Final Evaluation Report

In support of:

GHPC's Program To Promote Geoexchange
To
Southern California Edison's Customers

GHPC-SCE-004

Submitted to:

Geothermal Heat Pump Consortium, Inc.
701 Pennsylvania Avenue, NW
Washington, DC 20004-2696

Submitted by:

1104 Main Street, Suite 630
Vancouver, WA 98663

May 2004

Table of Contents

1

Introduction

1.1 Program Overview

Beginning in the fall of 2002 and going through mid-2004, the Geothermal Heat Pump Consortium (GHPC) managed a program within the Southern California Edison (SCE) service territory designed to enhance public awareness and educate potential customers and trade allies on the advantages of the geoexchange technology for HVAC application. The program was targeted toward new and existing schools, small to mid-sized owner occupied businesses, multi-site commercial chains, and municipal buildings. The program was also designed to assist in the installation of geoexchange systems in two schools in economically distressed areas of the SCE service territory.

Itron's role in this program was to provide an independent assessment of GHPC's performance as program manager. The objectives of this assessment included:

- Providing up-front market assessments and baseline analysis,
- Providing ongoing feedback, and corrective and constructive guidance regarding the implementation of programs,
- Measuring indicators of the effectiveness of specific programs, and
- Assessing the overall levels of performance and success of programs.

To meet these objectives, Itron performed participant and non-participant surveys; attended selected GHPC sponsored workshops and seminars, and reviewed program materials.

There were three prime components to the program. The first was public education, which GHPC approached through a series of educational seminars and workshops. The second component was public outreach. Here, GHPC implemented a number of different strategies including face-to-face meetings with building system decision makers, creation and dissemination of outreach material, enhancement of the offerings through their Geoexchange Information Center, dissemination of press kits, and preparation of case study information for the media. The third primary component is the still to be completed installations of two geoexchange systems in schools within economically distressed areas of the SCE service territory. As of the beginning of May 2004, one

system installation commitment has been achieved. A 146-ton geoexchange system in the Mohave Unified School District's Forecast Elementary School in California City has been formally agreed to. Although the program is beyond its original scheduled completion date of December 2003, GHPC is continuing its efforts to secure the second geoexchange system commitment. Several prospective candidates remain as potential recipients of the second system.

Based upon the responses to the many surveys and workshops attended by Itron staff, the efforts by GHPC to promote awareness of the geoexchange technology have been well received. The materials developed and the presentations provided were regarded as highly professional and useful.

It is still too early to determine if a significant market penetration by the geoexchange technology will occur. Development of capital projects is a multi-year process, as evidenced by the efforts to recruit two schools to receive assistance in the design and installation of a geoexchange system. Interest has been developed and an infrastructure to support the industry has begun, but it will take several years before any permanent impact can be detected.

This report summarizes the evaluation efforts and results that were performed over the program's lifetime. The evaluation efforts completed were primarily process evaluations. A simplified impact estimation was also planned and the data for this estimation methodology developed and reviewed. It was to be based upon the results of the baseline and year one decision maker surveys, along with any information gathered from the currently on-going Commercial End-Use Survey (CEUS) being performed by Itron for the California Energy Commission. Decision maker familiarity with the geoexchange technology was found to have increased in the target area between the baseline period and the year one period. However, no saturation of geoexchange systems within the SCE service territory, were found in the sample of buildings included in the CEUS survey. As stated earlier, development of capital projects is a multi-year process and at this point, there is not enough information available to develop reasonable energy impact estimates from the program. There may well be energy impact, but it is too early to determine.

This report includes sections that summarize the baseline decision maker survey, evaluations of the seminars and workshops, the public outreach evaluation, and the final year one decision maker survey.

Appendices are provided within this report that include the detailed results of each of the survey efforts completed.

2

Summary of Findings

2.1 GHPC Program Review

The GHPC program was very successful in meeting or exceeding its stated project goals of performing a certain number of workshops/presentations and disseminating information. Over the life of the project, awareness and acceptance of the geoexchange technology increased among the architects, mechanical engineers, and school officials within the Southern California Edison (SCE) service territory. A large number of people were provided information about the technology through workshops, seminars, meetings, and media releases. The workshops, seminars, and meetings were very well received with an overwhelming majority of participants expressing satisfaction with the events and an increased awareness and acceptance of the technology. Progress was also made toward developing an infrastructure of planners, dealers, drillers, and installers of the technology in the region. Recruiting potential participants in the direct installation portion of the project within the short time frame of the project proved to be difficult. A number of schools expressed interest in participating in the demonstration effort and detailed discussions occurred with several potential participants. As of May 2004, only one firm participant has been recruited. However, this appears not to be because of a disinterest in the technology, but rather because of the very limited number of opportunities and the long time frame in the planning process for building or remodeling a school.

Key findings from the evaluation efforts include:

- An increasing awareness and acceptance over time among the architects, mechanical engineers, and school officials within the SCE service territory of the geoexchange technology.
- Very limited number of geothermal heat pump installations in the Southern California area.
- A high level of acceptance of the technology after attending the workshops/seminars/meetings.
- Although an increased awareness of the technology over the program life, still a limited understanding of the technology among architects, school officials, and government oversight agencies as a whole.

- A relatively good understanding of the technology among mechanical engineers.
- Remaining high levels of uncertainty regarding the reliability and cost-effectiveness of the technology among decision makers as a whole. However, attendance at the workshops and seminars helped reduce these levels of uncertainty considerably.
- A desire for local case studies and local information.
- A desire to clear the uncertainty regarding required permits and regulatory issues.
- Workshops and seminars appeared to be the most effective means of increasing awareness and appreciation of the technology. Distribution of media kits was of limited value. The most effective media kits and news releases had a specific local angle to them, an in the case of specialized publications, a local angle that was specific to that target audience.

2.2 GHPC Program Impact

The GHPC program is designated by the California Public Utility Commission (CPUC) as an informational program and as such does not require an impact analysis. However, in the proposed EM&V plan submitted by Itron for this project, it was anticipated that at least some limited impact evaluation could be performed. The first was to be directly related to the two schools that were to receive direct assistance to install a geoexchange system. The second was to estimate increased levels of decision maker awareness of the technology and willingness to install it as a result of the program and estimate how this change in awareness would impact geoexchange installations.

The relatively short timeframe for the project along with the long budgetary cycle for school capital improvements and the limited number of qualified schools has made it difficult for GHPC to recruit participants to receive assistance for installing a geoexchange system. As of the beginning of May 2004, already several months after the original end date for the project, only one firm school commitment has been received, although several other potential candidates still exist. Even for the one committed school, actual design and system installation is many months into the future. Therefore, not enough information exists to either estimate probable impact or to develop a specific monitoring plan. This probability became apparent toward the end of 2003 and led to the decision to shift the resources allocated for this effort to an expansion of the year one decision maker survey. The number of year one survey participants was doubled.

Both baseline and year one estimates of decision maker awareness and willingness were developed based on the two survey efforts fielded (see Sections 3 and 6). However, not

enough time has passed to provide sufficient additional information needed to make an estimate of impact. For the service territory as a whole, there was improvement in decision maker awareness and willingness (see Section 6). However, as with the schools issue discussed in the previous paragraph, the short timeframe for the project along with the long lead times for most capital improvement or new construction projects has not provided a long enough period of time to make any reasonable estimates. The currently on-going Commercial End-Use Survey (CEUS) sponsored by the California Energy Commission has not found any geothermal heat pump installations within the SCE service territory within its sample. The sample is not large and systems are likely being missed, but it is indicative of the current very low saturation of the technology within the commercial building sector.

Although information is not sufficient to estimate energy impacts, changes between the baseline and first year estimates for willingness and awareness indicate success for the program. Willingness is relatively high and consistent in both the baseline and year one surveys (over 80%), but awareness levels grow significantly. In the baseline survey, awareness of the technology was found with only 22% of the survey participants. By the end of year one, the survey indicated that awareness had grown to 29%. When the survey responses are segmented into the geographic area targeted for the workshops and seminars (outside the main urban core of Los Angeles), awareness was 45%. This 45% awareness level cannot be compared to a baseline value (not enough sample points to segment the baseline results), but it is significantly higher than the overall 29% awareness level for the SCE territory as a whole.

3

Baseline Development

In order to measure the effectiveness of the GHPC efforts to enhance public awareness and educate potential customers, it is necessary to have a baseline measurement of current awareness of the geoexchange technology. Architects are one of the prime decision maker influencing groups in the identification of HVAC technology to include in non-residential new construction and re-modeling. In order to assess the baseline levels of geothermal heat pump awareness and willingness to recommend the technology, Itron conducted a telephone survey of building architects in the Los Angeles area. This was followed up in December of 2003 with another survey of building architects in the Los Angeles area to determine changes in the level of overall awareness and appreciation of the geoexchange technology. Discussion of this year one follow-up survey is provided in Section 6. In retrospect, both the baseline and follow-up surveys should have also included mechanical engineers since they are another key decision making group.

3.1 Sample Selection and Survey Instrument

The population of architects from which the sample was drawn was gained through the website of the American Institute of Architects (AIA). Within this website is a listing of members by AIA chapter. A listing of members of chapters that were within the SCE service territory was downloaded and placed within a master database. A total of 622 firms were included in this master database. The phone survey sample was drawn randomly and survey attempts were continued until there was a minimum of 50 participants. The final number of completed surveys was 51. When phone contact was made (there were several wrong numbers and answering machines), most potential respondents were very friendly. There were 11 potential respondents who declined with "being to busy" or "a pressing deadline" given as the reason given for most of the declines.

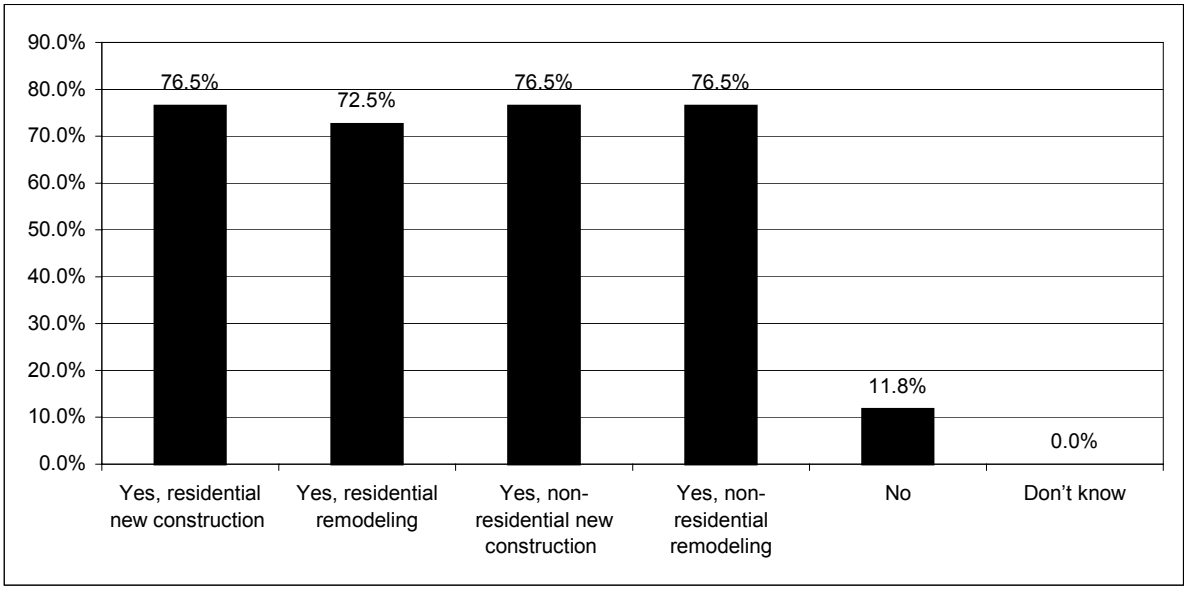
The survey instrument consisted of 13 questions and took approximately 10 minutes to complete. Appendix A of this report includes a copy of the survey instrument as well as the number of responses by question. The questions began with an attempt to determine if the architect does provide recommendations or suggestions regarding HVAC equipment and if so by type of construction. Questions that followed queried their

familiarity with the technology, their impressions of the technology, their familiarity with the term "geoexchange" and with the GHPC organization, and ended asking if they would be interested in receiving additional information about geothermal heat pumps.

3.2 Results by Question

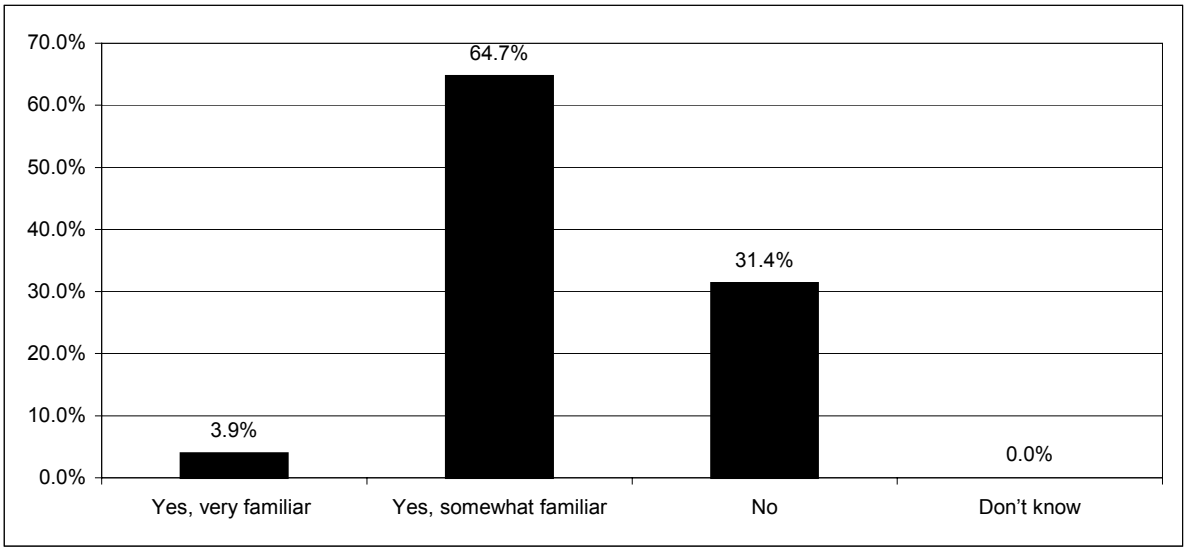
In general, architects in the region had some limited familiarity with the geothermal heat pump technology. However, even among respondents who indicated some familiarity, there seemed to be significant uncertainty about the technology. Some of the respondents did indicate that they have recommended a geothermal heat pump system and several of these indicated that the systems had been installed. Knowledge of the term "GeoExchange" was very limited and no one indicated having a familiarity with the Geothermal Heat Pump Consortium. However, over 90% of the survey participants were interested in receiving more information about the technology.

Q1. As an architect, do you normally provide recommendations or suggestions to your clients regarding space-conditioning equipment? (Mark all that apply) (n=51)



Nearly 90% of the respondents indicated that they normally did provide recommendations or suggestions to their clients regarding HVAC systems. Response was nearly equal between residential and non-residential and between new construction and remodeling.

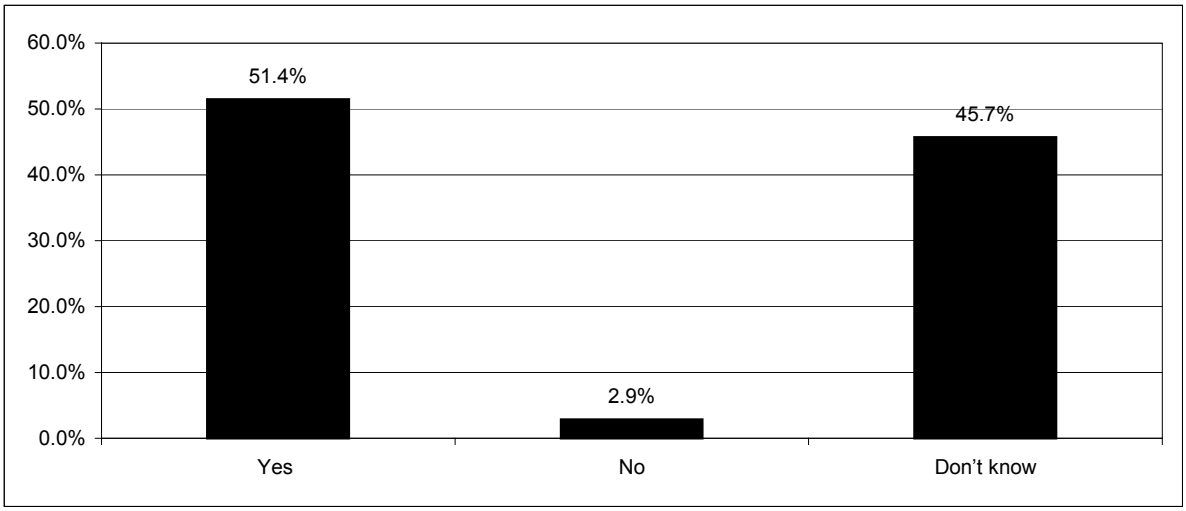
Q2. Are you familiar with the geothermal heat pump technology? (n=51)



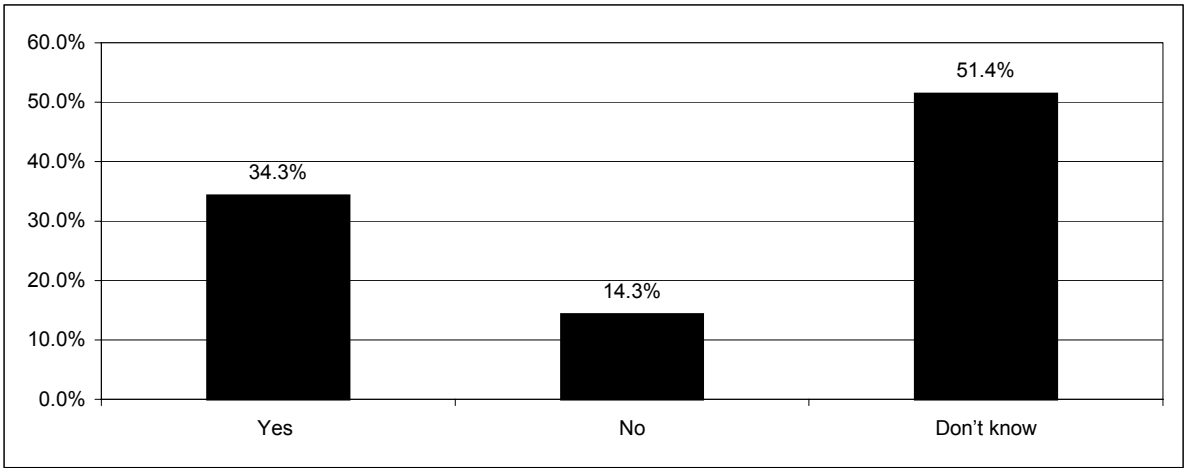
Very few respondents indicated a high familiarity with the technology, although nearly two-thirds indicated *some* familiarity. Nearly one-third knew nothing about the technology.

Questions 3 through 7 were only asked of those who responded having at least some familiarity with the technology. Of the 68% of respondents who indicated that they had at least some familiarity with the technology, about one-half of them didn't know if geothermal heat pumps were reliable or cost effective; as indicated by the responses for questions 3 and 4, respectively. In question 3, only 1 respondent felt that the technology was unreliable. This respondent indicated that the systems required too much piping, which was subject to breakage. In question 4 and 5 respondents representing about 14% of the sub-sample thought that geothermal heat pumps were not cost effective compared to other HVAC options.

Q3. Do you consider geothermal heat pumps a reliable technology? (n=35)

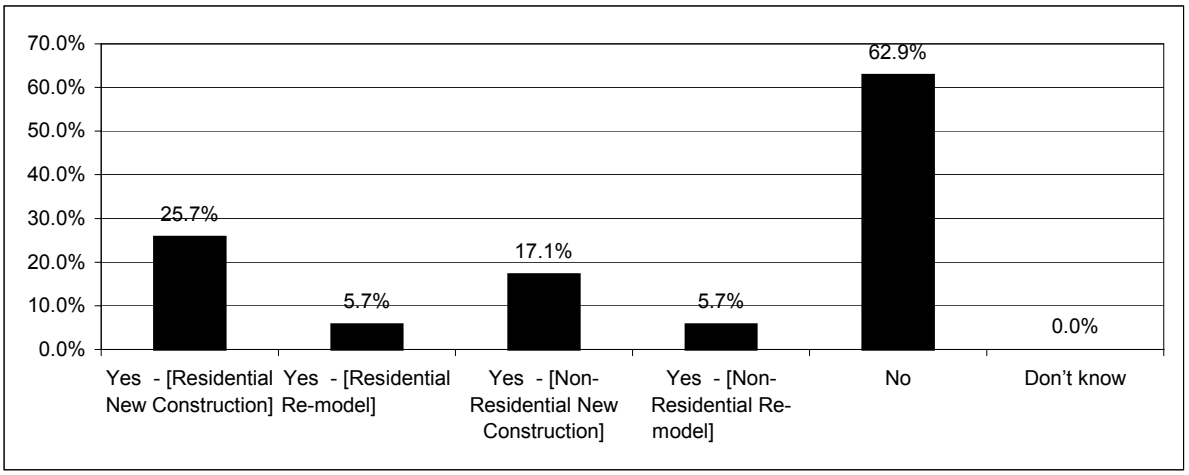


Q4. Do you consider them to be cost effective compared to other HVAC options? (n=35)



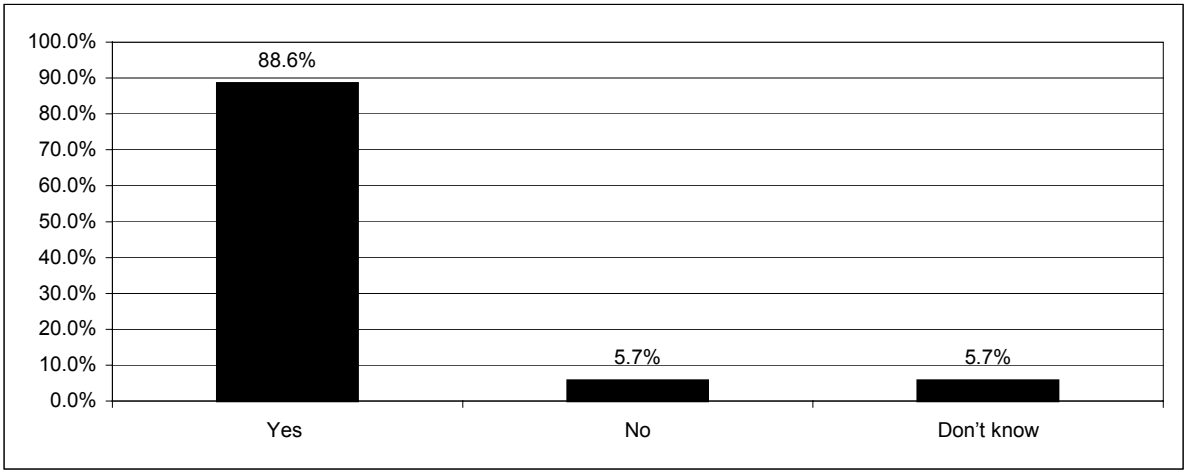
As indicated by their response to question 5, about 60% of this sub-sample with some geothermal heat pump familiarity, indicated that they have not recommended or suggested that a client install a geothermal heat pump. Of those who had suggested a geothermal heat pump installation, most were in new construction applications with the larger share being for residential buildings. However, most of the systems were not installed with initial cost being cited as the primary reason when a reason was given.

