# RECENT DIRECT-USE TECHNICAL ASSISTANCE ACTIVITY

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#### INTRODUCTION

The U.S. Department of Energy is currently developing a long-range plan to guide its geothermal activities for the next 10 years. As part of this task, a meeting was recently held in Klamath Falls to examine those issues related in direct use. To acquaint those in attendance with recent trends in industry activity, a summary was prepared of Geo-Heat Center technical assistance (TA) activity over the past two years. The following data is based on contacts made with the public, through the TA program between October 1996 and September 1998. This information provides a clear picture of the areas of current activity in direct use and as a result, the most likely areas to remain most active in the short-term future.

Figure 1 provides a summary of all Geo-Heat Center technical assistance activity over the past two years. The focus of this article is direct use. It is apparent from the data, however, that geothermal heat pump (GHP) requests for assistance constitute a significant part of the Center's TA volume. Approximately 80% of the requests for GHP assistance are related to residential systems. Interestingly, most of these requests are received via email and the typical contact is an individual planning a large (2500 sq. ft to 6000 sq. ft) home in a rural setting in a moderate-to-cold climate. This suggests that our activity in this area is an accurate reflection of the niche market currently served by GHP systems in the residential sector.

### Distribution of Requests by Type 4Q96 to 3Q98



Figure 1.

General requests for information (19.8%) are related to tours of geothermal facilities provided by Geo-Heat Center staff, information requests related to geothermal statistics, project locations, and the growing area of email requests from school children for help with their homework.

The Resource category (13.5%) represents requests related to general locations of resource areas in the U.S., specific locations of hot springs and general information about geothermal energy. These requests do not involve a specific project.

Figure 2 focuses on only the requests for assistance that are clearly related to direct-use projects. It is apparent that the distribution is quite even with respect to the various uses. Resort applications (17.7%) are virtually all related to expansion and repair of existing resorts, pools and similar facilities. Over the entire two-year period, only one new resort project was initiated. This project, located in Washington State, is currently in construction. Little new project development is occurring in the resort category.

### Project Related Requests by Type 4Q96 to 3Q98



#### Figure 2.

Power generation requests (15.3%) are generally of two types. The first involves questions about a particular project or level of development in a particular state. This involves only providing general information which is available in the literature. The second, and much more common, type of power generation request is project related. The typical case involves an individual who has a geothermal resource on his property and needs information about how to go about generating electricity. Invariably, our response involves explaining the nature of geothermal power plants in terms of scale, basic operation, performance, flow requirements and general economics. There is a commonly held misconception that generating power with geothermal is similar to buying a solar panel or a Coleman generator and that resources of 100°F are perfectly suitable for the application. There were no projects identified in the past two years, as a result of TA contacts, that involved a realistic power generation application.

The remaining categories, Space Heating, Greenhouse, District Heating, Aquaculture and Industrial, are the key direct-use project related categories. Superficially, it would appear that there is a good balance between these uses. In terms of number of contacts, this is true. However, to determine in which of these areas there is the greatest level of project development activity, it is necessary to look in greater depth at the nature of contacts in each of the categories.

Figure 3 presents a breakdown of contact types for the Space Heating category. Space heating, as it is used here, relates the heating of single buildings rather than multiple buildings (which is covered under the District Heating category). The number of contacts in Figures 3 through 7 are broken down into four types: contacts relating to existing projects, contacts related to new projects, contacts related to international requests, and non-project related requests. Approximately one quarter of space heating requests for assistance are related to existing projects. These include primarily maintenance, repair and equipment replacement issues for operating systems. Nearly 44% of the contacts are directly related to new projects including such topics as equipment selection, feasibility, cost and resource development. The small percentage of requests from the international sector is a reflection of the fact that individual building space heating with geothermal is not common in other countries. When geothermal is used for space heating it is normally in conjunction with district heating. Non-project related contacts in this area are responses to general space heating information requests, communications related to staff activities in the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) and occasionally mis-labeled logbook entries.

### Distribution of Requests by Type Space Heating



### Figure 3.

Figure 4 presents a similar summary for the Aquaculture category. Geothermal applications of aquaculture generally involve the raising of warm-water fish species. Roughly 10 % of our contacts are related to existing operations. This low percentage is likely a reflection of the relatively simple mechanical arrangement used in these systems with which operators have little problem. The bulk of aquaculture contacts (61 %) is related to the development of new projects. This results from the explosive growth in aquaculture in general over the past several years. Most new geothermal applications are involved with Tilapia which is the fastest growing single species in aquaculture in general. International requests for aquaculture assistance constitute only about 10 % of the total maybe related to the fact that much of the aquaculture activity outside the U.S. is in much warmer climates preclud-

ing the need for heat. Non-project requests are most often requests for Geo-Heat Center publications on this topic, particularly those relating to the past work with Macrobrachium Rosenbergii (Malaysian prawn) performed here at OIT.

### Distribution of Request Types Aquaculture



Figure 4.

Figure 5 presents the distribution of requests for Greenhouse applications. Again, a substantial percentage (58%) of the contacts involve new project development. As with other categories, requests for assistance with existing projects (21%) are most often related to equipment replacement or maintenance.

## Distribution of Request Types Greenhouses



### Figure 5.

Figure 6 presents the distribution of requests for assistance in the area of District Heating. The largest single category here is the non-project related area. This is a reflection of Geo-Heat Center staff activities on the ASHRAE District Heating and Cooling Technical Committee. All communications relating to committee activities are logged as district heating. In addition, tours provided by Geo-Heat Center staff of local geothermal facilities for visitors to Klamath Falls are logged as district heating. Due to the complex nature of district heating systems and the extensive piping networks required, a much higher percentage (31%) of requests for assistance are related to operations and maintenance than for other direct-use applications. New project-related requests are the smallest portion of this category. This is a reflection of the negligible level of activity in district heating in the U.S. In fact, all of the activity in new project development is related to only two systems in the past two years—neither of which has entered construction. International requests are a reflection of the higher level of district heating practiced in other countries—particularly Europe.



#### Figure 6.

Industrial applications are summarized in Figure 7. Industrial applications include such uses as dehydration, gold mining and refrigeration. Industrial applications in the U.S. are few, but tend to be very large in scale and quantity of energy displaced. The distribution of requests underscores the low level of new project development with only 3% of contacts related to this area. International and non-project related constitute equal shares of the remaining contacts. These are requests for generic application publications (refrigeration, dehydration, etc) or for information on the use of geothermal for industrial applications in general. Dehydration is of particular interest to Pacific Rim nations. Of note is the fact that none of the requests for assistance are related to existing systems. This is likely a reflection of the more sophisticated nature of the system owners in industrial applications.



#### Figure 7.

Figure 8 is a summary of the new project activity in the five application areas presented earlier. It is apparent that the new projects are resulting from three principle areas: space heating, greenhouses and aquaculture. Less than 10% of new project-related contacts were in the areas of district heating and industrial applications, and as mentioned above, none of these are actually in construction.

### New Project Development Applications 4Q96 to 3Q98



Figure 8.

Promoting greater use of geothermal resources for direct use could best be done by targeting those areas in which there is already a clearly defined interest on the part of developers. Fortunately, both the greenhouse and aquaculture industries have well established professional and industry groups (and publications) to serve as information conduits for these efforts.

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