost, design, modeling, energy use, standards and field testing of systems. The papers contained in the Bulletin were published between 1992 and 1995.

ASHRAE Transactions

The *ASHRAE Transactions* contains all of the papers presented at ASHRAE winter (January) and summer (June) meetings each year. TC 6.8 has been very active over the past several years holding sessions on GHPs at most meetings. Between 5 and 15 papers per year have been published as a result of these programs. All are included in the *ASHRAE Transactions*.

The research projects which have been conducted with oversight from TC 6.8 have recently resulted in two important publications.

Operating Experiences with Commercial Ground-Source Heat Pumps

This report by CANETA Research was published in October 1995 and resulted from ASHRAE Research Project RP-863. The report contains detailed case study information on 23 commercial ground-source heat pump systems. A wide variety of system types, designs and geographical locations included. Information on system cost, design, layout, operation and maintenance is included.

Assessment of Antifreeze Solutions for Ground-Source Heat Pump Systems

This report by the Center for Global Environmental Technologies (University of New Mexico) was completed as part of ASHRAE Research Project RP-908 and published in 1996. It contains a comprehensive review of the environmental, physical and thermodynamic properties of four current and two potential antifreeze fluids for GHP systems. Specific areas covered for each include: cost, corrosion, leakage, health hazard, fire risk and environmental risk.

In addition to these publications, TC 6.8 members are currently developing a 3-hour short course for presentation at the ASHRAE's January meeting in Boston. The course would include design information for large building GHP systems. Development of the 3-hour course is considered a stepping stone to preparation of an ASHRAE course on GHP to be included in the Professional Development Series (PDS).

This series presents 1-day seminars around the country each year on topics of current interest to ASHRAE members.

The publications described in this article can be ordered directly from ASHRAE by calling 1-800-527-4723 or www.ashrae.org. A Geo-Heat Center staff member is actively involved in the TC 6.8 and can provide additional information on any of the above publications.

7.2 GHP TRAINING CENTERS AND WEBSITES

Regional training centers for the installation of geothermal heat pumps have been established in seven areas of the U.S. The support for these centers has come through the Geothermal Heat Pump Consortium with funding from USDOE, USEPA and electric utilities. The purpose is to provide training and certification for HVAC firms involved with the installation of geothermal heat pump systems.

Alabama Heat Pump Training Center
Verbena, AL
800-634-0154

Alternative Energy Corp.
Raleigh, NC
919-857-9000

Geothermal Energy Association
Davis, CA
916-750-0135

Ferris State University
Big Rapids, MI
616-592-2351

Keystone Geothermal Heat Pump Training Center
Johnstown, PA
814-269-3874

Northern Geothermal Support Center
Brookings, SD
605-688-4288

International Ground Source Heat Pump Assoc.
Stillwater, OK
800-626-4747

The following websites have information on geothermal heat pumps.

- Geothermal Heat Pump Consortium
  http://www.ghpc.org
- Geo-Heat Center
  http://www/oit.edu/~geoheat
- IGSHPA
  http://www.igshpa.okstate.edu
- EPRI
  http://www.eprihp.com
- New Jersey Heat Pump Council
  http://www.njhpc.org
- DOE
  http://doegeothermal.inel.gov

Geothermal heat pump manufacturers' websites:

- Addison Products Company
  http://www.addison-hvac.com
- ClimateMaster Inc.
  http://www.climatemaster.com
- Econar Energy Systems Corporation
  http://www.econar.com
- FHP Manufacturing
  http://www.fhp-mfg.com
- Mammoth Inc.
  http://www.mammoth-inc.com
- The Trane Company
  http://www.trane.com
- WaterFurnace International
  http://www/waterfurnace.com

7.4 CALIFORNIA

Geothermal Plant Shutting Down

One of 24 geothermal energy plants hooked into The Geysers outside Santa Rosa, the world's largest producer of natural steam energy, is slated for dismantling because that energy source has been tapped out by overuse.

A consortium of public utilities that serves Sacramento, Modesto and Santa Clara opened the $200 million Coldwater Creek Geothermal Power Plant in 1988. But from the beginning, it operated at only half capacity because there wasn't enough steam.

According to the U.S. Energy Commission, power production at Sonoma County's geysers, 60 miles north of San Francisco, peaked in 1988 but has declined steadily since then. The reason: too many plant operators tapped into its natural underground heat source (Source: *Herald & News*, March 31, 1997).

7.5 PENNSYLVANIA

New WEBFAXX Option Delivers ASTM Standards Any Day, Any Time, Any Where

American Society for Testing and Materials (ASTM) standards can now be delivered within 10 minutes to any fax machine, any time, any where.

Thanks to WEBFAXX, a new option on ASTM's website, users can receive copies of ASTM documents via fax for just $.75 per page in the United States, Canada and Mexico, and $1.50 per page in other countries (plus the cost of the standard). WEBFAXX can be accessed at: <http://www.astm.org>, in the "Search for Standards" area.

ASTM, the world's leading developer and publisher of voluntary consensus standards, is the first and only standards development organization to provide this service, which requires no customer service assistance.

ASTM updates the database weekly to ensure the most up-to-date standards are available. The quality of most standards is good, text, line drawings, and tables are perfectly legible and useable. Photographs, however, do not fax clearly because fax machines are incapable of the resolution necessary. If photographic clarity is essential to you, mail delivery is suggested.

Organized in 1898, ASTM is one of the largest standards development system in the world.