Q5. Have you ever recommended or suggested that a client use geoexchange? (n=35)



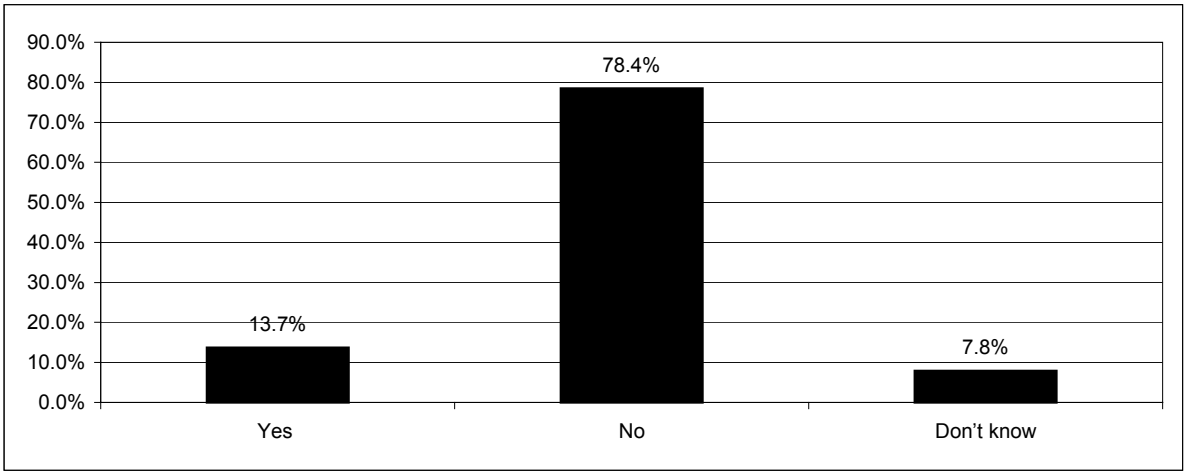
In question 6, survey participants with some geothermal heat pump familiarity indicated by an overwhelming number (nearly 90%), that they would consider recommending or suggesting using a geothermal heat pump to their clients. However, several of the yes responses included the caveat that they would make such a recommendation only after learning more about geothermal heat pumps. Only two respondents indicated that they would not recommend a geothermal heat pump. As noted previously, one cited that the systems required too much piping, which was subject to breakage; while the other stated that they relied solely on the recommendation of an HVAC engineer. (Because there were only 2 responses, the question 7 graph and table are not provided.)

Q6. Would you consider recommending or suggesting using a geothermal heat pump? (n=35)

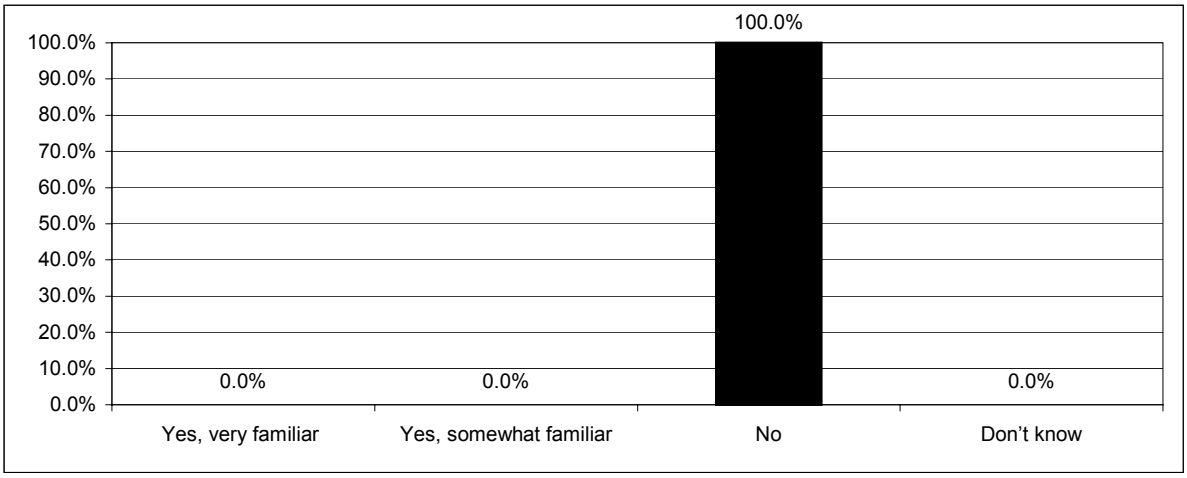


Questions 8 through 10 were asked of all 51 survey respondents. This series of questions was designed to characterize the current level of knowledge about GHPC and about the GHPC term for geothermal heat pumps, GeoExchange. None of the respondents have heard about GHPC or knew if they had received any information from GHPC or attended any GHPC sponsored workshop or seminar. A small percentage (about 14%) had heard of the term GeoExchange. There were no responses for questions 11 and 12, which were only to be answered if anyone had received information from GHPC or attended a GHPC workshop or seminar.

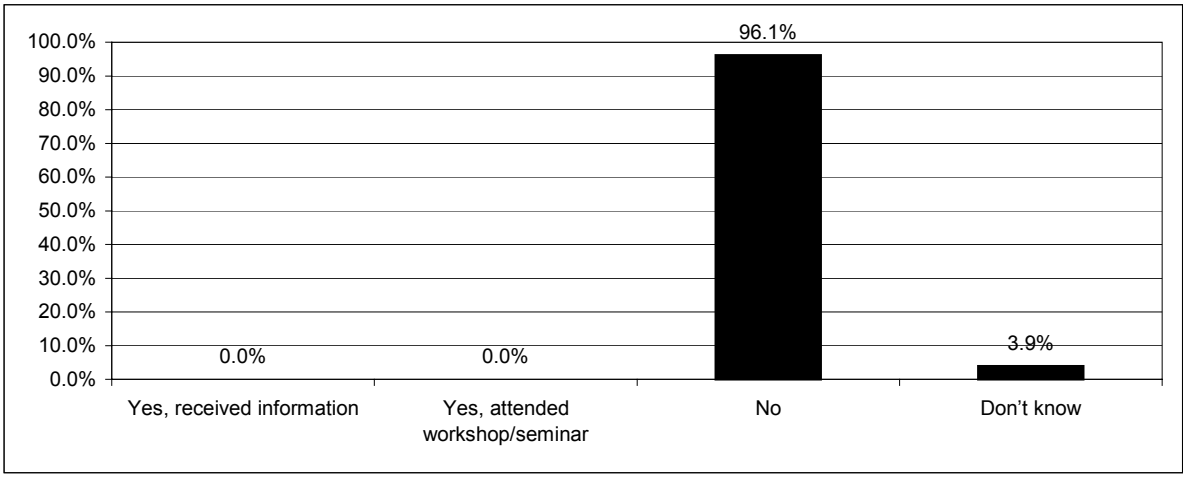
Q8. Have you ever heard of the geothermal heat pump technology referred to as GeoExchange? (n=51)



Q9. Are you familiar with the Geothermal Heat Pump Consortium, which is promoting the geothermal heat pump technology in Southern California? (n=51)

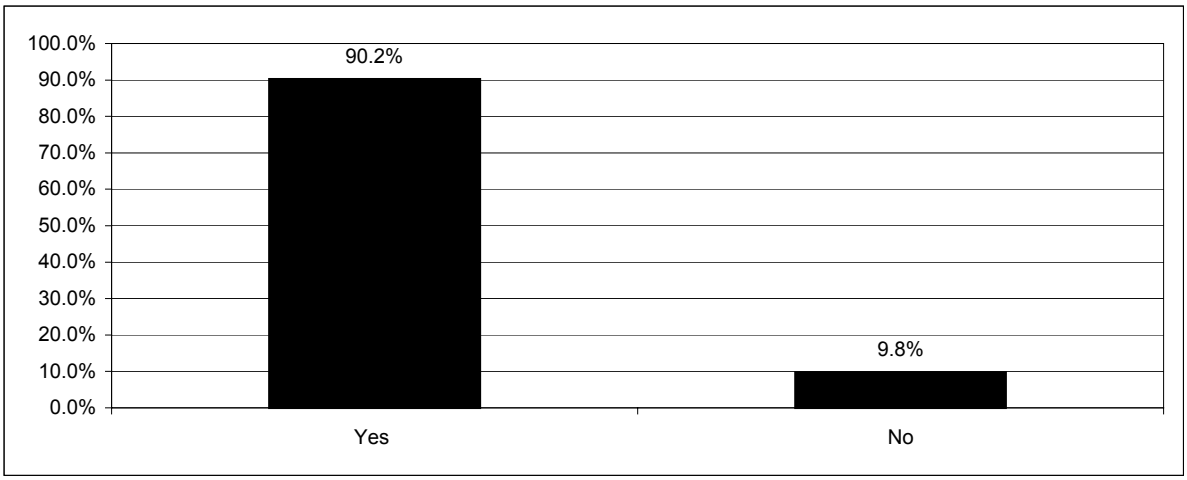


Q10. Have you received any information from the Geothermal Heat Pump Consortium or participated in one of their workshops or seminars? (Mark all that apply) (n=51)



The last question of the survey, question 13, asked the survey participants if they would like to receive information on geothermal heat pumps. Over 90% stated that they do have an interest in learning more and receiving more information. The list of those requesting more information was provided to GHPC.

Q13. Would you be interested in receiving information on geothermal heat pumps? (n=51)



3.3 Baseline Estimates of Awareness and Willingness

In the original Measurement and Evaluation Plan for this project, it was suggested that the indirect energy impacts of the GHPC program. These indirect energy impacts would be estimated utilizing changes in decision maker awareness of geothermal heat pumps

and changes in their willingness to install such systems along with current information on geoexchange installation rates that would be obtained from the commercial sector on-site survey (CEUS) that was occurring in the SCE territory in 2004. This baseline survey would be used to identify the initial levels of Awareness and Willingness.

Awareness is defined as not only some level of familiarity with the concept of geothermal heat pumps, but an effective awareness of this technology. In question 2 of this survey, nearly 4%, or 2 respondents, indicated that they were very aware of the geothermal heat pump technology. An additional 64.7%, or 33 respondents, indicated that they were somewhat aware of the technology. The 2 respondents indicating that they were very aware can be considered to have an effective awareness. Only a portion of this group can be considered to have effective awareness.

Question 3 asked if the respondent considered the technology reliable, and question 4 asked if the respondent considered the technology cost effective. Only 9 of these 33 somewhat aware respondents answered both questions 3 and 4 as either yes or no. Twenty-four answered "don't know" to one or both of these questions. These 9 respondents, along with the two that answered that they were very aware of the technology make up the group that is considered to have effective awareness. The baseline estimate of effective awareness is 22% (11/51).

Willingness to recommend the technology is a subset of those who are effectively aware of the technology. It is only measured for the 11 respondents considered effectively aware and is developed from their response to question 6. Question 6 asked if they would consider recommending or suggesting using a geothermal heat pump. Two of these 11 respondents indicated that they would not recommend a geothermal heat pump. The baseline estimate of willingness is 82% (9/11).

4

Public Education Evaluation

The goals of this Task are to perform process evaluations of the GHPC public education efforts. The process evaluations of the GHPC public education efforts consist of several components that are designed to assess how well the seminar/workshop goals are achieved. These components include:

- Attending selected seminars and workshops to assess effectiveness of the presentations (three attended),
- Comparing goals and achievement in terms of number, timing, reaching desired target audiences, and attendance at these seminars/workshops,
- Reviewing and assessing seminar/workshop attendee evaluation sheets, and
- Conducting telephone surveys of seminar/workshop attendees.

4.1 Attending Public Seminars and Workshops

On February 11th, Mr. Gary Cullen and Mr. Brad Souza of Itron attended the GHPC California Industry meeting at the SCE Energy Technology Center. The following day Feb 12th, Mr. Cullen attended the Architects seminar in San Bernardino. Later in the project, Mr. Cullen attended the "Certified Geoexchange Designer Training Course", held July 21-23, 2003 at the SCE Energy Technology Center.

Process evaluation reports for each of these workshops/meetings are included in Appendix B of this report. In summary, the February 11th meeting was well attended with good levels of interaction between the GHPC representatives and the audience. However, the February 12th workshop had only two attendees. Although attendance was low, the two in attendance thought the workshop was both useful and well presented. The July 21-23 training course was well attended. The instructors were very well qualified and provided an excellent presentation.

Comparing Goals and Achievement in Terms of Number, Timing, Reaching Desired Target Audiences, and Attendance at These Seminars/Workshops

The GHPC goal of conducting 40 workshops and seminars by the end of 2003 was completed. With the exception of one month, at least one workshop/seminar was

conducted every month from October 2002 through December 2003. There was no specific goal for the total number of workshop/seminar participants. However, a total of approximately 660 attendees have attended one of the 40 workshops and seminars that have occurred. The target audiences have been diverse and have included ASHRAE members, architects, local and state government officials, school representatives, industry representatives, utility representatives, and commercial building owners/operators.

From the perspective of goals and achievement in terms of number, timing, reaching desired target audiences, and attendance at these seminars/workshops, it appears that the GHPC efforts were highly successful.

Reviewing and Assessing Seminar/Workshop Attendee Evaluation Sheets

At the conclusion of each workshop and seminar, a short evaluation form was distributed and collected from the attendees. The evaluation form asked the respondents to rate the instructor and course on a scale of 1 (poor) to 10 (excellent) on eight issues:

- Instructor knowledge
- Instructor ability to communicate material
- Could hear what instruct said
- Could see what the instructor wrote or presented
- The classroom setting was a good teaching environment
- The time the class was held was convenient
- Class presentations (a/v materials) were helpful
- Handouts will be useful

After these eight rating questions were the following open-ended questions:

- What improvement in the course would you suggest or what additional material would you have liked to see covered?
- What did you find the most helpful in the course?
- Did the course substantially increase your knowledge about geothermal heat pump systems?

Itron directly reviewed the evaluation forms from eight of the workshops and seminars and reviewed the summaries for each of the remaining 32 workshops and seminars. Attendees included engineers, architects, school board representatives, and county water permit officials. Overall, the attendee evaluations were very positive with the score for each of the eight rating questions averaging above 9.0. The highest scores were for the instructor's knowledge and the instructor's ability to communicate the material, both with averages over 9.5. The lowest was for the handouts with an average score of about 9.1.

The instructors were generally praised for their overall knowledge of the technology, their use of examples, and their ability to answer questions openly and directly. The handouts were praised for having some case studies and good general information, but many participants did not like the copies of the power point slides that were provided.

There were many detailed responses to the three open-ended questions. For the first open-ended question "What improvement in the course would you suggest or what additional material would you have liked to see covered?" the following responses (paraphrased in some cases to capture similar responses) were among the most relevant.

- Would like more technical information such as with the installation procedure, boring, sealing, and how to protect the ground water.
- Although examples were provided, would like to see more local examples and with pictures of the existing systems.
- Wanted more information on the system cost analysis.
- More information on retrofit and other building types besides schools.
- Improve the quality of the video. The filming quality and sound was not satisfactory and some of the information outdated.
- More information on reliability and maintenance realities.

For the second open-ended question "What did you find the most helpful in the course?" the following responses were provided. Again, these are the most relevant and several of these responses have been paraphrased to capture multiple similar responses. Some of these responses were in direct contrast to some of the more common responses listed above for suggested improvements.

- Descriptions of the various loop fields.
- Drilling and grouting issues.
- Good, general information and description of process.
- Financial analysis.
- The handout material and slides.
- Ability to interact with the instructors.
- HVAC knowledge.
- Environmental effects.

For the third open-ended question "Did the course substantially increase your knowledge about geothermal heat pump systems?" the overwhelming response was "yes" in one form or another. No other relevant responses were provided.

4.2 Telephone Surveys of Seminar/Workshop Attendees

Three separate sets of telephone surveys were conducted of seminar/workshop participants. The first set was of the Architect Seminars held in Victorville on January 29th, 2003 and the Architect Seminar held in San Bernardino of February 12th, 2003. The second set was of the attendees of two ASHRAE workshops. The first ASHRAE workshop was in Corona on October 15th, 2002 and the second at the Western Chapter ASHRAE meeting in Santa Barbara on December 10th, 2002. The third set was of attendees of the four workshops geared toward county public health officials. These county health official workshops where held over the three day period of November 5th through 7th in Riverside, Los Angeles, and Santa Barbara counties.

It was the original intention to combine the results from these three sets of surveys into a single analysis of the seminars and workshops. However, results for many of the questions were significantly different, reflecting the difference in the respective target audiences. Therefore, results are provided separately for each group.

Overall, response to the seminars/workshops was very positive. In general, the attendees of the ASHRAE workshops were more knowledgeable about the GeoExchange technology than were those who attended either the Architect workshops or county health official workshops. However, each group was very receptive to the technology and felt the workshops helped in their understanding of the technology. Nearly all of the attendees felt positively toward the technology and would consider recommending it in the future. Many attendees indicated that they would like to see more information provided that is specifically Southern California based, specifically as it relates to cost and reliability in the Southern California area. Southern California specific case studies would be good to present. Several county health officials were concerned that regulations regarding drilling and ground water exist or properly cover the issue.

Architect Seminars

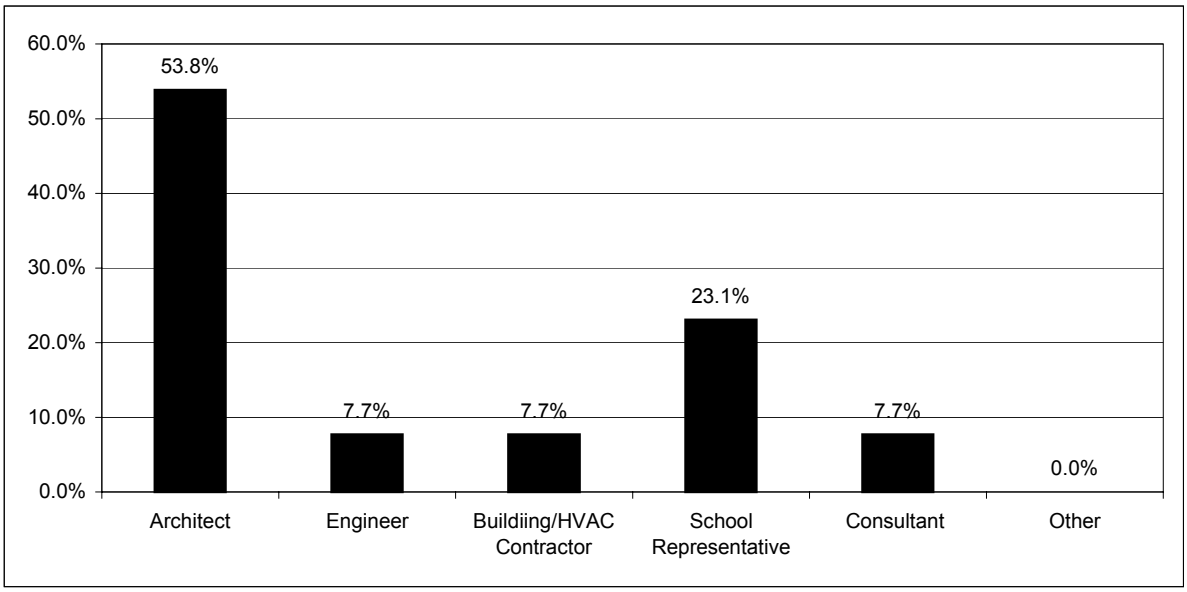
Seminar participant lists were obtained from the GHPC project team for attendees at the Architect Seminar in Victorville on January 29th, 2003 and the Architect Seminar held in San Bernardino of February 12th, 2003. The population of seminar participants was 15. We attempted to contact each of these 15 participants, but were only able to complete surveys for 13.

The survey instrument consisted of 16 questions and took approximately 10-15 minutes to complete. Appendix C of this report includes a copy of the survey instrument as well as the number of responses by question.

Results by Question

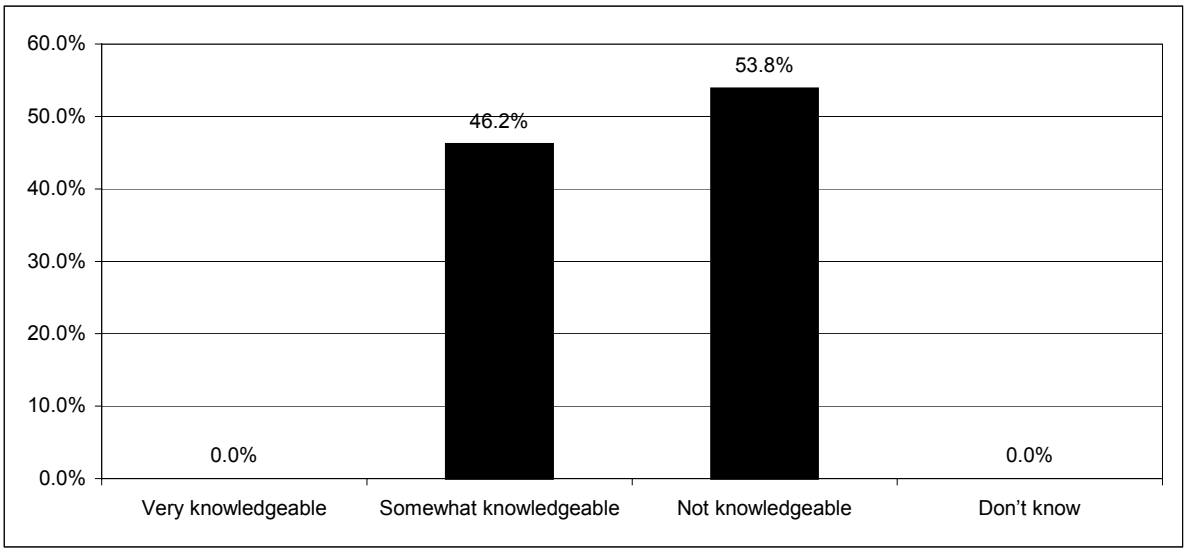
The two seminars included in this portion of the participant surveys were directed towards architects. This goal was primarily met in that results from Question 1 indicate just over one-half of the attendees were architects followed by representatives of school boards or districts.

Q1. What is your occupation? (n=13)

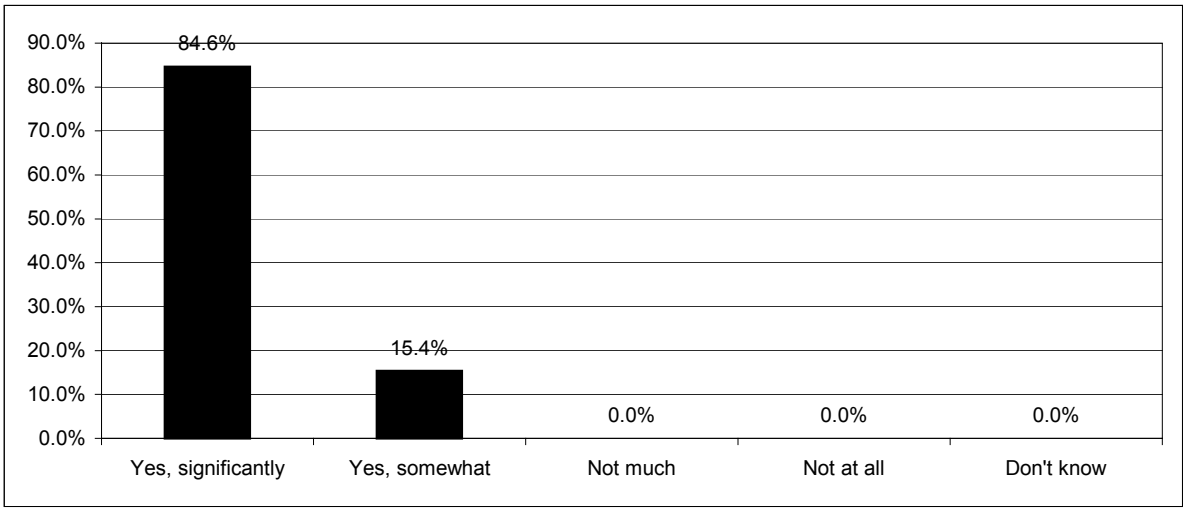


Most of the attendees indicated through their response to Question 2 that they knew little or nothing about the GeoExchange technology. A vast majority, as reflected in the Question 3 responses, felt that the seminar improved their knowledge of the technology. None said it did not and about 85% indicated that it improved their knowledge significantly.

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange? (n=13)

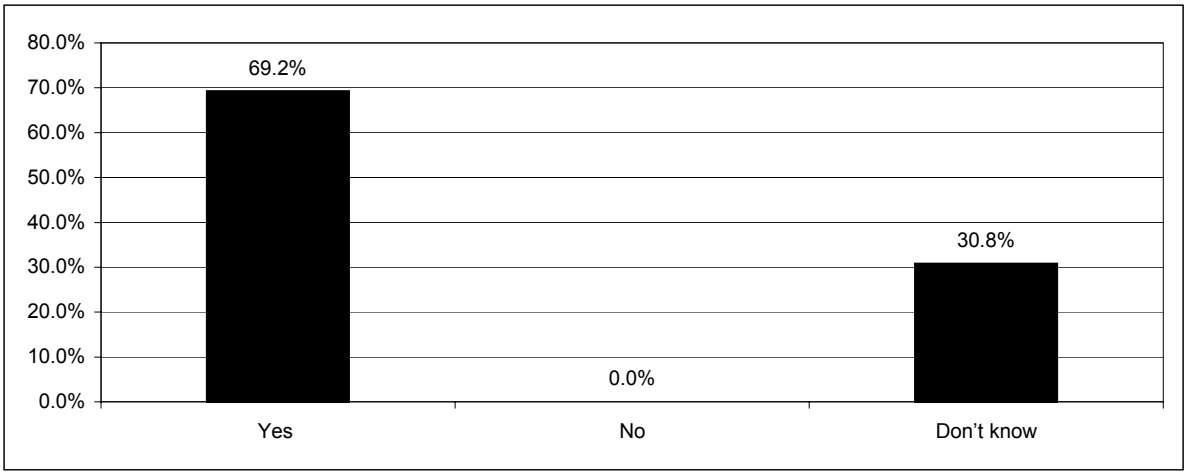


Q3. Did attending the meeting improve your level of knowledge about GeoExchange? (n=13)



Questions 4, 5, and 6 query the seminar attendees on their perceptions of the reliability and cost effectiveness of the GeoExchange technology. Question 4 asked if the attendees thought that GeoExchange was a reliable technology. Almost 70% said yes and no one said no. The message of the technology's reliability came through for most of the attendees, but 30% still were not sure and wanted more information

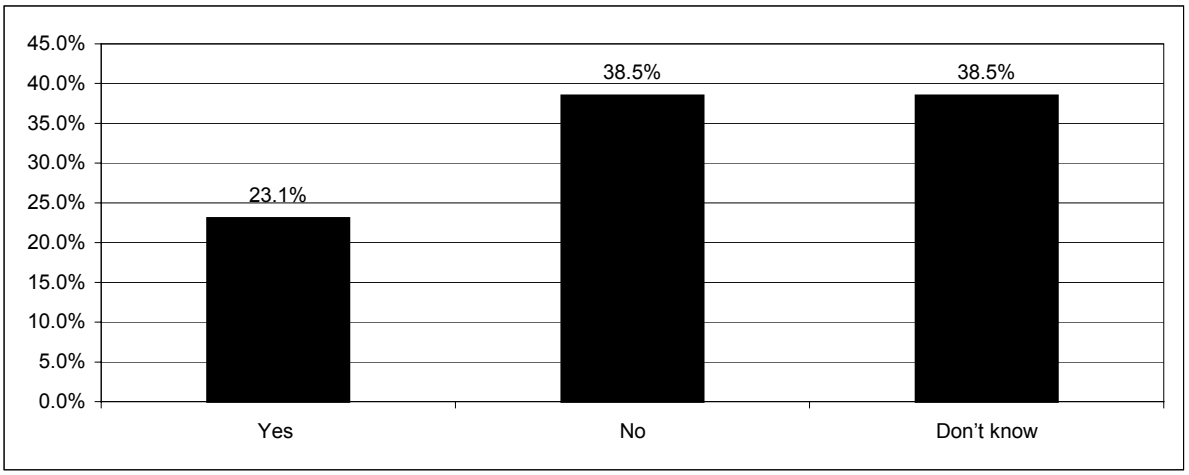
Q4. Do you consider GeoExchange a reliable technology? (n=13)



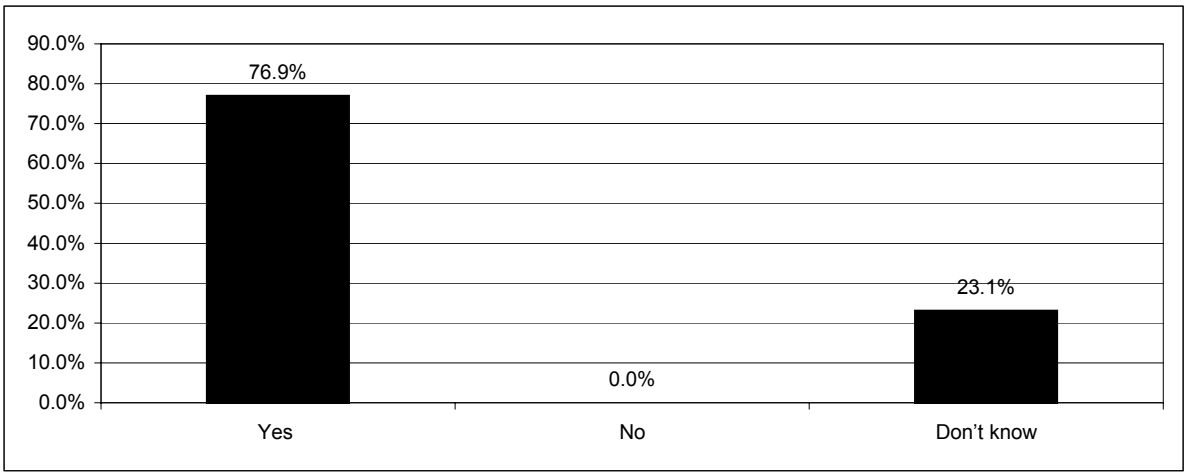
On the issue of cost effectiveness, the attendees were much less certain. The issue of cost effectiveness was addressed in Question 5 by looking at first cost compared to competing HVAC technologies. In Question 6, the issue of cost effectiveness was addressed from the life-cycle perspective. A priori, one would expect much more uncertainty about cost effectiveness from the first cost perspective. The message that is trying to be impressed through the seminar is that the GeoExchange technology becomes a very viable and competitive technology from the life cycle perspective, although it may not be so from the first cost perspective.

The response for Question 5 on cost effectiveness from the first cost perspective found a near equal split of opinion each at about 40% of "no it is not cost effective", and "don't know". Only 20% thought it was cost effective from the first cost perspective. The more important question of cost effectiveness from the life cycle perspective found that for the most part, the seminar message of cost effectiveness on a life cycle basis was coming through. In Question 6, over 75% responded that the technology was cost effective from a life cycle perspective. No one thought that the technology was not cost effective from this perspective.

Q5. Do you consider it cost effective in terms of up-front cost, compared to other HVAC options? (n=13)

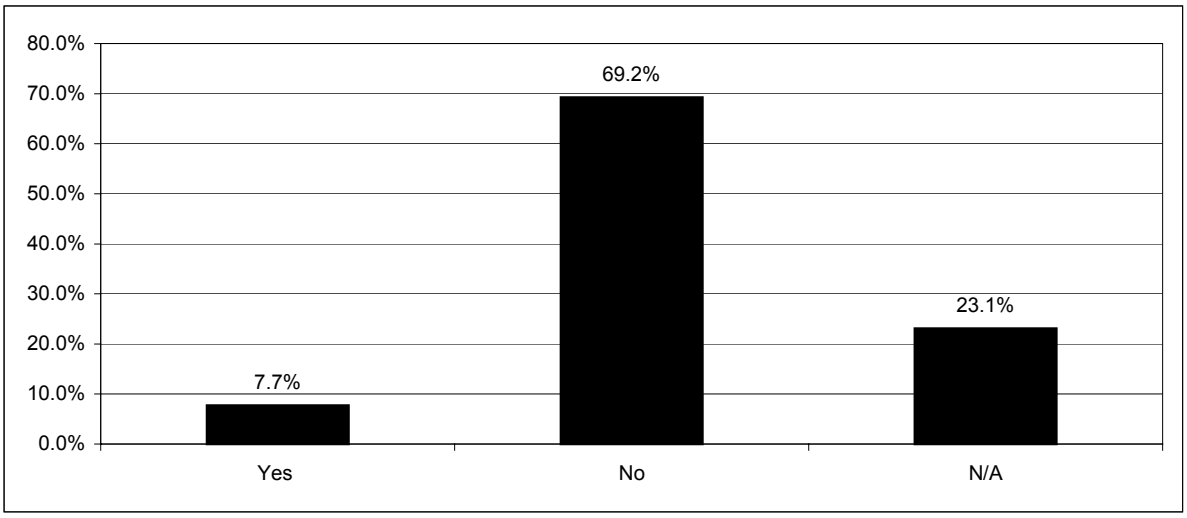


Q6. Do you consider it cost effective in terms of lifecycle cost, compared to other HVAC options? (n=13)



Question 7 asked if any of the attendees had ever recommended or suggested that a client use the GeoExchange technology. Only one attendee said that they had and in responding to Question 8 that asked if the recommended system had been installed, they indicated that the system was not installed.

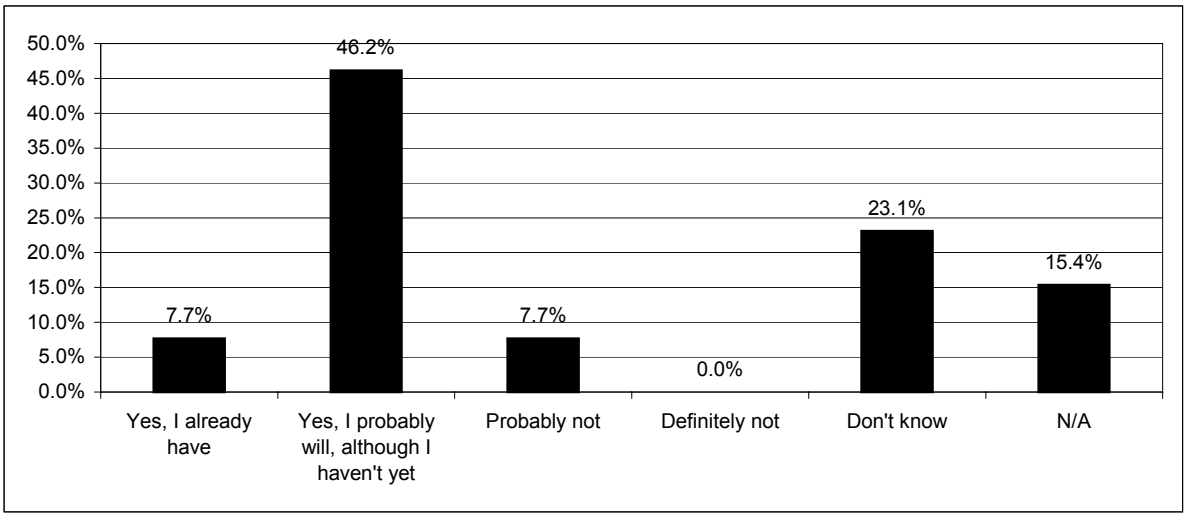
Q7. Prior to the workshop, had you ever recommended or suggested that a client use GeoExchange?? (n=13)



Question 9 sought to assess how effective the seminar was at convincing participants to consider recommending GeoExchange systems to future clients. Over one-half of the respondents indicated that they would with one indicating that they have already done so. Only one respondent indicated that they would not recommend a GeoExchange system. Question 10 asked why they wouldn't recommend a GeoExchange system and the reason given by this one respondent was that the systems are too costly.

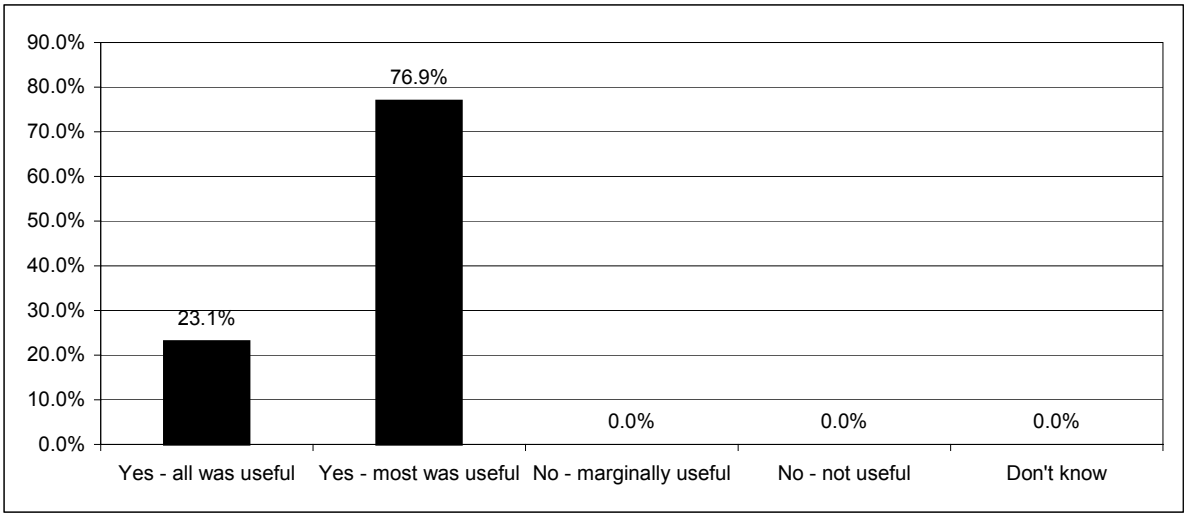
Considering that over 50% of the seminar participants had no knowledge of the GeoExchange technology before the seminar (see Question 2 responses), the seminar impact, as indicated in Question 9, was very positive. However, a significant amount of uncertainty still exists with about one-fourth of Question 9 respondents indicating, "Don't know".

Q9. Having completed the workshop, would you now recommend or suggest that a client use a GeoExchange system? (n=13)



Question 11 asks if the attendees found the information provided by the speakers useful. Each respondent indicated that the information was useful with over three-fourths indicating, "Most was useful". The follow-on question (#12) asked the reason why some of the material may not have been useful. There was only one respondent to this and he indicated that he found it too general.

Q11. At the workshop, did the speakers provide you with useful information? (n=13)

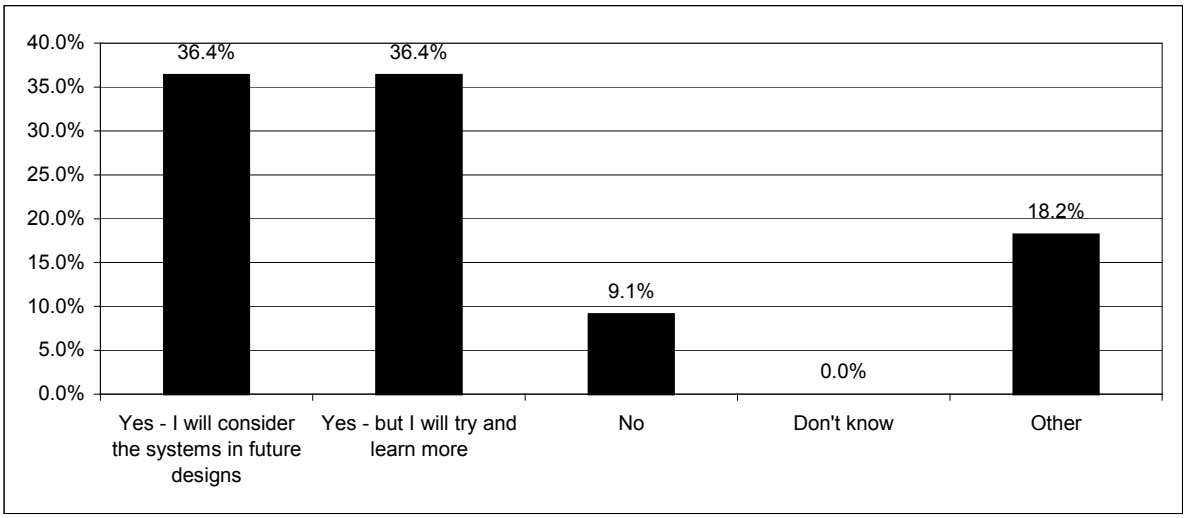


Question 13 asked the respondents a question similar to Question 9. With Question 9, we wanted to see how many of the seminar participants would actually recommend a

GeoExchange system. Although just over one-half indicated that they likely would, there were still high levels of uncertainty.

With Question 13, we wanted to find out how many of the seminar participants would consider recommending to future clients the GeoExchange technology, even if they needed to learn more. Phrased this way, over 70% indicated that they would. However, one-half of this 70% would want to learn more before making such a recommendation.

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems? (n=11)



The survey concluded with three open-ended questions. For those that gave a response, their answers are transcribed and provided within Appendix C of this report. Responses to Questions 1 through 15 are also included in Appendix C. Question 16 is not included since all respondents indicated yes; attending the workshop was a good use of their time.

Question 14 asked the seminar participants "What issues did you think were covered particularly well at the workshop?" All 13 survey participants provided an answer. Nearly all respondents indicated that either all issues were well covered or that the basic design and philosophy were well covered.

Question 15 asked "What issues did you think were not covered adequately at the workshop?" Nearly all respondents indicated that certain issues could have been covered with more information. The most common response was that more detail about the technology could have been provided. What would have been especially helpful would be specific information and examples from Southern California and information on the existing infrastructure to support the GeoExchange technology.

ASHRAE Seminars

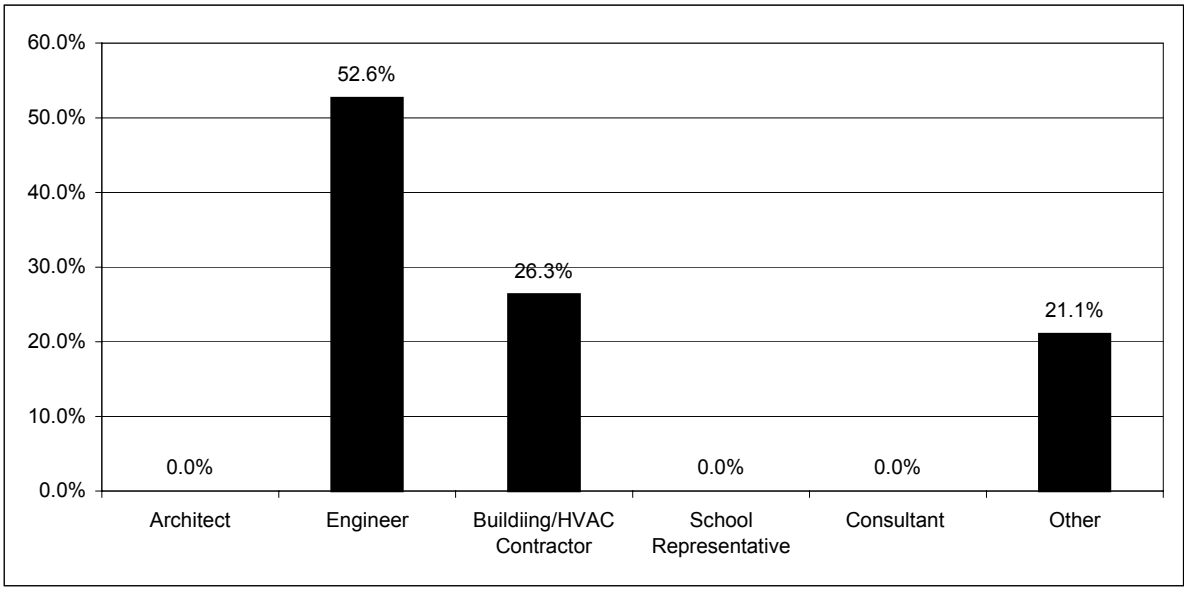
Seminar participant lists were obtained from the GHPC project team for attendees at the ASHRAE workshop in Corona on October 15th, 2002 and at the Western Chapter ASHRAE meeting in Santa Barbara on December 10th, 2002. The population of seminar participants was 46. Seminar participants were selected at random until 15 surveys were completed.

The survey instrument consisted of 16 questions and took approximately 10-15 minutes to complete. Appendix D of this report includes a copy of the survey instrument as well as the number of responses by question.

Results by Question

The two seminars included in this portion of the participant surveys were directed towards engineers. This goal was primarily met in that results from Question 1 indicate just over one-half of the attendees were engineers followed by building and HVAC contractors.

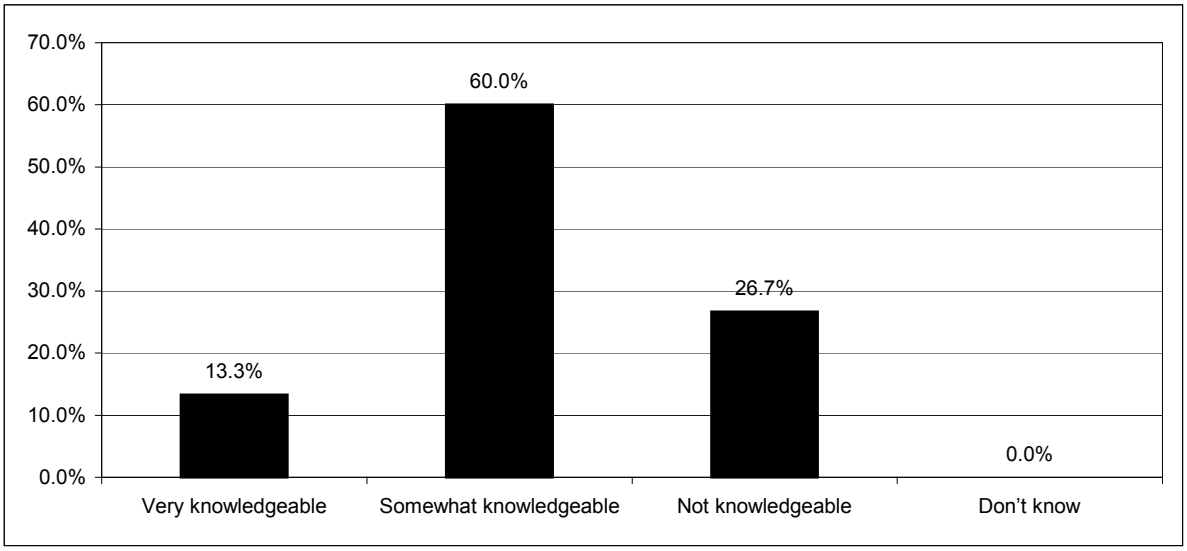
Q1. What is your occupation? (n=15)



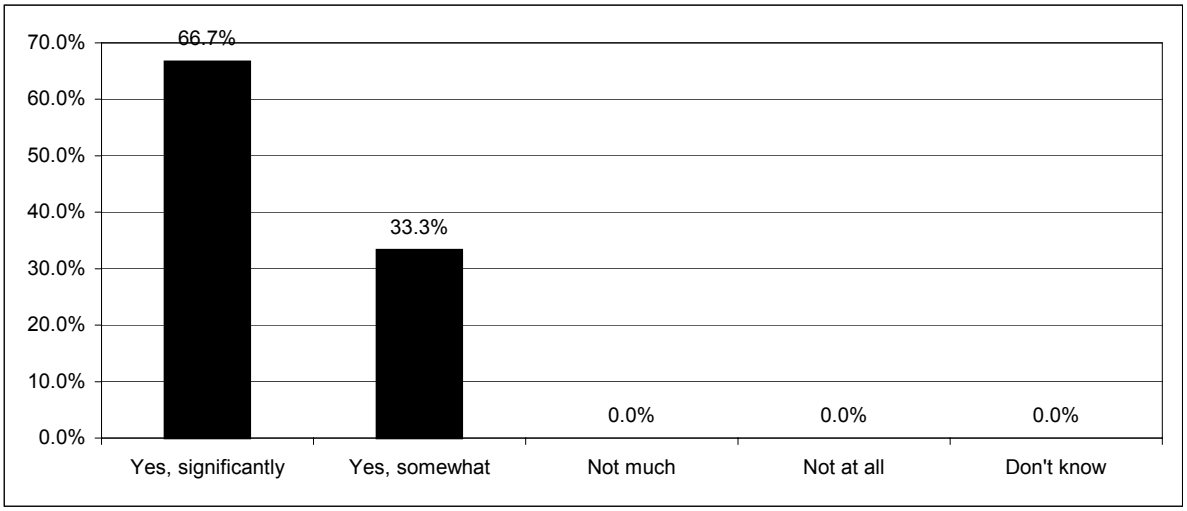
Most of the attendees indicated through their response to Question 2 that they were at least somewhat knowledgeable about the GeoExchange technology with several indicating they were very knowledgeable. These responses contrast sharply with the responses from the architect's survey where the majority of respondents indicated that they were not knowledgeable about the technology. A vast majority, as reflected in the Question 3 responses, felt that the seminar improved their knowledge of the technology.

None said it did not and about 67% indicated that it improved their knowledge significantly.

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange? (n=15)

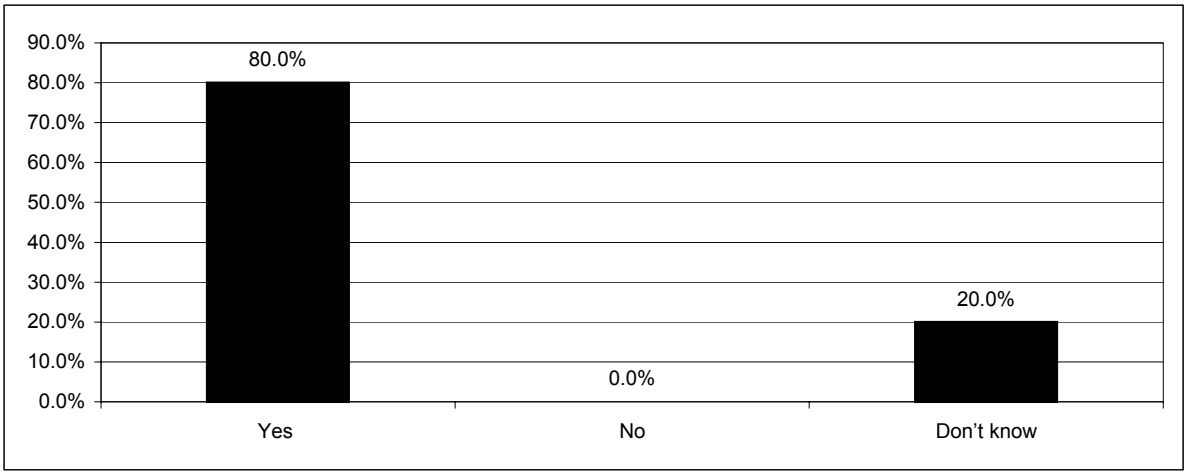


Q3. Did attending the meeting improve your level of knowledge about GeoExchange? (n=15)



Questions 4, 5, and 6 query the seminar attendees on their perceptions of the reliability and cost effectiveness of the GeoExchange technology. Question 4 asked if the attendees thought that GeoExchange was a reliable technology. 80% said yes and no one said no. The message of the technology's reliability came through for most of the attendees, but 20% still were not sure and wanted more information

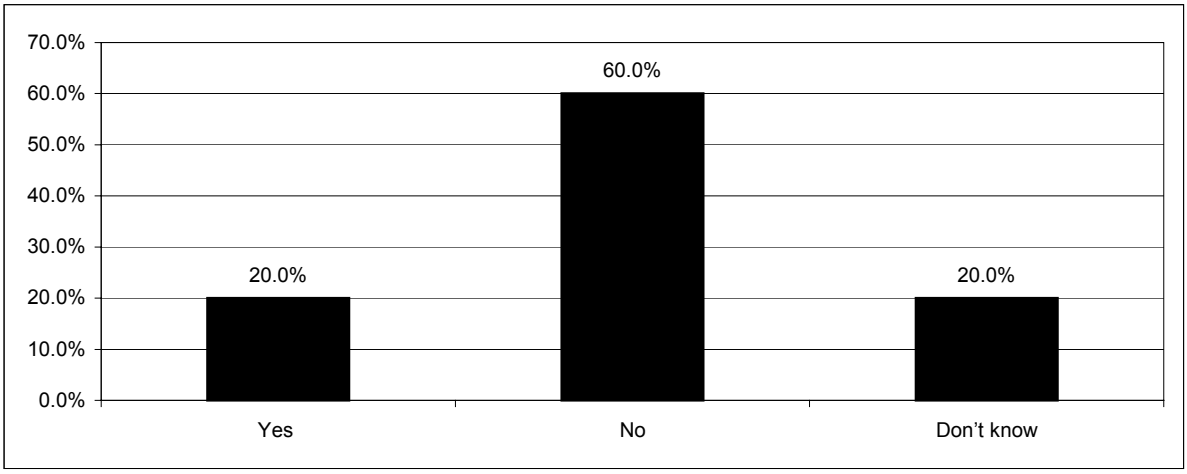
Q4. Do you consider GeoExchange a reliable technology? (n=15)



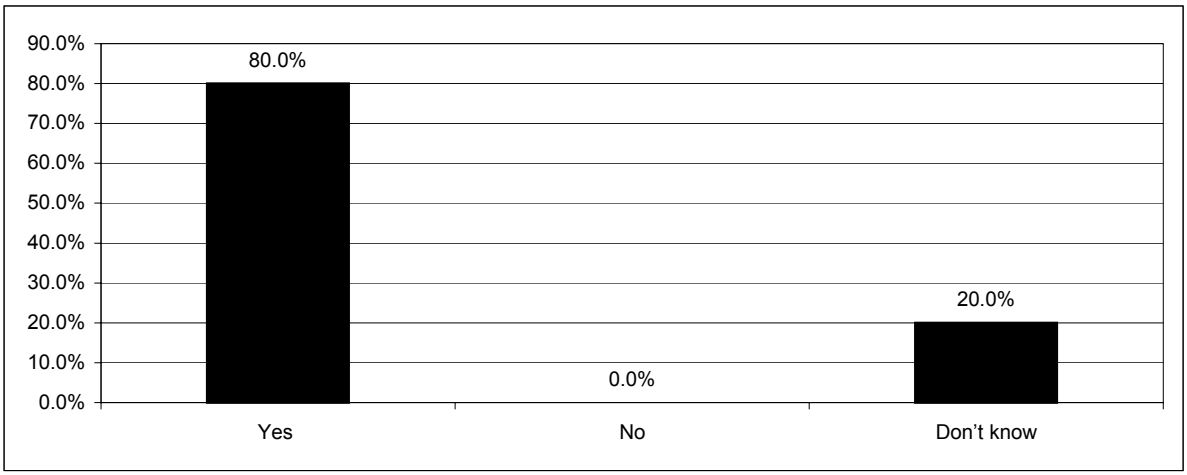
On the issue of cost effectiveness, the ASHRAE attendees had strong opinions on cost effectiveness from the perspective of first cost (Question 5) and life cycle cost (Question 6). From the first cost perspective, 60% of the respondents did not think the GeoExchange technology is cost effective. However, from the life cycle perspective, 80% thought it is cost effective.

The level of uncertainty was much higher, especially from the first cost perspective, for the Architect workshop participants. However, the majority of both groups agree that the technology is not cost effective from the first cost perspective but is cost effective from the life cycle cost perspective.

Q5. Do you consider it cost effective in terms of up-front cost, compared to other HVAC options? (n=15)

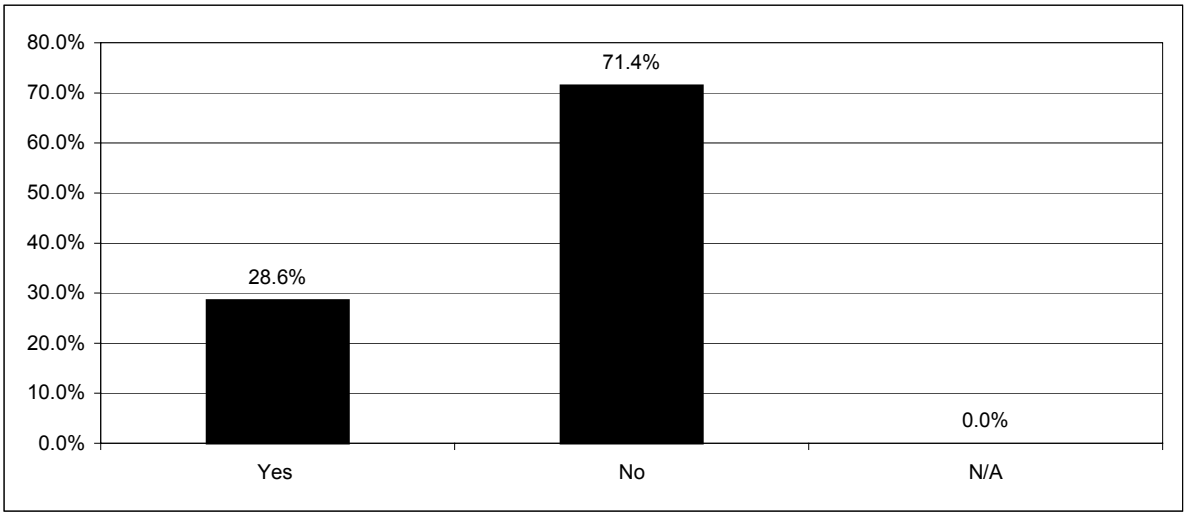


Q6. Do you consider it cost effective in terms of lifecycle cost, compared to other HVAC options? (n=15)



Question 7 asked if any of the attendees had ever recommended or suggested that a client use the GeoExchange technology. Four attendees said that they had and in responding to Question 8 that asked if the recommended system had been installed, two indicated that the systems were installed. The incidence of both recommending GeoExchange systems and actually having them installed was much higher with the ASHRAE workshop attendees than the Architect workshop attendees.

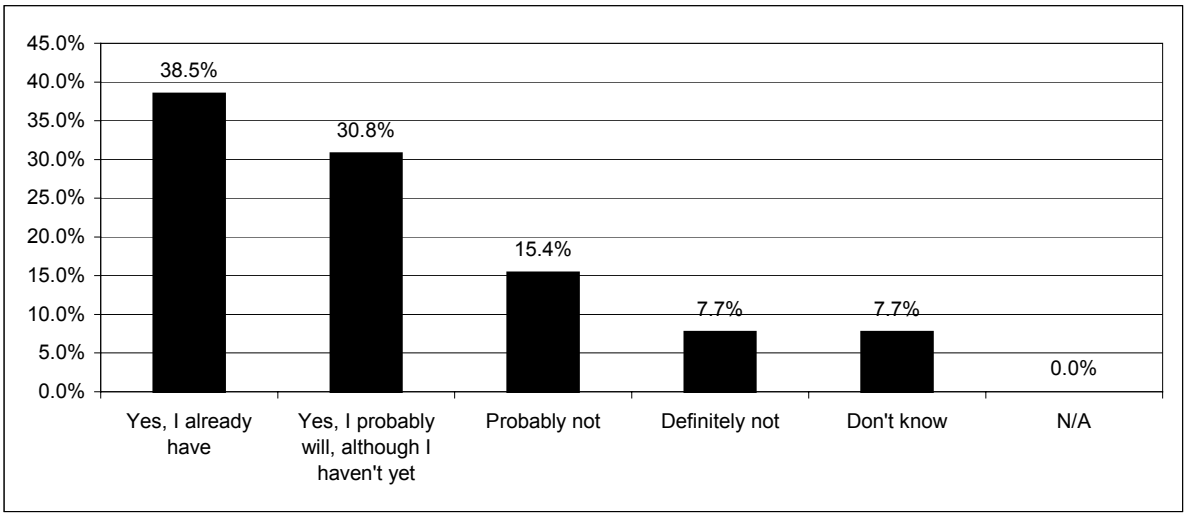
Q7. Prior to the workshop, had you ever recommended or suggested that a client use GeoExchange?? (n=14)



Question 9 sought to assess how effective the seminar was at convincing participants to consider recommending GeoExchange systems to future clients. Nearly 70% indicated that either they already have or probably would in the future. However, over 20%

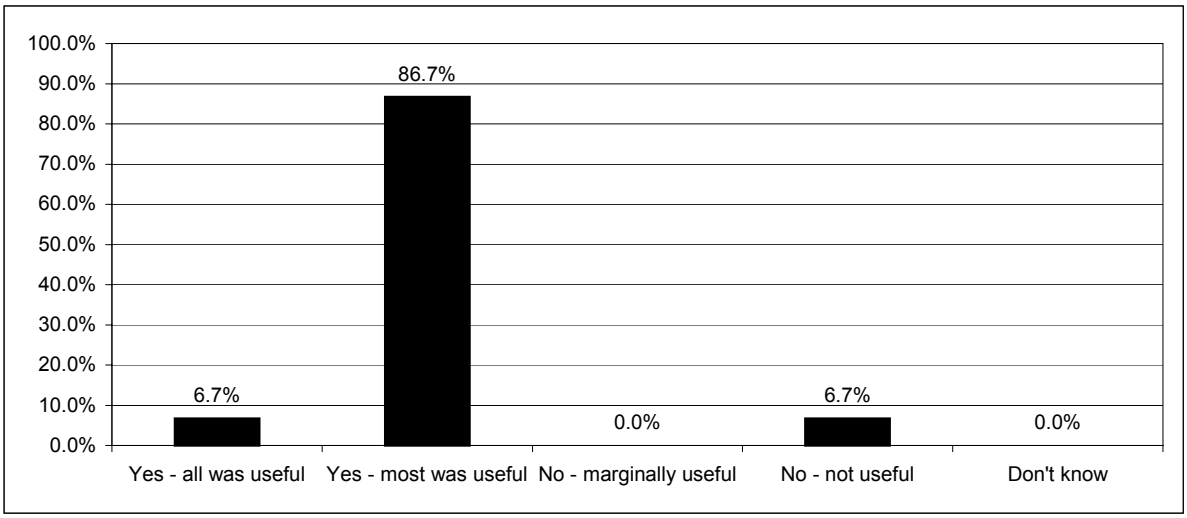
indicated that they definitely would not or probably would not recommend such systems. Question 10 asked why they wouldn't recommend a GeoExchange system. Two indicated that the systems were not suitable for the applications they consider and one indicated that he/she did not know enough about the technology to be comfortable in recommending one.

Q9. Having completed the workshop, would you now recommend or suggest that a client use a GeoExchange system? (n=13)



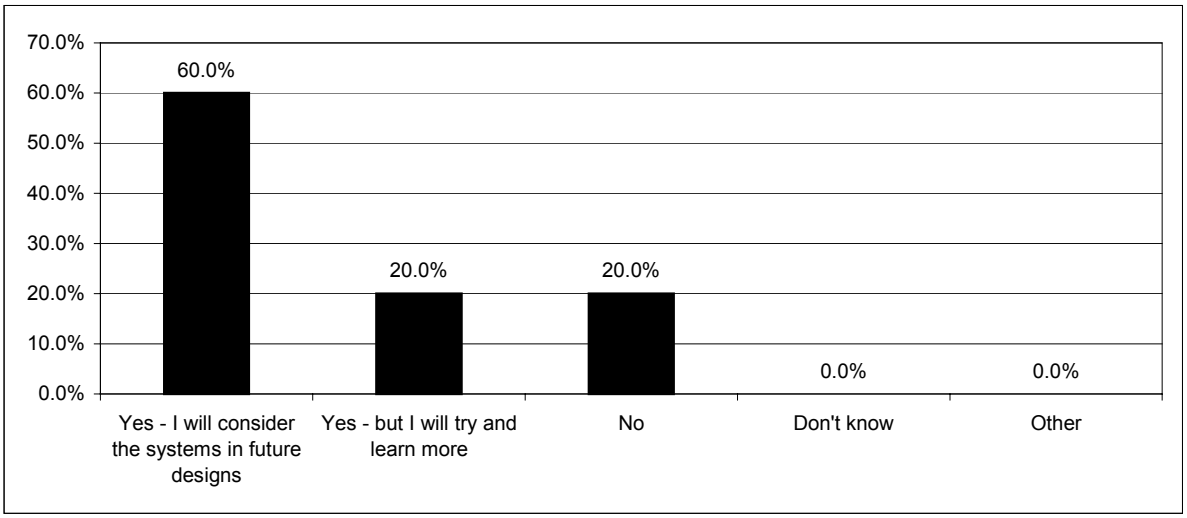
Question 11 asks if the attendees found the information provided by the speakers useful. Only one respondent indicated that it was not useful. Nearly 90% indicated, "Most was useful". The follow-on question (#12) asked the reason why some of the material may not have been useful. There was only one respondent to this and he indicated that he did not feel anything was covered adequately.

Q11. At the workshop, did the speakers provide you with useful information? (n=15)



Question 13 asked the respondents a question similar to Question 9. With Question 9, we wanted to see how many of the seminar participants would actually recommend a GeoExchange system. Nearly 70% indicated that either they already have or probably would in the future. With Question 13, we wanted to find out how many of the seminar participants would consider recommending to future clients the GeoExchange technology, even if they needed to learn more. Phrased this way, 80% indicated that they would.

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems? (n=10)



The survey concluded with three open-ended questions. For those that gave a response, their answers are transcribed and provided within Appendix D. Responses to Questions 1 through 15 are included in Appendix D. Question 16 is not included since all respondents but one responded yes, attending the workshop was a good use of their time.

Question 14 asked the seminar participants "What issues did you think were covered particularly well at the workshop?" Nearly all respondents indicated that either all issues were well covered or that the basic design and philosophy were well covered.

Question 15 asked "What issues did you think were not covered adequately at the workshop?" Only six respondents indicated that certain issues could have been covered with more information. The most common response was that more detail about the technology could have been provided. One respondent didn't think anything was covered adequately.

County Health Official Seminars

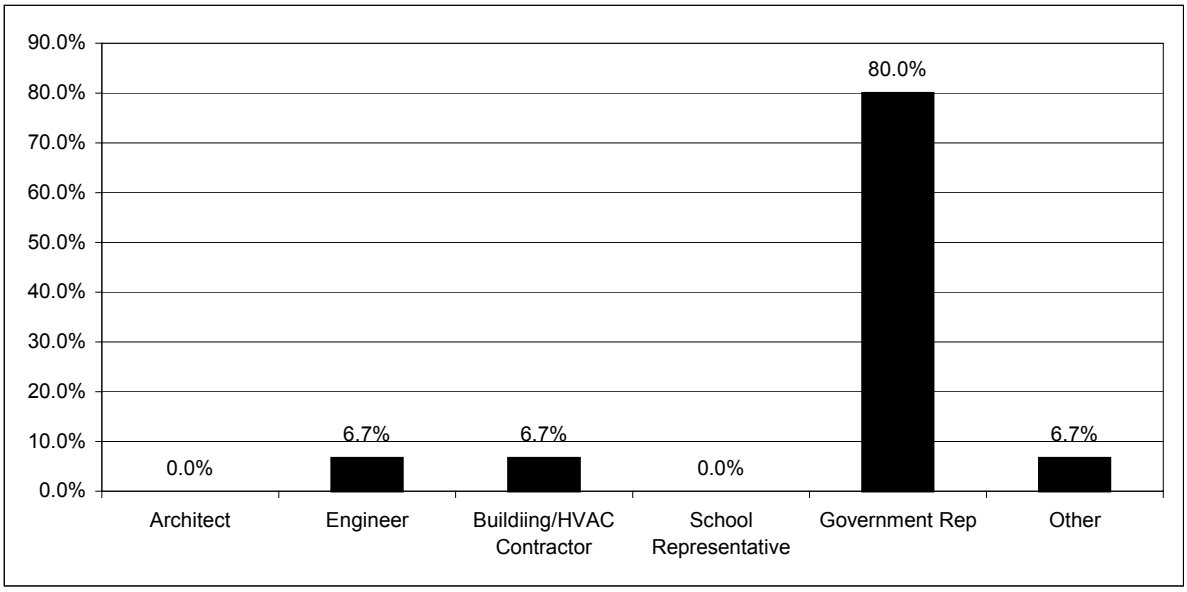
Seminar participant lists were obtained from the GHPC project team for attendees at the four seminars geared toward county health officials. These seminars were held in November 2002 at four different locations in Santa Barbara, Riverside, and Los Angeles counties. The total number of attendees at these four seminars was 27. For the survey, seminar participants were selected at random until 15 surveys were completed.

The survey instrument was the same as for the Architects and ASHRAE seminar participant surveys. However, questions 7 through 10 were not asked of the county health official seminar participants since they dealt with recommending the installation of GeoExchange systems with clients. Appendix E includes a copy of the survey instrument as well as the number of responses by question.

Results by Question

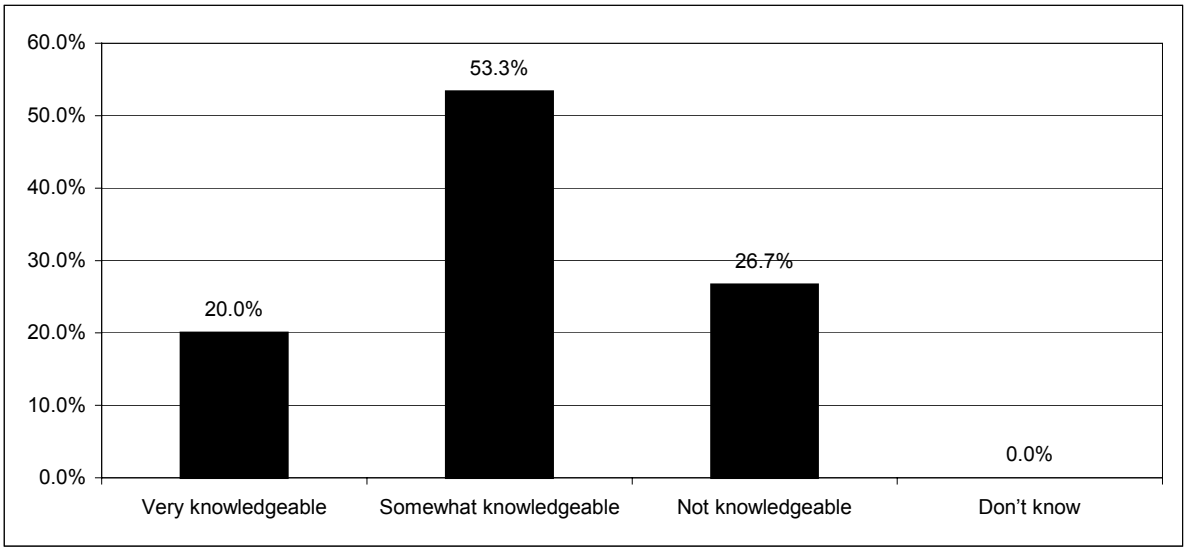
The four seminars were directed towards county health officials. This goal was met as indicated by the response to Question 1. Eighty percent of the attendees indicated that they were government representatives.

Q1. What is your occupation? (n=15)



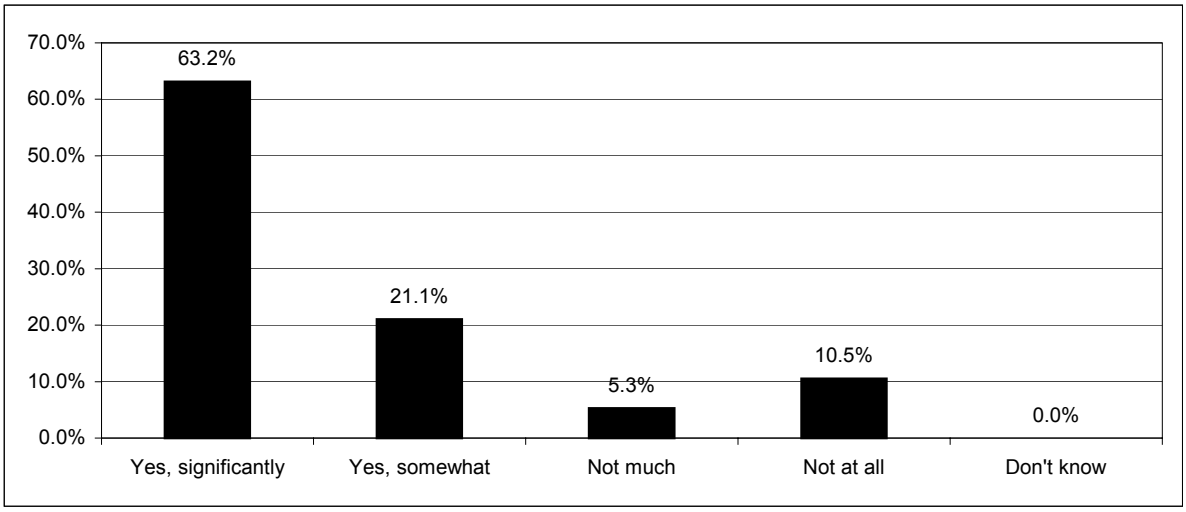
Most of the attendees indicated through their response to Question 2 that they were at least somewhat knowledgeable about the GeoExchange technology with several indicating they were very knowledgeable. However, only one of the respondents stating they were very knowledgeable was a county health official. The other two were a manufacturing representative and a HVAC contractor. The results from question 2 were similar to the Architect seminar results but much different from the ASHRAE seminar results. The ASHRAE seminar attendees had a much higher level of knowledge about the technology.

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange? (n=15)



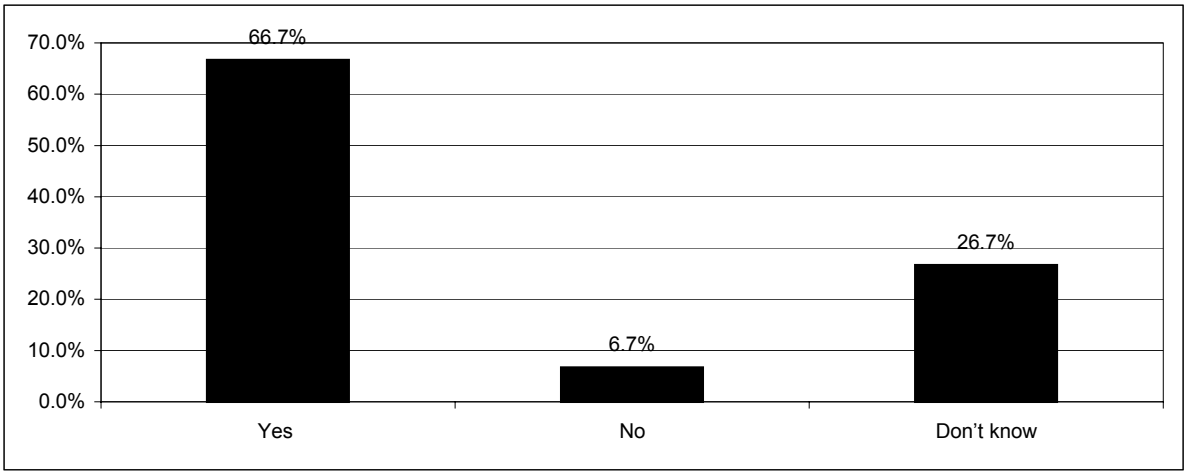
Results from Question 3 indicated that the seminar participant's on whole felt that the seminar improved their knowledge of the technology. Over 60% indicated that it improved their knowledge significantly. The three respondents that answered "not much" or "not at all" were the same three who indicated high knowledge of the technology in Question 2.

Q3. Did attending the meeting improve your level of knowledge about GeoExchange? (n=15)



Questions 4, 5, and 6 sought to evaluate the seminar attendee's perceptions of the reliability and cost effectiveness of the GeoExchange technology. Question 4 asked if the attendees thought that GeoExchange was a reliable technology. Over 60% said yes and one respondent said no. However, the level of uncertainty was high at over 25%. This level of uncertainty is higher than for the ASHRAE participants and about the same as the Architect participants.

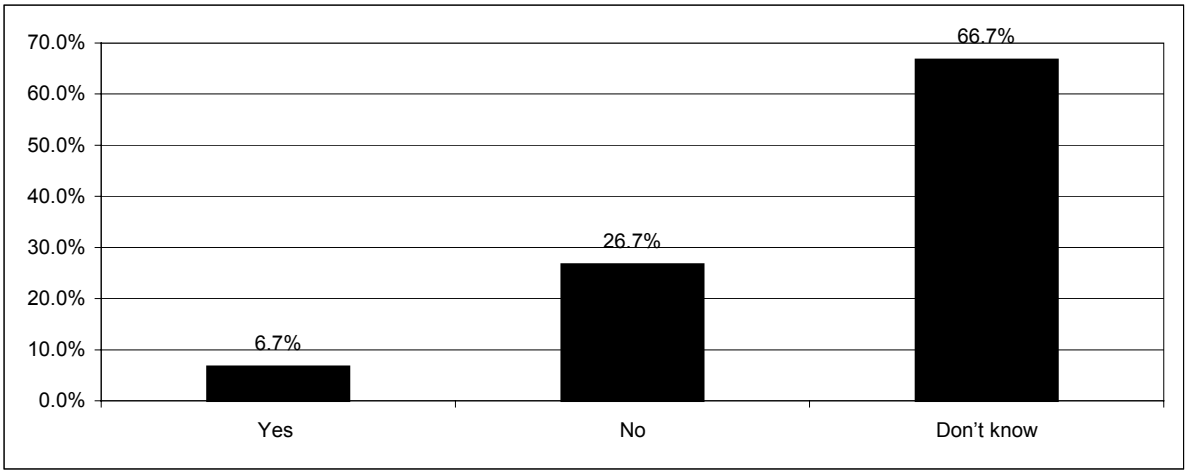
Q4. Do you consider GeoExchange a reliable technology? (n=15)



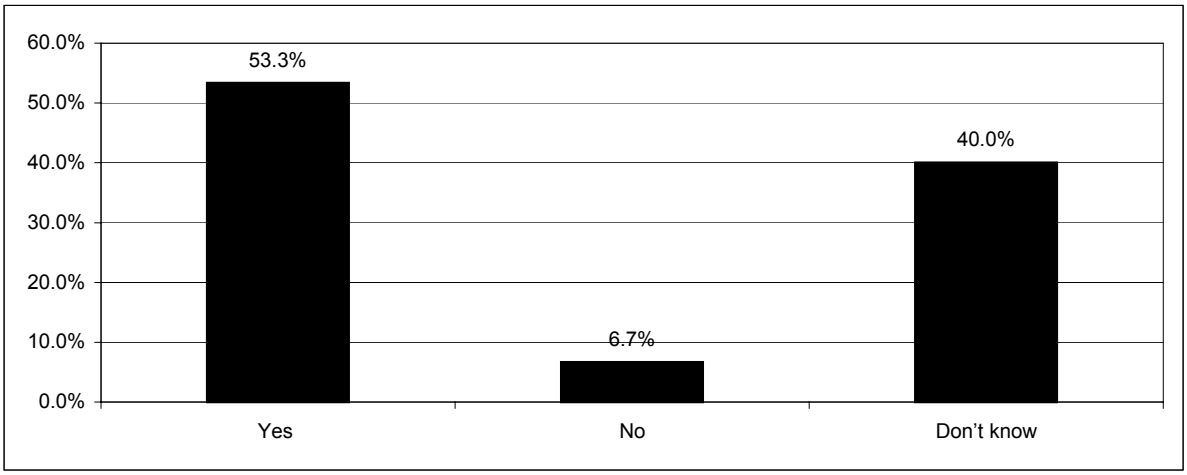
On the issue of cost effectiveness, the county health official seminar participants had the greatest levels of uncertainty, when compared to the Architects and ASHRAE participants. From the first cost perspective, nearly 70% of the respondents did not know if the GeoExchange technology is cost effective. The level of uncertainty in the Architect group was also high at nearly 40%, but much lower than the county health official participants. The uncertainty level was a relatively low 20% for the ASHRAE participants.

As indicated in Question 6, the level of uncertainty was also high with this group from the life cycle cost perspective at 40%. This level of uncertainty was about twice the level of the other two groups. However, as with the other groups, the majority of respondents felt that the technology is cost effective from the life cycle cost perspective.

Q5. Do you consider it cost effective in terms of up-front cost, compared to other HVAC options? (n=15)

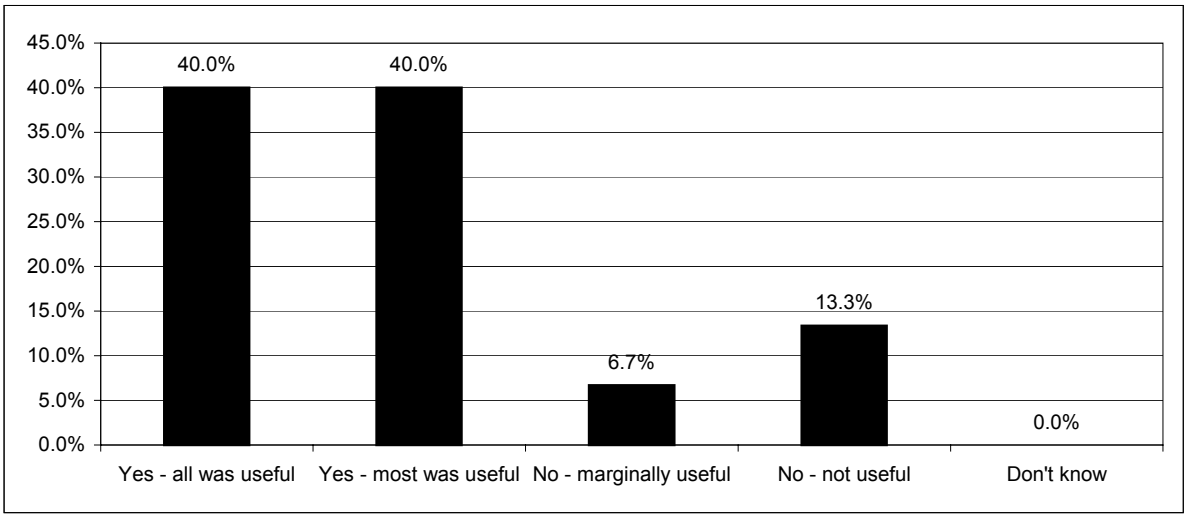


Q6. Do you consider it cost effective in terms of lifecycle cost, compared to other HVAC options? (n=15)



Questions 7, 8, 9, and 10 were not asked of the county health attendees. Question 11 asks if the attendees found the information provided by the speakers useful. Three respondents indicated that it was not useful or marginally useful. However, these three are the same three who indicated in Question 2 that they were very knowledgeable about the technology. Eighty percent indicated that either all or most was useful. The 40% responding that all was useful was much higher that the other two groups.

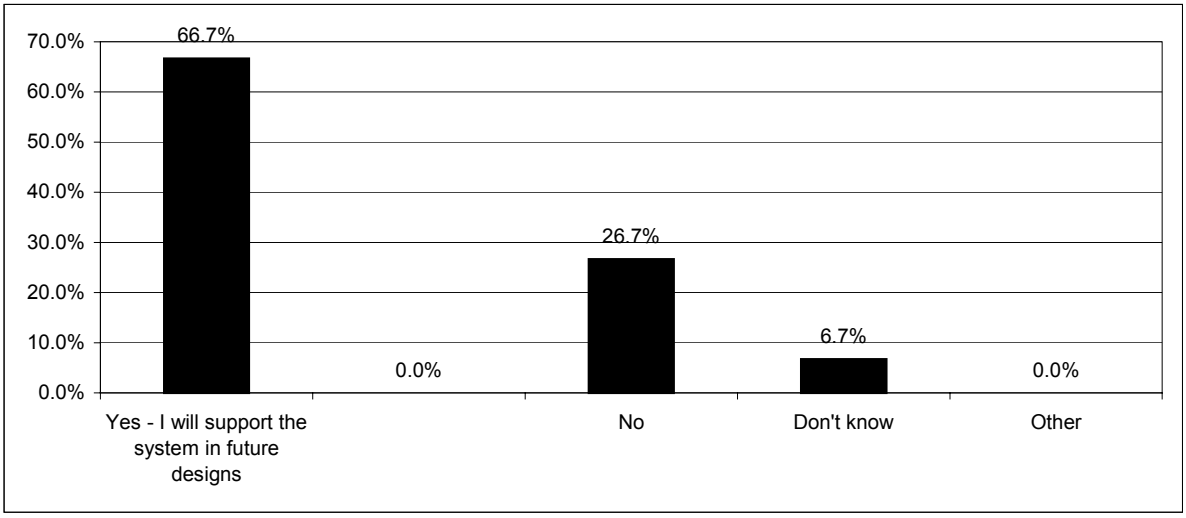
Q11. At the workshop, did the speakers provide you with useful information? (n=15)



Question 13 was slightly modified for the county health group since they do not design and recommend HVAC systems. A yes response to this question indicated that the respondent would support the technology in future designs they reviewed. About two-

thirds of the respondents indicated that they would support the technology in future design reviews. However, about one-fourth indicated that they would not. The "no" response was the largest among each of the three groups surveyed.

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems? (n=15)



The survey concluded with three open-ended questions. For those that gave a response, their answers are transcribed and provided within Appendix E. Responses to Questions 1 through 16 are included in Appendix E.

Question 14 asked the seminar participants "What issues did you think were covered particularly well at the workshop?" Nearly all respondents indicated that either all issues were well covered or that the basic design and philosophy were well covered. Several indicated that the ground water information and sealant information was well presented.

Question 15 asked "What issues did you think were not covered adequately at the workshop?" Only seven respondents indicated that certain issues could have been covered with more information. The most common response was that more information needed to be provided on regulatory and drilling issues. Other comments included a desire to have more information on Southern California Edison's involvement with the technology.

Question 16 asked if "Overall, was attending the workshop a good use of your time? Please explain". Three fourths indicated that yes, it was a good use of there time. However, the three respondents who indicated in Question 2 that they were very knowledgeable stated that it was not a good use of their time.

5

Public Outreach Evaluation

The public outreach portion of the GHPC project includes several different efforts and was designed to expand from the audience targeted to be reached in the public education portion of the project. GHPC efforts included conducting meetings and/or presentations with individuals from the GHPC target groups, upgrading the GHPC Geoexchange Information Center, developing and disseminating press kits, developing and disseminating information on case studies, and issuing media releases.

The process evaluation efforts for the public outreach portion of the GHPC project focused on two phone survey efforts. The first was of participants in the one-on-one meetings with GHPC representatives. The second was of recipients of the media kits. It was hoped that a third phone survey effort of recipients of information materials through the GHPC information Center could also be accomplished. However, for privacy reasons, GHPC did not maintain a record of the names and addresses of the people who requested information.

5.1 Face-to-Face Meetings

GHPC has reported completing over 78 face-to-face meetings through the end of February 2004. This is well beyond the project goal of 40 face-to-face meetings through the end of June 2003. Itron received a list of contacts from the first 60 of these meetings from GHPC. Potential survey respondents were randomly drawn from this contact list until 15 completed surveys were achieved.

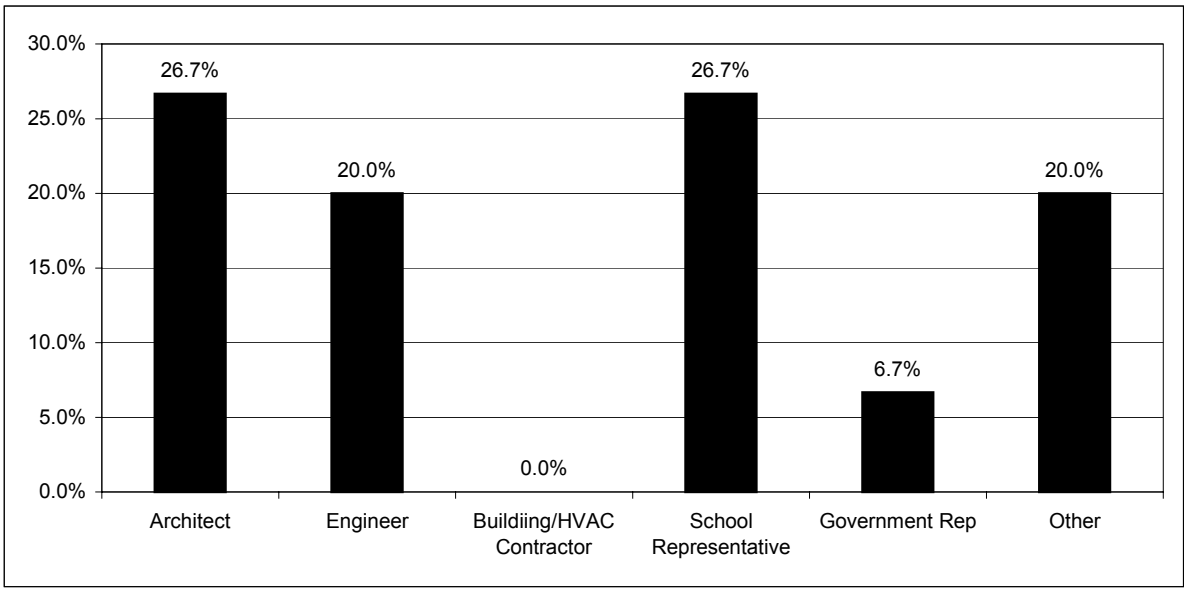
The survey instrument was similar to the one that was used for the workshops and seminars. It was designed to see who the face-to-face meetings were with, the purpose of the meetings, and the attendee knowledge and attitude toward the GeoExchange technology. Appendix F includes a copy of the survey instrument as well as the number of responses by question.

Results by Question

The results from Question 1 revealed that the face-to-face meetings were with a wide variety of people. There were almost equal shares of architects, engineers, and school

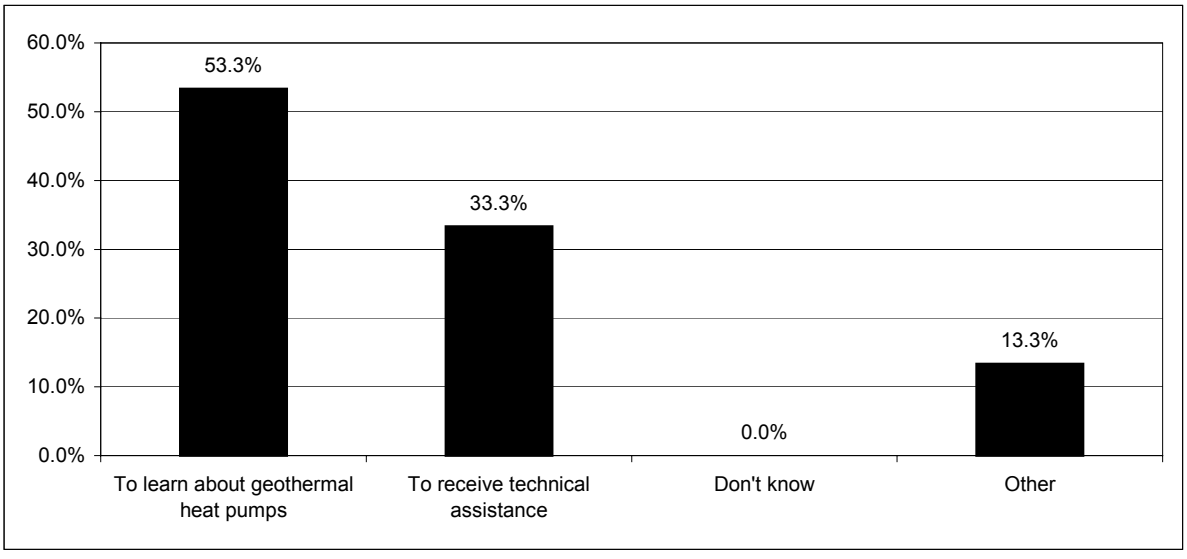
representatives at about 25% with a wide mix of other professions making up the final 25%.

Q1. What is your occupation? (n=15)



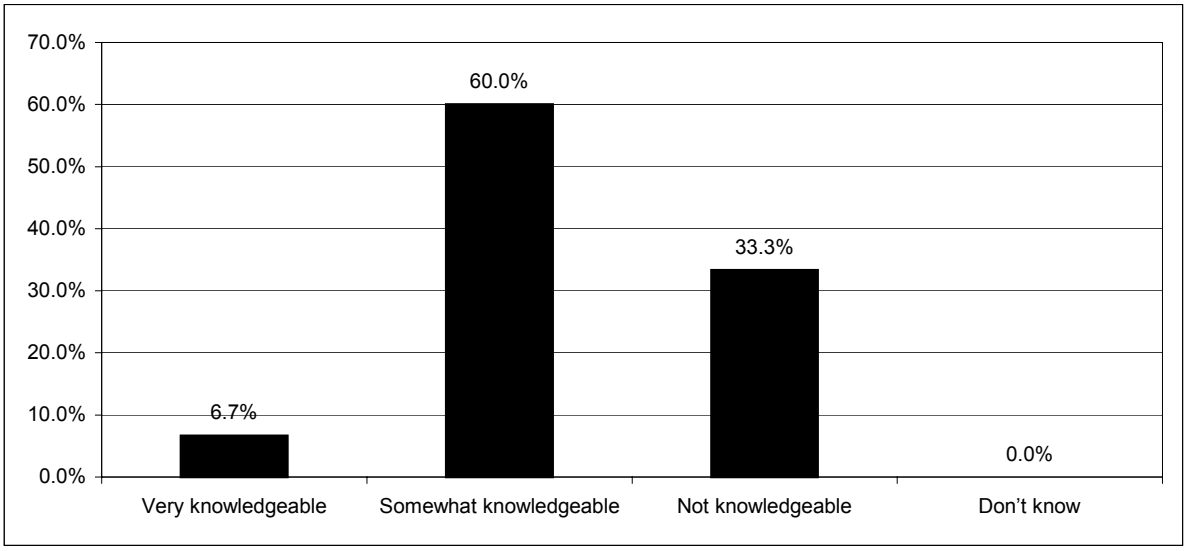
Question 2 inquired about the purpose of the meetings. For the most part, 53%, the meetings were for the purpose of learning more about the GeoExchange technology. However, one-third were for the purpose of receiving technical assistance. This assistance was primarily to answer questions about specific projects.

Q2. What was the purpose of the meeting? (n=15)



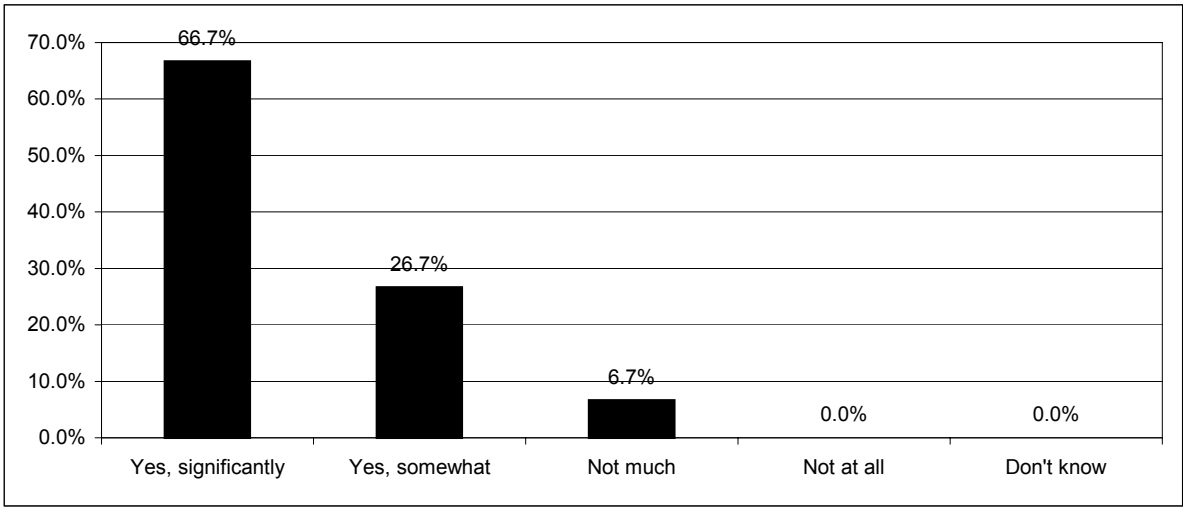
Most of the people attending these face-to-face meetings had some knowledge about the GeoExchange technology (Question 3). However, about one-third were not at all knowledgeable about the technology.

Q3. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange? (n=15)



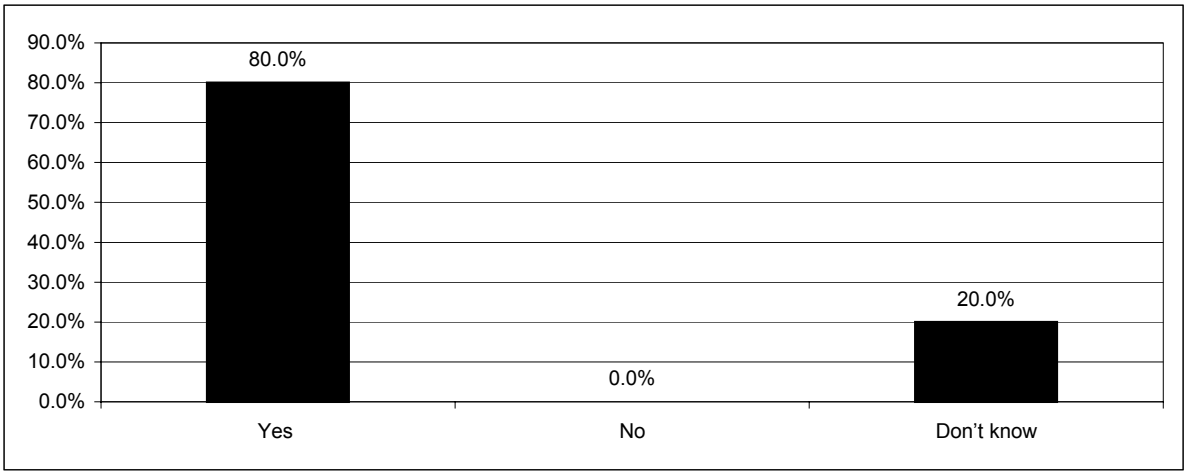
As with all of the workshops and seminars, those attending the face-to-face meetings found them useful. As indicated by the responses to Question 4, over 90% of the respondents found the meetings at least somewhat useful with 68% finding them very useful.

Q4. Did attending the meeting improve your level of knowledge about GeoExchange? (n=15)

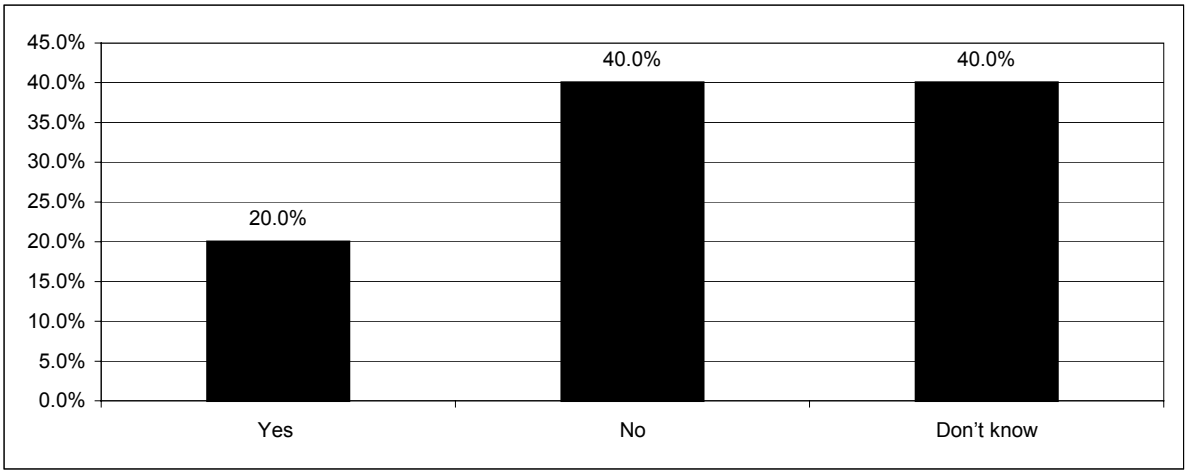


As shown in the responses to Question 5, most everyone (80%) believe the GeoExchange technology to be reliable. In terms of up-front cost, only 20% thought the technology was cost effective (Question 6), but in terms of lifecycle cost, nearly 90% (Question 7) thought the technology was cost effective.

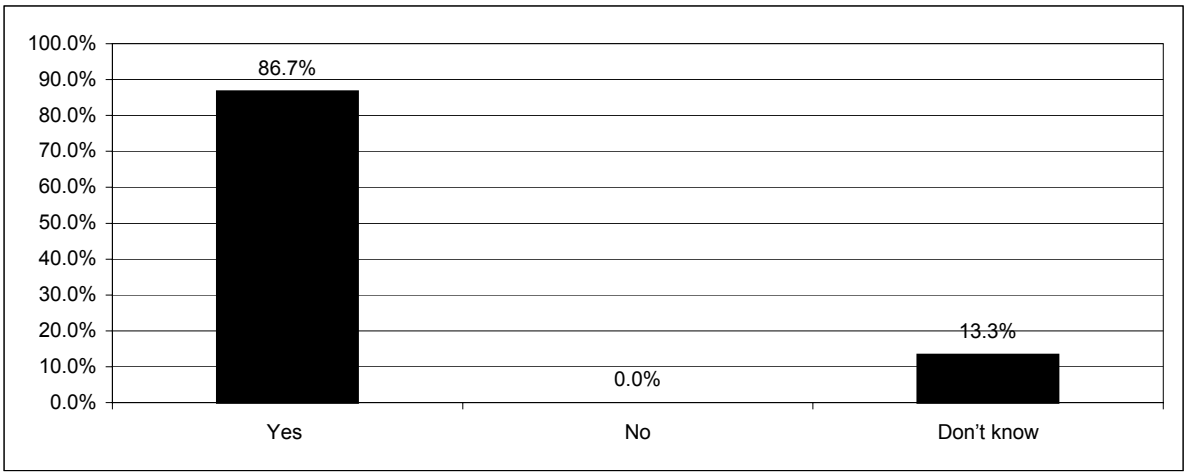
Q5. Do you consider GeoExchange a reliable technology? (n=15)



Q6. Do you consider it cost effective in terms of up-front cost, compared to other HVAC options? (n=15)



Q7. Do you consider it cost effective in terms of lifecycle cost, compared to other HVAC options? (n=15)



Three open-ended questions completed the survey. Question 8 asked "What issues did you think were covered particularly well at the meeting?" Everyone responded to this question with the most common response being that the general concepts of the technology were covered well. Question 9 asked "What issues did you think were not covered adequately at the meeting?" Seven responded to this question. The most common comments were that the discussion was not technical enough and more information should have been provided on grants. Question 10 asked if "Overall, was attending the meeting a good use of your time? Please explain". Only one person responded no, but with the caveat that even though he knew most of the information, the meeting was designed to educate the project architect, who was also in attendance.

5.2 Media Kits

In February 2003, GHPC disseminated press kits to the media outlets that serve the SCE service area. A total of 327 media kits were distributed. Itron performed a telephone survey of a sample of those who received a media kit. The list of media kit recipients was obtained from GHPC and ten participants were selected at random to participate in the survey.

The survey consisted of a potential for seven questions. However, five of the seven questions would not be asked if the survey participant did not remember receiving the media kit. None of the survey participants remembered receiving the kit and therefore the survey became a discussion on the usefulness of media kits in the manner they were distributed by GHPC. Overall, based on this small sample of ten, it appears that doing a general distribution of media kits with generic information, as was done in February, was not successful. Two of the respondents indicated that they would likely be interested in a

geothermal heat pump story if there was a local angle with basic facts and indicated they would like to hear from the GHPC in the future. Many of the subsequent press releases from GHPC took these recommendations into consideration by providing stories of local interest.

Universally, every respondent said it was critical to have a local angle to a media kit or news release. Many found that most media kits (one said 90%) are overblown exaggerations and not particularly useful. However, if they stick to the facts and have the local angle, then they have a chance to be at least considered. Additionally, if the form of media has a specialized audience, then the media kit or news release must be geared toward that audience.

There were significant differences among the respondents on how they preferred to receive media kits. However there was some consistency among the respondents who represented newspapers and among those who represented magazines. There was only one mention of faxes, and these were not liked.

Newspapers, especially daily newspapers, did not like to receive media information via email. They are generally inundated with emails and the information is generally ignored if it comes by e-mail. The smaller weekly newspapers took some exceptions to this general dislike for e-mail. Though most of these also preferred well designed, local angle, fact sheet based media kits, one said he likes an e-mail with a website link for more detail and another said he would look at an e-mail if the subject line caught his eye. Some newspapers indicated that they liked personal contact (by phone or in person) where a quick synopsis can be given with more detailed written material follow-up to come later if interest is expressed.

Magazines, on the other hand, seemed to like receiving information by e-mail. They mentioned that the subject line is *critical*, and one mentioned he liked e-mail media kits because the information is available electronically for cutting and pasting.

6

Year One Decision Maker Survey

In order to measure the effectiveness of the GHPC efforts to enhance public awareness and educate potential customers, a baseline measurement of current awareness of the GeoExchange technology was performed in March of 2003. Architects are one of the prime decision makers influencing groups in the identification of HVAC technology to include in non-residential new construction and remodeling. To assess the baseline levels of geothermal heat pump awareness and willingness to recommend the technology, Itron conducted a baseline telephone survey of building architects in the SCE service area. It would have been preferable to conduct the baseline survey during the fall of 2002, but approval of the independent evaluation contractors was not made until the winter of 2003. A discussion of this baseline survey is provided in Section 3 of this report.

A follow-up to this baseline decision maker survey was conducted approximately one-year after the start of the GHPC program. The survey was fielded in October and November 2003. The same survey instrument was used and building architects within the SCE service area were again targets of the telephone survey. However, the sample size was increased from 50 to 100 in this follow-up survey. The GHPC program is designed to promote geothermal heat pumps throughout the SCE service territory, but seminar and workshop efforts were primarily directed toward organizations outside of the main urban core of Los Angeles. To estimate the impact of the program throughout the entire SCE service area, the sample was selected at random in the same manner as the baseline survey. However, to ensure that about one-half of the respondents were outside of the Los Angeles urban core, the sample size was increased.

The baseline and year one survey results were analyzed both for the samples as a whole (n=51 for the baseline and n=100 for the year one) and for the targeted areas outside of the Los Angeles urban core (n=23 for the baseline and n=49 for the year one). Differences between the population as a whole and the targeted areas were observed both in the baseline and year one surveys. In general, familiarity with the geothermal heat pump technology was higher outside of the Los Angeles urban core both at the time of the baseline survey and during the time when the year one survey was fielded. For the target area, familiarity increased from the baseline survey level of 74% to 80% in the year one survey. Familiarity of the term GeoExchange also increased over the program time frame, especially in the target area.

6.1 Sample Selection and Survey Instrument

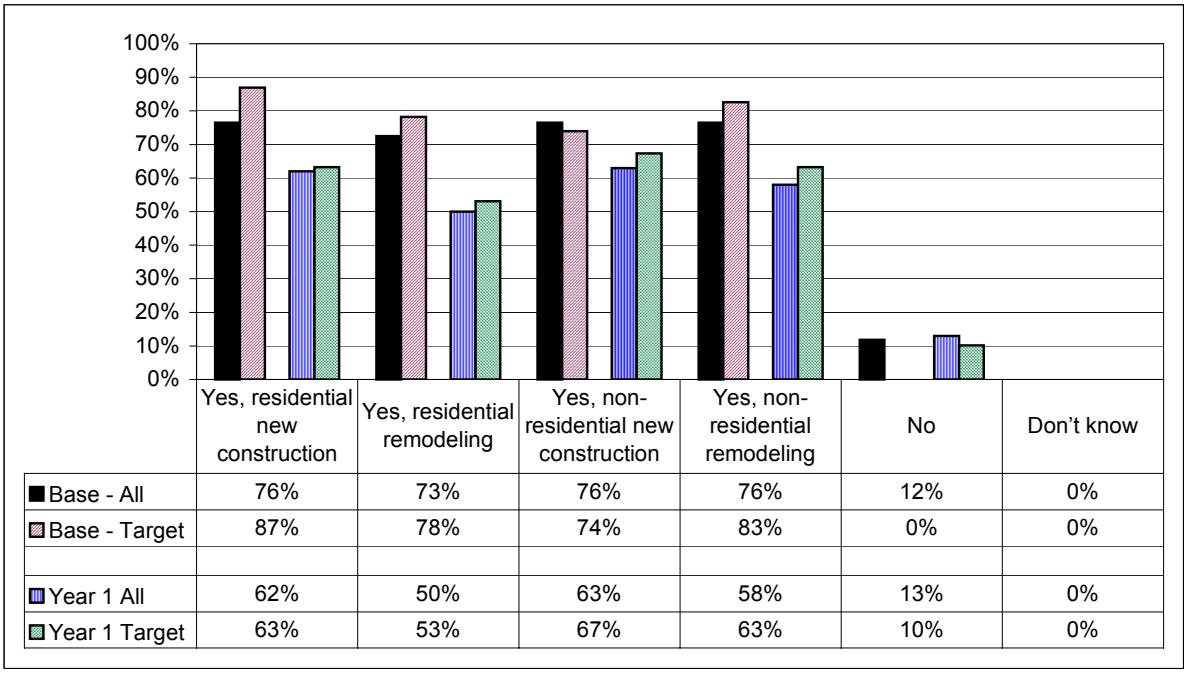
The same sample population of architects that was used for the baseline survey (see Section 3.1) was used for this year one survey. No one who was contacted during the baseline survey was contacted in the year one survey.

The survey instrument consisted of the same13 questions as the baseline survey and took approximately 10 minutes to complete. Appendix G of this report includes a copy of the survey instrument as well as the number of responses by question, both for the baseline and year one surveys. The questions began with an attempt to determine if the architect does provide recommendations or suggestions regarding HVAC equipment and if so by type of construction. Questions that followed queried their familiarity with the technology, their impressions of the technology, their familiarity with the term GeoExchange and with the GHPC organization, and ended asking if they would be interested in receiving additional information about geothermal heat pumps.

6.2 Results by Question

In general, architects in the region have familiarity with the geothermal heat pump technology. However, despite some familiarity, there appears to be high levels of uncertainty about the technology. Some of the respondents did indicate that they have recommended a geothermal heat pump system and several of these indicated that the systems had been installed. Knowledge of the term "GeoExchange" grew over the program timeframe. In the targeted area, familiarity with the term more than doubled from 13% in the baseline survey to 27% in the year one survey. Interest in the geothermal heat pump technology remained high with about 90 percent of the respondents from both surveys being interested in receiving more information about the technology. Many of those in the year one survey who did not want more information were those who attend GHPC workshops and already had received information.

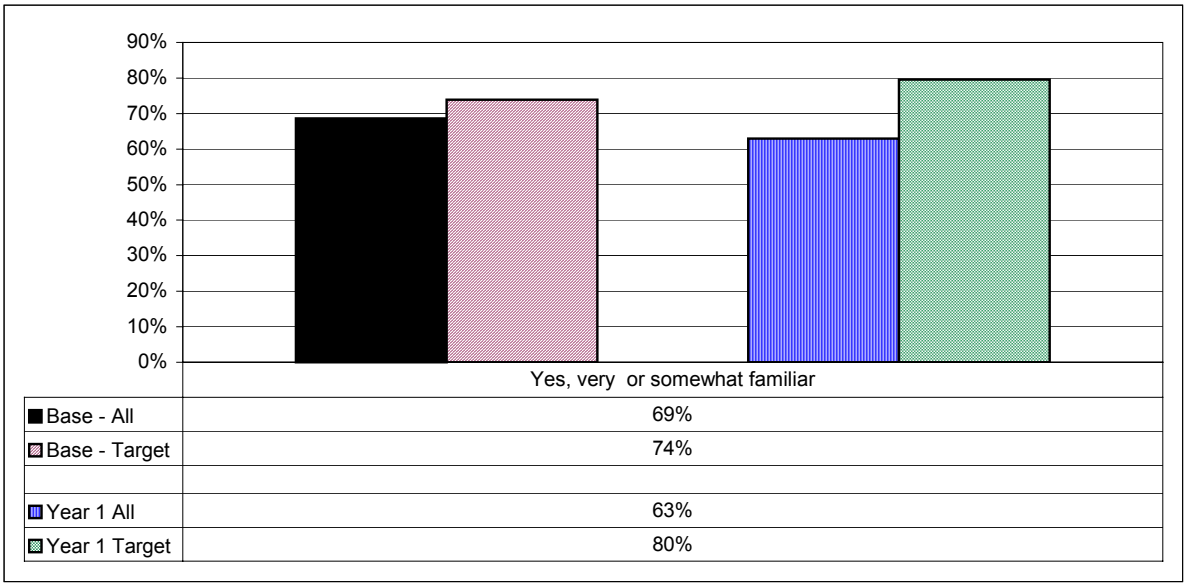
Q1. As an architect, do you normally provide recommendations or suggestions to your clients regarding space-conditioning equipment? (Mark all that apply)



	Yes, residential new construction	Yes, residential remodeling	Yes, non-residential new construction	Yes, non-residential remodeling	No	Don't know
Base - All	76%	73%	76%	76%	12%	0%
Base - Target	87%	78%	74%	83%	0%	0%
Year 1 All	62%	50%	63%	58%	13%	0%
Year 1 Target	63%	53%	67%	63%	10%	0%

Nearly 90% of the respondents in both surveys indicated that they normally did provide recommendations or suggestion to their clients regarding HVAC systems. Response was nearly equal between residential and non-residential and between new construction and remodeling. The lower response rates by category in the year one survey merely reflect fewer participating architects that offer their services to both the residential and commercial sectors.

Q2. Are you familiar with the geothermal heat pump technology?



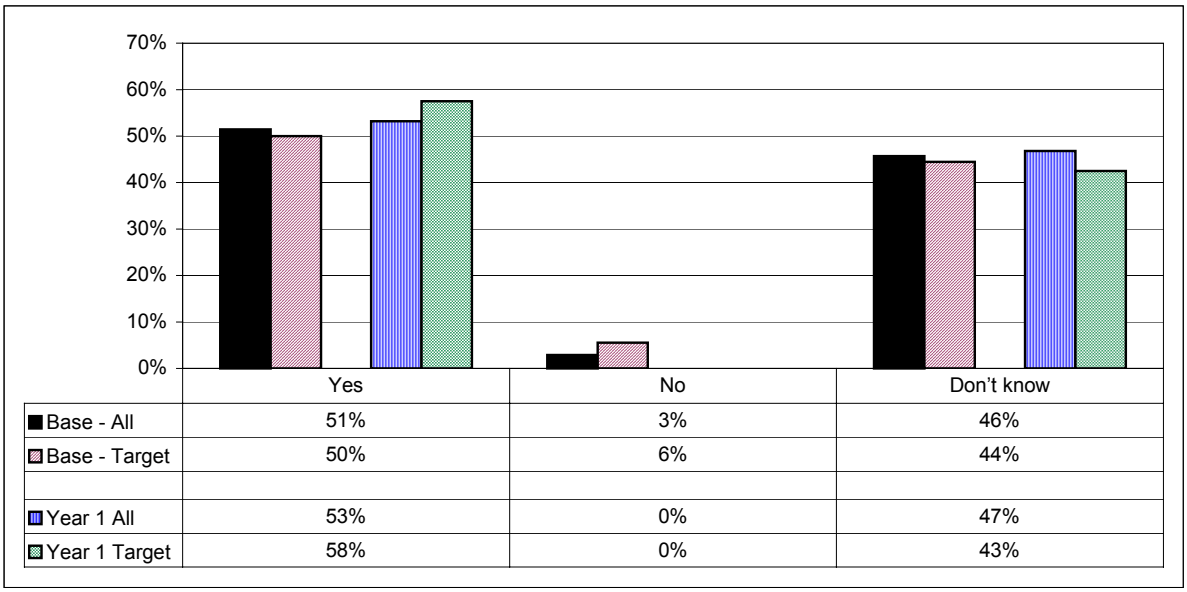
As shown in the response for Question 2, familiarity with the concept of geothermal heat pump technology is generally moderate to high. For both the baseline and year one surveys, familiarity is higher outside of the Los Angeles core urban area. Within the program target area (outside of the Los Angeles core urban area), familiarity increased rising from a baseline level of 74% to a year one level of 80%, indicating success by the GHPC program in increasing technology awareness.

Questions 3 through 7 were only asked of those who responded having at least some familiarity with the geothermal heat pump technology. Of the respondents who indicated that they had at least some familiarity with the technology, about ½ of them didn't know if geothermal heat pumps were reliable (Q3). This was true both in the baseline and year one surveys. However, the response rate for those who thought the technology was reliable increased over the program time frame. In the target area, belief in the technology's reliability increased from 50% in the baseline survey to 58% in the first year survey.

Question 4 asked the respondents if they thought the technology was cost effective. The level of uncertainty increased significantly between the baseline and year one surveys. In the target area, the response of "don't know" was 53% in the baseline survey and this increased to 67% in the first year survey. However, based on comments received from the respondents, the increase in uncertainty is due to more knowledge (and not less) of the high first cost for geothermal heat pumps in relation to competing technologies. The uncertainty is with the life cycle cost of geothermal heat pumps compared to the

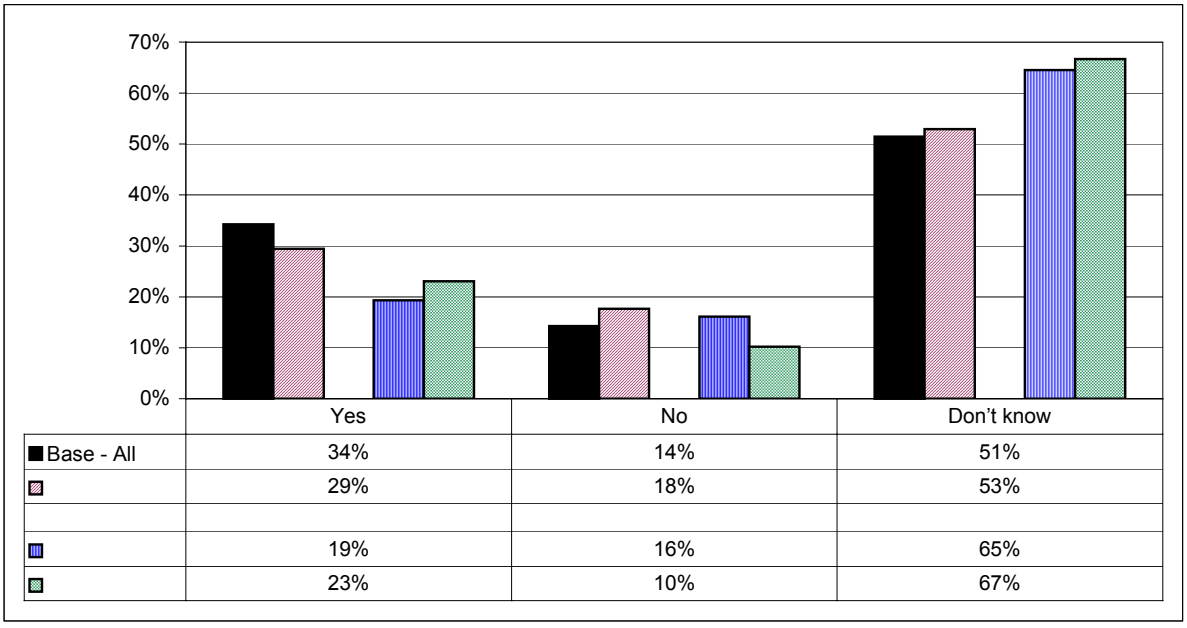
competing technologies. It appears that information and knowledge on cost is increasing but more information needs to be provided on life cycle cost comparisons.

Q3. Do you consider geothermal heat pumps a reliable technology?



	Yes	No	Don't know
Base - All	51%	3%	46%
Base - Target	50%	6%	44%
Year 1 All	53%	0%	47%
Year 1 Target	58%	0%	43%

Q4. Do you consider them to be cost effective compared to other HVAC options?

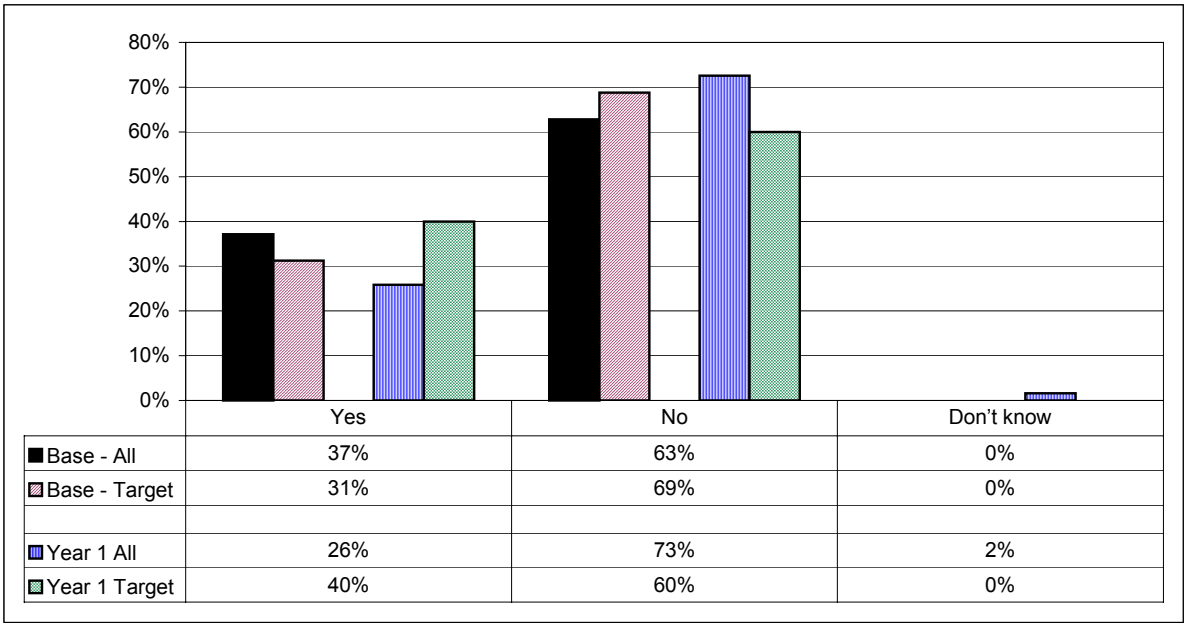


	Yes	No	Don't know
Base - All	34%	14%	51%
	29%	18%	53%
	19%	16%	65%
	23%	10%	67%

Question 5 asked respondents if they have recommended or suggested that a client install a geothermal heat pump. For the samples as a whole, the number of respondents who indicated that they have recommended the installation of the technology fell over the

program period. However for the targeted area, the number of respondents who indicated that they had recommended installation of a geothermal heat pump system increased from a baseline estimate of 31% to a year one estimate of 40%. Most of those who did indicate that they had recommended installation of geothermal heat pumps were either unsure if the technology had been installed or said it had not been installed; primarily because of high first cost. However, many respondents did indicate that several of the systems had been installed, both in residential and commercial applications.

Q5. Have you ever recommended or suggested that a client use GeoExchange?

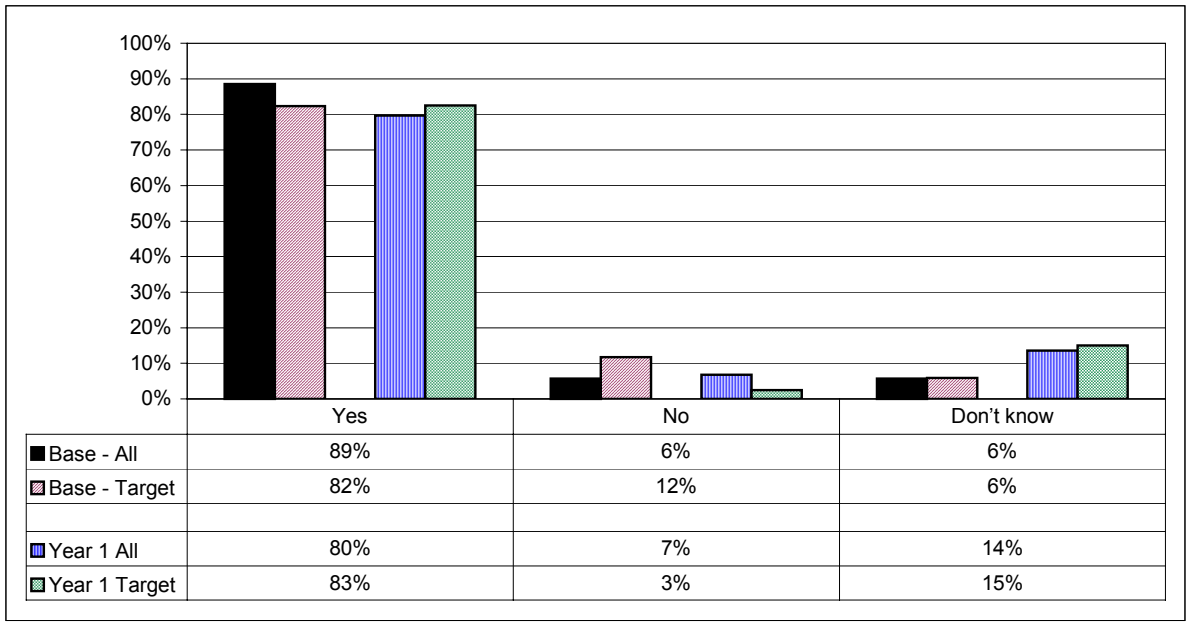


	Yes	No	Don't know
Base - All	37%	63%	0%
Base - Target	31%	69%	0%
Year 1 All	26%	73%	2%
Year 1 Target	40%	60%	0%

In question 6, survey participants with some geothermal heat pump familiarity were asked if they would consider recommending or suggesting using a geothermal heat pump to their clients. A large majority (80% or more) indicated that they would, both in the baseline and year one surveys. In the target area, baseline and year one results were nearly identical.

The number of respondents indicating that they would not recommend the technology was very small in both the baseline and year one surveys. Because there were so few respondents saying that they would not recommend the technology, the question 7 graph and table are not provided. (Question 7 asked why they would not recommend the technology).

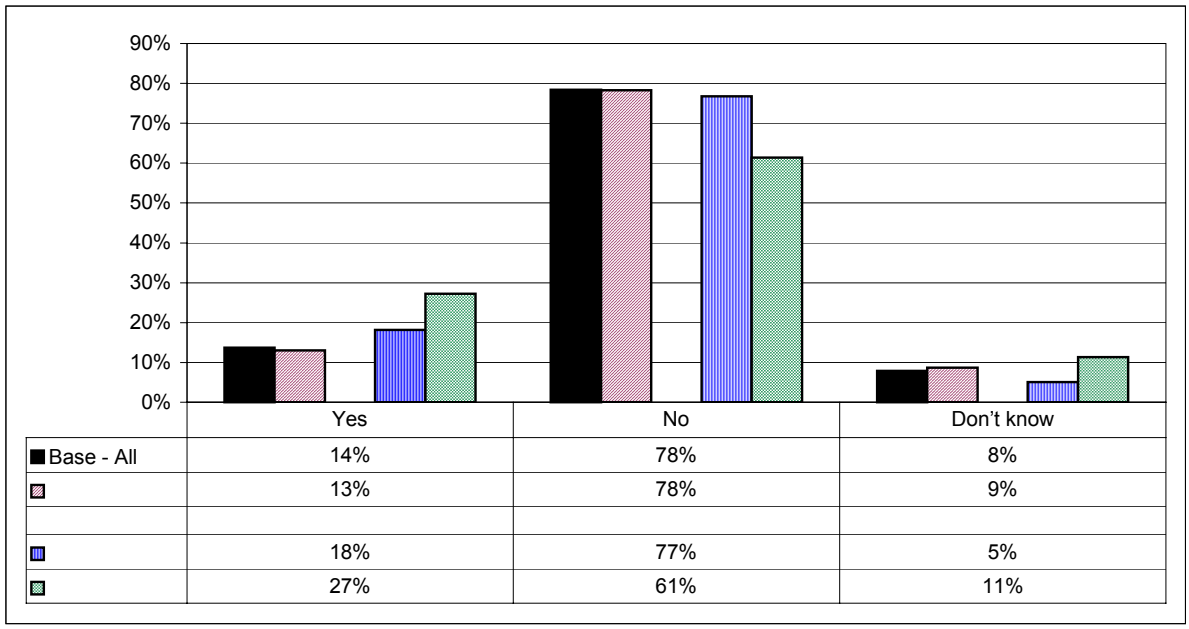
Q6. Would you consider recommending or suggesting using a geothermal heat pump?



	Yes	No	Don't know
Base - All	89%	6%	6%
Base - Target	82%	12%	6%
Year 1 All	80%	7%	14%
Year 1 Target	83%	3%	15%

Questions 8 through 10 were asked of all survey respondents. This series of questions was designed to characterize the current level of knowledge about GHPC and about the GHPC term for geothermal heat pumps, "GeoExchange".

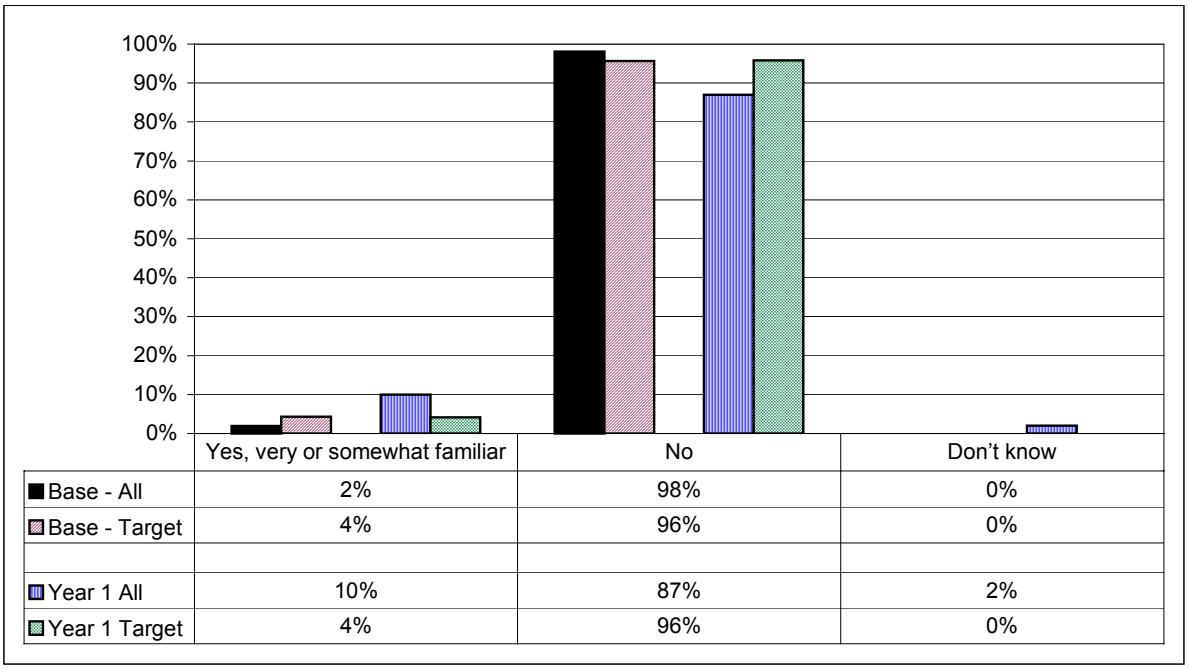
Q8. Have you ever heard of the geothermal heat pump technology referred to as GeoExchange?



	Yes	No	Don't know
Base - All	14%	78%	8%
	13%	78%	9%
	18%	77%	5%
	27%	61%	11%

Question 8 asked about familiarity with the term "GeoExchange". In the baseline survey, only 13-14% indicated that they have heard of the term. However, the response increased significantly in the year one survey, indicating that GHPC is having success in their marketing efforts. In the target area, familiarity with the term "GeoExchange" grew from the baseline level of 13% to the year one level of 27%.

Q9. Are you familiar with the Geothermal Heat Pump Consortium, which is promoting the geothermal heat pump technology in Southern California?

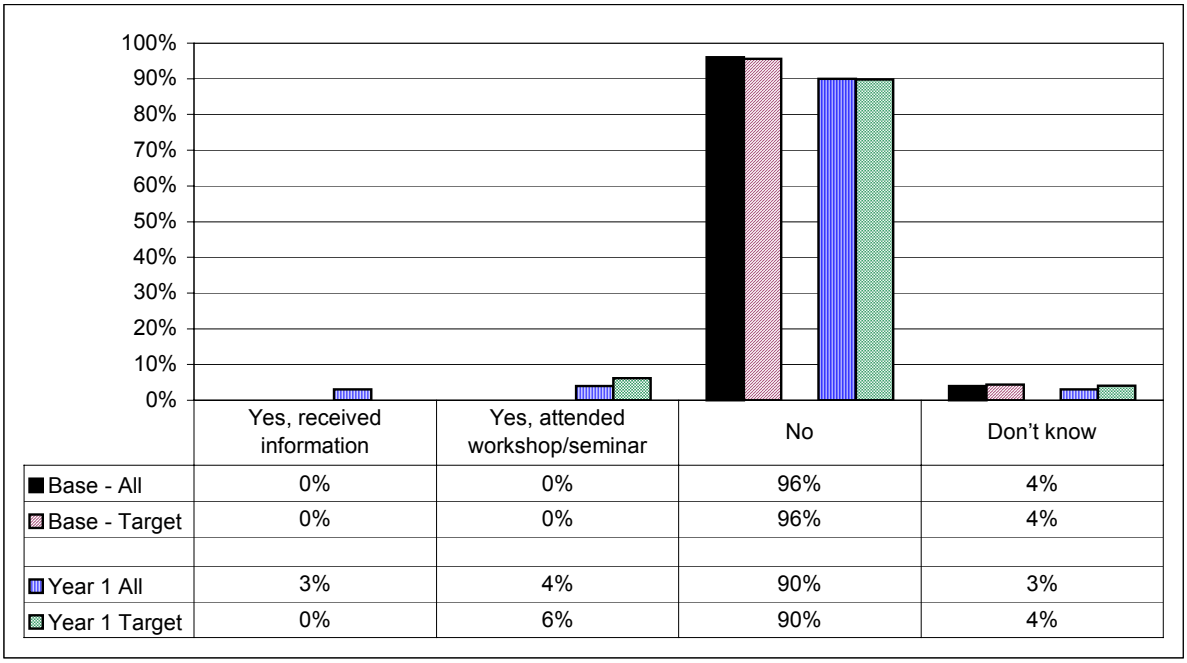


	Yes, very or somewhat familiar	No	Don't know
Base - All	2%	98%	0%
Base - Target	4%	96%	0%
Year 1 All	10%	87%	2%
Year 1 Target	4%	96%	0%

Familiarity with GHPC as an organization, as asked in question 9, was nearly non-existent in the baseline survey with only one respondent indicating any awareness. In the year one survey, awareness of GHPC was still low, but higher than in the baseline survey with 10% of the total sample stating some level of familiarity of GHPC.

Question 10 asked if any of the respondents had either received information from GHPC or attended any of the GHPC workshops. As would be expected, no one in the baseline survey had either received information or attended a GHPC sponsored workshop. In the year one survey, some respondents did state that they had either received information from GHPC or attended one of the workshops. However, response was low with only three indicating that they had received information and four indicating that they had attended a workshop.

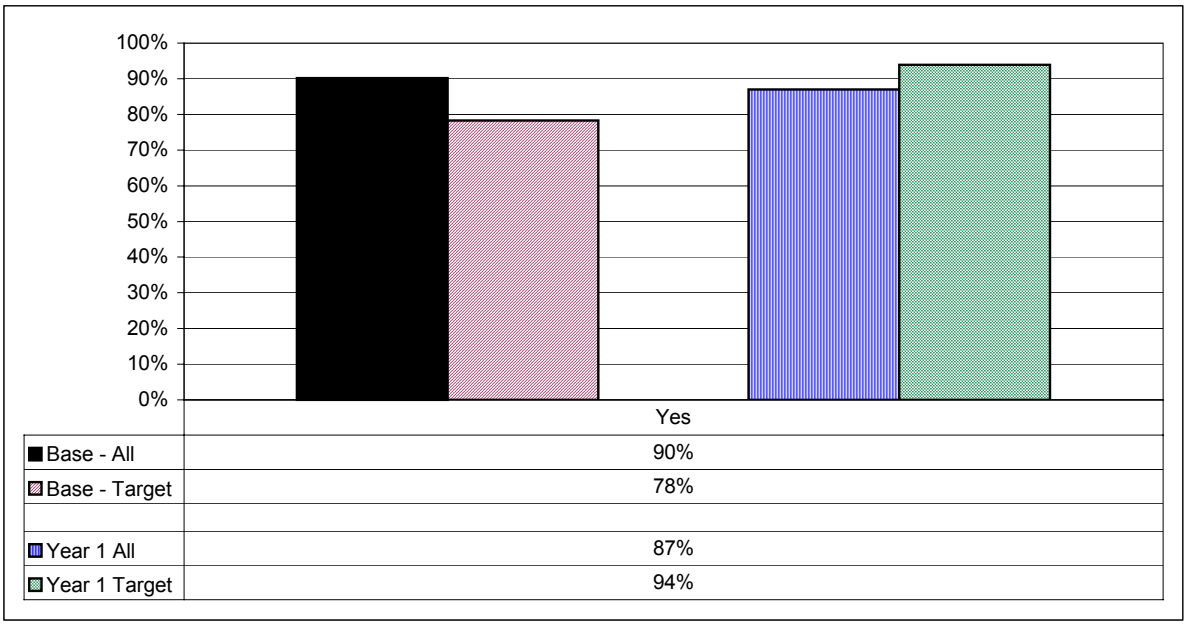
Q10. Have you received any information from the Geothermal Heat Pump Consortium or participated in one of their workshops or seminars? (Mark all that apply)



	Yes, received information	Yes, attended workshop/seminar	No	Don't know
Base - All	0%	0%	96%	4%
Base - Target	0%	0%	96%	4%
Year 1 All	3%	4%	90%	3%
Year 1 Target	0%	6%	90%	4%

The last question of the survey, question 13, asked the survey participants if they would like to receive information on geothermal heat pumps. A high percentage in both the baseline and year one surveys stated that they do have an interest in learning more and receiving more information. In the year one survey, many of the "no" responses were from those who had attended the GHPC workshops and already had information in-hand. The list of those requesting more information is included in Appendix B of this report.

Q13. Would you be interested in receiving information on geothermal heat pumps?



6.3 Estimates of Awareness and Willingness

Task 4 of the Project Evaluation Plan proposed a methodology to estimate the indirect energy impacts of the GHPC program. This methodology utilizes changes in decision maker awareness of geothermal heat pumps and changes in their willingness to install such systems to calculate indirect impact estimates. Results from the baseline survey are be used to identify the initial levels of Awarness and Willingness and the results from the year one survey used to measure changes in these baseline levels.

Year One Awareness and Willingness – All Respondents

Awareness is defined as not only some level of familiarity with the concept of geothermal heat pumps, but an effective awareness of this technology. In the year one survey that includes all 100 respondents, 5 respondents of question 2 indicated that they were very aware of the geothermal heat pump technology. An additional 58 respondents indicated that they were somewhat aware of the technology. The 5 respondents indicating that they were very aware are considered to have an effective awareness. Only a portion of the 58 somewhat aware respondents can be considered to have effective awareness.

All of those whose answer to question 5 indicated that they had recommended the installation of a geothermal heat pump system to a client are also considered to have effective awareness. Inclusion of these respondents brings the estimate of those with effective awareness to 20.

Question 3 asked if the respondent considered the technology reliable, and question 4 asked if the respondent considered the technology cost effective. Those who provided either a "yes" or "no" response to both of these questions are also considered to have effective awareness. An answer of "don't know" to either question 3 or 4 indicates less than effective awareness. Including this subset of respondents brings the total number of respondents considered to have effective awareness to 29. The year one estimate of effective awareness for all year one respondents is 29% (29/100), an increase of 7% over the baseline value.

Willingness to recommend the technology is a subset of those who are effectively aware of the technology. It is only measured for the 29 year one respondents considered effectively aware and is developed from their response to question 6. Question 6 asked if they would consider recommending or suggesting using a geothermal heat pump. Twenty-four of these 29 respondents indicated that they would recommend a geothermal heat pump. The year one estimate of willingness for all year one respondents is 83% (24/29), a slight increase of 1% over the baseline value.

Year One Awareness and Willingness – Target Area Respondents

The target areas for the GHPC workshops and seminars were outside the urban core of Los Angeles. The baseline survey did not include enough sample points to provide information for the geographic sub-area that made up the GHPC target area. Therefore, willingness and awareness estimates are only developed from the year one survey results.

In the year one survey that includes only those in the target area (49 respondents), 5 respondents of question 2 indicated that they were very aware of the geothermal heat pump technology. An additional 34 respondents indicated that they were somewhat aware of the technology. The 5 respondents indicating that they were very aware are considered to have an effective awareness. Only a portion of the 34 somewhat aware respondents can be considered to have effective awareness.

All of those whose answer to question 5 indicated that they had recommended the installation of a geothermal heat pump system to a client are also considered to have effective awareness. Inclusion of these respondents brings the estimate of those with effective awareness to 15.

Question 3 asked if the respondent considered the technology reliable, and question 4 asked if the respondent considered the technology cost effective. Those who provided either a "yes" or "no" response to both of these questions are also considered to have effective awareness. An answer of "don't know" to either question 3 or 4 indicates less

than effective awareness. Including this subset of respondents brings the total number of respondents considered to have effective awareness to 22. The year one estimate of effective awareness for year one respondents in the target area is 45% (22/49). This estimate is considerably higher than the awareness estimate of 29% for all the year one respondents.

Willingness to recommend the technology is a subset of those who are effectively aware of the technology. It is only measured for the 22 year one respondents in the targeted area considered effectively aware and is developed from their response to question 6. Question 6 asked if they would consider recommending or suggesting using a geothermal heat pump. Nineteen of these 22 respondents indicated that they would recommend a geothermal heat pump. The year one estimate of willingness for the target area year one respondents is 86% (19/22), slightly higher than the 83% for all year one respondent.

Appendix A

GHPC Architect's Baseline Survey

Attached please find a sample of the baseline survey instrument utilized for this report.

GHPC Architect's Baseline Survey

Hello, my name is _____ from Regional Economic Research calling in regard to a geothermal heat pump program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, which is being promoted by California Public Utilities Commission, as part of an evaluation of Energy Conservation efforts in the State of California. I'm not calling you to sell you anything or to recruit you for the program.

As an architect, you have influence on the design of buildings. We would like to take just a few minutes of your time to ask you about geothermal heat pumps.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

Q1. As an architect, do you normally provide recommendations or suggestions to your clients regarding space-conditioning equipment? *(Mark all that apply)*

Yes, residential new construction	39
Yes, residential remodeling	37
Yes, non-residential new construction	39
Yes, non-residential remodeling	39
No	6
Don't know	0

Q2. Are you familiar with the geothermal heat pump technology?

[A geothermal heat pump is different from a common air-to-air heat pump in that it uses the earth or water as its heat exchange medium instead of air.]

Yes, very familiar	2
Yes, somewhat familiar	33
No	16
Don't know	0

[If yes to Q2, then continue to Q3, else skip to Q8]

Q3. Do you consider geothermal heat pumps a reliable technology?

Yes	18
No	1
Don't know	16

Q4. Do you consider them to be cost effective compared to other HVAC options??

Yes	12
No	5
Don't know	18

Q5. Have you ever recommended or suggested that a client use geoexchange?

Yes		
	[Residential New Construction]	9
	[Residential Re-model]	2
	[Non-Residential New Construction]	6
	[Non-Residential Re-model]	2
No		22
Don't know		0

Q6. Would you consider recommending or suggesting using a geothermal heat pump?

Yes	31
No	2
Don't know	2

[If no to Q6, then continue to Q7, else skip to Q8]

Q7. Why not?

Don't know enough	_____
Too Costly	_____
Not reliable	___1_
Not suitable for the applications considered	_____
Other *[please specify]*_____	1_
__Defer to Mechanical Engineer_____	
Don't know	_____

Q8. Have you ever heard of the geothermal heat pump technology referred to as GeoExchange?

Yes	__7__
No	_40__
Don't know	__4__

Q9. Are you familiar with the Geothermal Heat Pump Consortium, which is promoting the geothermal heat pump technology in Southern California?

Yes, very familiar	_____0____
Yes, somewhat familiar	_____0____
No	____51____
Don't know	_____0____

Q10. Have you received any information from the Geothermal Heat Pump Consortium or participated in one of their workshops or seminars? *(Mark all that apply)*

Yes, received information	_____0____
Yes, attended workshop/seminar	_____0____
No	____49____
Don't know	_____2____

[If yes to Q10, then continue to Q11, else skip to Q13]

Q11. Did you consider the information or workshop/seminar useful?

Yes, very useful _____
Yes, somewhat useful _____
No _____
Don't know _____

[If no to Q11, then continue to Q12, else skip to Q13]

Q12. Why not?

Too general _____
Too technical _____
Didn't seem applicable to my needs _____
Other _____
Don't know _____

Q13. Would you be interested in receiving information on geothermal heat pumps?

Yes 46
No 5

[If yes to Q13, note the respondent's name]_____

That completes our survey, thank you very much for your time.

Appendix B

Process Evaluation Summaries

Process Evaluation Summary for the GHPC California Industry Meeting Feb 11, 2003

Purpose:

- To introduce trade allies interested in operating in Southern California to the business opportunities for GeoExchange systems and to present a GHPC RFQ for a GeoExchange trade ally referral list. The intent of this referral list is to help strengthen and expand the GeoExchange infrastructure in Southern California.

Setup and Attendance:

- The weather was poor with heavy rain and many accidents on the freeway.
- Approximately 80 people signed up for the seminar with about 50 attending. The poor weather and resulting traffic likely was a key a factor. The audience seemed very knowledgeable and was a mix of turnkey providers, HVAC contractors, drillers, manufacturer's reps, and utility staff.
- Apparently, two different agendas had been distributed for the workshop. The first had an 8:30 start and the second a 10:00 start. About 20 people were at the meeting in anticipation of an 8:30 start. This could have caused annoyance, however, the attendees instead took it as an opportunity to network.

Presentations:

- Wael El-Sharif led the seminar and was a competent speaker. Wael and the other GHPC representatives came off as very knowledgeable about ground source heat pumps.
- Peter Lai from the CPUC gave a very broad overview of California's 3rd Party Energy Efficiency Program Initiative.
- Michael Lo, the 3rd Party Program Manager for Southern California Edison (SCE), provided an overview of the various energy efficiency programs offered through SCE.
- The California Energy Commission was scheduled to speak at this time, but was unable to because of new travel restrictions. However, they did send

down their slide presentation, which was presented by Craig Hoellwarth. The information provided in the CEC slideshow was good and very well directed toward the audience. However, the lack of a CEC representative limited the usefulness of the presentation since it appeared that there could have been good interaction between the audience and the CEC representatives.

- Tony Pierce of SCE was an unscheduled presenter who talked about SCE's experience with the GeoExchange technology. The discussion was technical and addressed issues directly applicable to the GeoExchange industry. Tony talked about the demonstration installation at the YMCA and the thermal conductivity and other issues surrounding it and the new demonstration installation being installed in SCE's new Ag Technology Center. The audience was engaged in the presentation with much interaction between the presenter and the audience.
- Wael, Jack DiEnna, and Brian Heard provided an overview of program accomplishments, discussed the process for identifying two schools to participate in the program, and some examples of lower first costs for a well-designed GSHP system. Infrastructure issues were discussed and an RFP distributed that is designed to develop a list of approved trade allies in the SCE service territory.
- Before lunch, everyone introduced himself or herself and during the lunch period, there was much mingling and interaction.
- After lunch, there was a casual roundtable discussion during which This roundtable was a productive use of time as it allowed experienced individuals to share their stories and important questions to be addressed (i.e. inspections, codes & standards, etc.).

Handouts:

- The handouts consisted of a series of glossy brochures, technical information papers, list of manufacturers with representative contacts, and information about the GHPC program. The materials provided were extremely professional and well done.

Areas For Additional Information:

1. What are some average SCE area costs associated with installation?
    a. Drilling
    b. Underground equipment
    c. Design
    d. Permitting

2. "Building load profile" was mentioned as a very important factor. The building must have a significant heating and cooling load to make the technology

worthwhile. This will be an issue in the coastal areas where there is not a significant heating or cooling season. Does this need to be directly addressed?

3. Tony Pierce from SCE presented some results from a 12-ton system in SCE service territory that SCE is studying. The results from this site indicate an extremely poor thermal conductivity of the soil. Someone else indicated that he had similar results in the "high desert", which is where the GHPC is focusing their efforts. This issue appeared to be important to the audience, potentially have significant impact, but did not seem to be adequately addressed by the GHPC.

4. It was our impression that California site-specific data is needed. As was pointed out, there are few installations in Southern California, but it was reported that a school within the region will be installing a system and Tony mentioned that he still had monitoring equipment at the YMCA that is not currently being used. Also, there are installations in Northern California. It may be out of the budget scope, but can more California specific information be included, especially monitored data?

Process Evaluation Summary for the GHPC Architect Seminar Feb 12, 2003

Purpose:

- To educate architects on the benefits of a GeoExchange system so that they may consider one when designing a building.

Setup and Attendance:

- The weather was poor with heavy rain and many accidents on the freeway.
- About 30 people signed up for the seminar, but there were only 2 in attendance.
- Most of the poor attendance probably caused by the poor weather. However, there was also some confusion on the part of the hotel about how to refer to the seminar. The hotel knew to refer to it as a GHPC or AEES seminar, but was unaware that some attendees would refer to it as an AIA seminar. An unknown number of possible attendees may have left after finding out from the hotel that there was no AIA seminar.
- The projector was having some problems in that the slide show came out a little fuzzy. Attempts at adjusting the projector failed.
- The room setup and food were good.

Presentations:

- A slide show was presented that provided a good overview of the subject. The intent of the seminar was to provide GeoExchange information in a broad and informative manner and the presentation succeeded in that.
- Despite the fact that there were only two attendees, there was good interchange and discussion.

Handouts:

- The handouts included information of SCE's Savings by Design Program, which was useful, a copy of the Earth Comfort Update (California Edition), which was very good in providing California specific information and examples, and information on GeoExchange in schools, which was also useful.
- A printed copy of the slide show was also provided.

Areas For Additional Information:

- The handout material was very useful, however it was targeted primarily to schools. More information should be provided about commercial buildings.

Process Evaluation for the Certified Geoexchange Designer Training Course July 21-23, 2003

Purpose:

- To provide advanced training towards certification as a GeoExchange Designer. The coarse is designed for a highly technical audience interested in taking and passing the International Ground Source Heat Pump Association's (IGSHPA) GeoExchange Designer exam.

Setup and Attendance:

- The classroom was set up within the Southern California Edison CTAC Energy Efficiency Center, which provides a good environment for technical training in the energy field. The initial site for the class was next to some internal construction. However, Brian Heard of AEEES quickly had the CTAC officials change the classroom location to a quite location. The setup was excellent.
- There were nine students. Each of these students appeared to be highly skilled and very interested in the technology.

Class Instructors:

- The two instructors, Dr. Bose and Dr. Smith, both of Oklahoma State University, were very impressive. It became quickly obvious that these two professors had extensive background in the field and were very knowledgeable about all aspects of the technology.
- Equally as impressive as their backgrounds was there ability to teach and interact with their nine students. Much of the information being provided was highly detailed and technical, but the professors imparted the information in a manner that kept the students both interested and fully involved.

Presentations and Handouts:

- As stated above, the instructors' presentation capabilities were excellent.
- There were extensive, very detailed, and very useful handouts.
- Reference was often provided on where to easily obtain additional information should the student desire it.

Overall Impression:

- Although the Itron representative only attended the first day of the 3-day course, based on that first day, it appeared to be an excellent course that was both well designed and professionally presented.

Appendix C

GHPC Architect Seminar Participant Survey

Attached please find a sample of the architect seminar participant survey instrument utilized for this report.

GHPC Workshop/Seminar Participant Survey

Hello, my name is _____ from Regional Economic Research calling in regard to the geothermal heat pump—or GeoExchange—program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, including the California Public Utilities Commission, as part of an evaluation of the GeoExchange education effort here in California.

From the sign-in sheets, it appears that you attended a workshop or seminar sponsored by the Geothermal Heat Pump Consortium. We would like to take just a few minutes of your time to ask you about the workshop you attended.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

___

Q1. What is your occupation?

Architect	7
Engineer	1
Building Contractor	1
HVAC Contractor	0
Driller	0
Manufacturer's Rep	0
Utility Rep	0
Government Rep	0
Consultant	1
Other	3 (School Board Reps)

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange?

Very knowledgeable	0
Somewhat knowledgeable	6
Not knowledgeable	7
Don't know	0

Q3. Did attending the meeting improve your level of knowledge about GeoExchange?

Yes, significantly	11
Yes, somewhat	2
Not much	0
Not at all	0
Don't know	0

Q4. Do you consider GeoExchange a reliable technology?

Yes	9
No	0
Don't know	4

Q5. Do you consider it to be cost effective in terms of up-front cost, compared to other HVAC options?

Yes	3
No	5
Don't know	5

Q6. Do you consider it to be cost effective in terms lifecycle cost, compared to other HVAC options?

Yes	10
No	0
Don't know	3

Q7. Prior to the workshop, had you ever recommended or suggested that a client use GeoExchange?

Yes	1
No	9
Don't know	0

[If yes to Q7, then continue to Q8, else skip to Q9]

Q8. Did any recommendation result in actual use of GeoExchange?

Yes	0
No	1
Don't know	0

Q9. Having completed the workshop, would you now recommend or suggest that a client use a GeoExchange system?

Yes I have already	1
Yes I probably will, although I haven't yet	6
Probably not	1
Definitely not	0
Don't know	3

[If no to Q9, then continue to Q10, else skip to Q11]

Q10. Why not?

Don't know enough	0
Too Costly	1
Not reliable	0
Not suitable for the applications considered	0
Other _____	0
Don't know	0

Q11 At the workshop, did the speakers provide you with useful information?

Yes – all of the information provided was very useful	3
Yes – most of the information provided was useful	10
No – the information was marginally useful	0
No – the information was not useful	0
Don't know	0

[If no to Q11, then continue to Q12, else skip to Q13]

Q12. Why not?

Too general __1___
Too technical __0___
Didn't seem applicable to my needs __0___
Other *[please specify* _____
__0_____
_____
___
Don't know __0___

[If yes to Q11, then continue to Q13, else skip to Q14]

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems?

Yes – I will consider the systems in future designs __4___
Yes – but I will try and learn more before considering the systems in future designs __4___
No __1___
Don't know __0___

Q14. What issues did you think were covered particularly well at the workshop?

A.1. All the issues that were covered were done well.
A.2. Basic design, how the systems work, philosophy of system.
A.3. Explanation of vertical vs. horizontal approach to laying the pipes in the ground.
A.4. Details of how the system works, the efficiency, the costs.
A.5. Equipment choices.
A.6. Conference well done. She understood the technology well at the end.
A.7. How the system works-overview.
A.8. Excellent conference. He knew nothing when he went in. He feels he understands now.
A.9. Set up of systems, loop systems for single-family families. All questions he had about SF homes were answered well.
A.10. General overview excellent.
A.11. Life cycle costs, basic information about the system.
A.12. Overall concept/design/life cycle cost. Information about funding available to client for energy efficient buildings, such as SoCal Edison's, "Savings by Design", and grant for Title 24.
A.13. Explaining how GTPH works – everything about the systems.

Q15. What issues did you think were not covered adequately at the workshop?

A.1. Needed more detail, more facts, more studies showing cost and reliability.
A.2. This person felt the presentation was too "rah, rah, sales oriented". Would have liked to have much more detail on how to calculate cost effectiveness. Would have liked a map of ct showing where system is most likely to be cost effective. Believes that cost effectiveness would be influenced by climate, type of soil, and availability of other natural resources.
A.3. He did not understand at first that the conference only covered the in-ground component of the whole system – not the actual air exchange in the building. He figured this out at the end.
A.4. None
A.5. Where to take if from here. Are there any other training venues available? Are there any other classes planned? Where to get more detailed information.
A.6. This woman was a school board member. Conference presented led her to believe that schools were being sought to agree to be experimental sites for GTHP. Invited GTHC people to her school only to find that funds were not available for her school. The issue needs to be more clear – what schools can participate.
A.7. Costs in southern California. More data specifically related to southern California.
A.8. None.
A.9. If he was involved in other buildings he would have needed more information, but for his purposes everything was covered adequately.
A.10. Specifics – particularly about maintenance and how to analyze costs for a specific project.
A.11. More details on installation costs, who is qualified/licensed to install these systems in southern California, "where to go from here". Need an infrastructure for this system in southern California.
A.12. Felt that the workshop was basically cone in general terms, which was ok, but several technical terms were used, and then not adequately/concisely explained. Would have liked to have it totally general or more completely technical. His example was: "This system works just like a heat pump", then attendees said: "Explain how heat pumps work again?" Then, explanation from instructor was not adequate. He, and the other attendee from his firm (both architects) both felt that some of the technical explanations could have been more clear.
A.13. More information on local projects (southern California) that have utilized this system, and how they have done. See Q4.

Q16. Overall, was attending the workshop a good use of your time? Please explain

all 13 answered Yes

Appendix D

GHPC ASHRAE Workshop Participant Survey

Attached please find a sample of the ASHRAE workshop participant survey instrument utilized for this report.

GHPC Workshop/Seminar Participant Survey

Hello, my name is _____ from Regional Economic Research calling in regard to the geothermal heat pump—or GeoExchange—program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, including the California Public Utilities Commission, as part of an evaluation of the GeoExchange education effort here in California.

From the sign-in sheets, it appears that you attended a workshop or seminar sponsored by the Geothermal Heat Pump Consortium. We would like to take just a few minutes of your time to ask you about the workshop you attended.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

___

Q1. What is your occupation?

Architect	0
Engineer	10
Building Contractor	1
HVAC Contractor	4
Driller	0
Manufacturer's Rep	1
Utility Rep	0
Government Rep	0
Consultant	0
Other	3 (Sales Reps)

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange?

Very knowledgeable	2
Somewhat knowledgeable	9
Not knowledgeable	4
Don't know	0

Q3. Did attending the meeting improve your level of knowledge about GeoExchange?

Yes, significantly	10
Yes, somewhat	5
Not much	0
Not at all	0
Don't know	0

Q4. Do you consider GeoExchange a reliable technology?

Yes	13
No	0
Don't know	3

Q5. Do you consider it to be cost effective in terms of up-front cost, compared to other HVAC options?

Yes	3
No	9
Don't know	3

Q6. Do you consider it to be cost effective in terms lifecycle cost, compared to other HVAC options?

Yes	12
No	0
Don't know	3

Q7. Prior to the workshop, had you ever recommended or suggested that a client use GeoExchange?

Yes	4
No	10
Don't know	0

[If yes to Q7, then continue to Q8, else skip to Q9]

Q8. Did any recommendation result in actual use of GeoExchange?

Yes	2
No	2
Don't know	0

Q9. Having completed the workshop, would you now recommend or suggest that a client use a GeoExchange system?

Yes I have already	5
Yes I probably will, although I haven't yet	4
Probably not	2
Definitely not	1
Don't know	1

[If no to Q9, then continue to Q10, else skip to Q11]

Q10. Why not?

Don't know enough	1
Too Costly	0
Not reliable	0
Not suitable for the applications considered	2
Other _____	0
Don't know	0

Q11. At the workshop, did the speakers provide you with useful information?

Yes – all of the information provided was very useful	1
Yes – most of the information provided was useful	13
No – the information was marginally useful	0
No – the information was not useful	1
Don't know	0

[If no to Q11, then continue to Q12, else skip to Q13]

Q12. Why not?

Too general	0
Too technical	0
Didn't seem applicable to my needs	0
Other *[please specify*	1 Generally did not feel anything was covered adequately
Don't know	0

[If yes to Q11, then continue to Q13, else skip to Q14]

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems?

Yes – I will consider the systems in future designs	6
Yes – but I will try and learn more before considering the systems in future designs	2
No	2
Don't know	0

Q14. What issues did you think were covered particularly well at the workshop?

A.1. All the issues that were covered were done well.
A.2. Basic design, how the systems work, philosophy of system.
A.3. Explanation of vertical vs. horizontal approach to laying the pipes in the ground.
A.4. Details of how the system works, the efficiency, the costs.
A.5. Equipment choices.
A.6. Conference well done. She understood the technology well at the end.
A.7. How the system works-overview.
A.8. Excellent conference. He knew nothing when he went in. He feels he understands now.
A.9. Set up of systems, loop systems for single family families. All questions he had about SF homes were answered well.
A.10. General overview excellent.
A.11. Life cycle costs, basic information about the system.
A.12. Overall concept/design/life cycle cost. Information about funding available to client for energy efficient buildings, such as SoCal Edisons, "Savings by Design", and grant for Title 24.
A.13. Explaining how GTPH works – everything about the systems.

Q15. What issues did you think were not covered adequately at the workshop?

A.1. Needed more detail, more facts, more studies showing cost and reliability.
A.2. This person felt the presentation was too "rah, rah, sales oriented". Would have liked to have much more detail on how to calculate cost effectiveness. Would have liked a map of ct showing where system is most likely to be cost effective. Believes that cost effectiveness would be influenced by climate, type of soil, availability of other natural resources.
A.3. He did not understand at first that the conference only covered the in-ground component of the whole system – not the actual air exchange in the building. He figured this out at the end.
A.4. None
A.5. Where to take if from here. Are there any other training venues available? Are there any other classes planned? Where to get more detailed information.
A.6. This woman was a school board member. Conference presented led her to believe that schools were being sought to agree to be experimental sites for GTHP. Invited GTHC people to her school only to find that funds were not available for her school. The issue needs to be more clear – what schools can participate.
A.7. Costs in southern California. More data specifically related to southern California.
A.8. None.

Q16. Overall, was attending the workshop a good use of your time? Please explain

__14 answered Yes, 1
No_____

Appendix E

GHPC County Health Official Seminar Participant Survey

Attached please find a sample of the county health official seminar participant survey instrument utilized for this report.

GHPC Workshop/Seminar Participant Survey

Hello, my name is _____ from Regional Economic Research calling in regard to the geothermal heat pump—or GeoExchange—program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, including the California Public Utilities Commission, as part of an evaluation of the GeoExchange education effort here in California.

From the sign-in sheets, it appears that you attended a workshop or seminar sponsored by the Geothermal Heat Pump Consortium. We would like to take just a few minutes of your time to ask you about the workshop you attended.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

___

Q1. What is your occupation?

Architect	__0___
Engineer	__1__
Building Contractor	__0___
HVAC Contractor	__1___
Driller	__0___
Manufacturer's Rep	__1___
Utility Rep	__0___
Government Rep	__12_
Consultant	__0___
Other	_____

Q2. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange?

Very knowledgeable	3
Somewhat knowledgeable	8
Not knowledgeable	4
Don't know	0

Q3. Did attending the meeting improve your level of knowledge about GeoExchange?

Yes, significantly	8
Yes, somewhat	4
Not much	1
Not at all	2
Don't know	0

Q4. Do you consider GeoExchange a reliable technology?

Yes	10
No	1
Don't know	4

Q5. Do you consider it to be cost effective in terms of up-front cost, compared to other HVAC options?

Yes	1
No	4
Don't know	10

Q6. Do you consider it to be cost effective in terms lifecycle cost, compared to other HVAC options?

Yes	8
No	1
Don't know	6

Q7. to Q10 NA

Q11 At the workshop, did the speakers provide you with useful information?

Yes – all of the information provided was very useful	6
Yes – most of the information provided was useful	6
No – the information was marginally useful	1
No – the information was not useful	2
Don't know	0

[If no to Q11, then continue to Q12, else skip to Q13]

Q12. Why not?

Too general	0
Too technical	0
Didn't seem applicable to my needs	0
Other *[please specify* _____	
Don't know	0

[If yes to Q11, then continue to Q13, else skip to Q14]

Q13. Did the information influence your knowledge or attitude toward GeoExchange systems?

Yes – I will consider the systems in future reviews	10
No	4
Don't know	1

Q14. What issues did you think were covered particularly well at the workshop?

A.1. Seminar was too long ago.
A.2. Operation & construction of the system. Since the workshop, he has approved 2 buildings for the GHP – a clinic and a court building.
A.3. All information presented was new to her so it was all useful. Felt the workshop was well done. Felt several people in the audience were at a much higher knowledge level than her.
A.4. Had very little knowledge of the systems prior to the meeting – felt everything presented was useful considering his starting point.
A.5. Cannot remember
A.6. Stressing importance in getting behind the CGD certification.
A.7. History/background of this technology.
A.8. On a technical basis – well presented. Helped to have contractors doing presenting about technical aspects (this person had attended 2 – GHPC presentations – did not say which one had contractors doing some of the presenting).
A.9. Piping: Physical components of piping, reliability, welding, and longevity.

A.10. Piping
A.11. Discussion – Various types of systems.
A.12. Did not know much about GHPC before the meeting. Feels all general concepts explained well. When looking at lots for approval it permits people to ask his opinion about various systems. Feels more informed.
A.13. Did not know anything about GHP tech before meeting. No reference point, so he's not sure if the subjects were covered well or not. He definitely received new information, and felt the workshop helped to keep him current in his field.
A.14. Ground water contamination. General principles regarding installation of system.
A.15. Information about sealants used was excellent for environmental agency employees. Information about installation.

Q15. What issues did you think were not covered adequately at the workshop?

A.1. Seminar was too long ago.
A.2. None
A.3. None
A.4. None
A.5. Cannot remember
A.6. A specific motivating plan for marketing incentives for GHP applications. Edison is over-designing – creating economically unviable systems.
A.7. How do you evaluate whether to do geothermal vs. conventional system in terms of like cycle cost analysis.
A.8. Regulatory issues. Is not sure if water table issues have been addressed and if regulations are in effect. Feels this technology is in "baby stages".
A.9. Above ground equipment needs w/examples.
A.10. Drilling methods. No state regulations covering these systems (San Bernardino Co.) cannot approve until there are regulations.
A.11. a.) Possible problems that might be encountered. b) Legal structure not yet in place in San Bernardino Co. – don't have regulations to cover them. Cannot approve at this time.
A.12. General cost information that he could use on the situations mentioned above- i.e., in general, what is the cost up front is comparison to other systems. In general, what is the payback time?
A.13. See Q.14
A.14. None
A.15. None

Q16. Overall, was attending the workshop a good use of your time? Please explain.

12 answered Yes, 3
No

Appendix F

GHPC Face-to-Face Meeting Participant Survey

Attached please find a sample of the face-to-face meeting survey instrument utilized for this report.

GHPC Face-to-Face Meeting Survey

Hello, my name is _____ from Regional Economic Research calling in regard to the geothermal heat pump—or GeoExchange—program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, including the California Public Utilities Commission, as part of an evaluation of the GeoExchange education effort here in California.

It is our understanding that you had a meeting in _____ with _____ to discuss geothermal heat pumps. We would like to take a few minutes of your time to ask you about the meeting.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

Q1. What is your occupation?

Architect	4
Engineer	3
Building Contractor	0
HVAC Contractor	0
Driller	1
Manufacturer's Rep	1
Utility Rep	0
Government Rep	1
School Rep	4
Consultant	1
Other _____	1

Q2. What was the purpose of the meeting?

To learn more about geothermal heat pumps	8
To receive technical assistance for a specific geothermal heat pump application	5
Don't know	0
Other	2

Q3. Before you went to the meeting, how would you describe your level of knowledge about GeoExchange?

Very knowledgeable	1
Somewhat knowledgeable	9
Not knowledgeable	5
Don't know	0

Q4. Did attending the meeting improve your level of knowledge about GeoExchange?

Yes, significantly	10
Yes, somewhat	4
Not much	1
Not at all	0
Don't know	0

Q5. Do you consider GeoExchange a reliable technology?

Yes	12
No	0
Don't know	3

Q6. Do you consider it to be cost effective in terms of up-front cost, compared to other HVAC options?

Yes	3
No	6
Don't know	6

Q7. Do you consider it to be cost effective in terms lifecycle cost, compared to other HVAC options?

Yes	13
No	0
Don't know	2

Q8. What issues did you think were covered particularly well at the workshop?

A.1. Overall system concepts. Responses to questions. Handouts.
A.2. General concepts of system – how this type of system can reduce tonnage going through system.
A.3. General concepts – technology to new to him.
A.4. General overview of straight forwardness of the system. Took away any technical apprehensions.
A.5. General explanation of concepts. Follow up meeting @ SCE was very good.
A.6. General issues
A.7. All. Lots of questions/conversation at the luncheon.
A.8. General info about GHPC – what it does, what grants are for, why grants are targeted @ Central Valley, what drilling companies could be used.
A.9. All of it, because the whole technology is new to him.
A.10. Basics of system, costs (up front and life cycle), how system works, systems requirements.
A.11. Type of ground source loop (vertical would be better for this application), materials to be used for pipe, where drilling would occur, what ventilation units would be used.
A.12. Boring, installation of u-tubes, incremental costs.
A.13. Explanation of the closed loop system.
A.14. How GHP fit into the green concept and leads program (?)
A.15. Technical information about how the system operates, reliability, cost-effectiveness.

Q9. What issues did you think were not covered adequately at the workshop?

A.1. Slide show/film hard to follow.
A.2. Not clear how "base case" was going to be established for the school grant. "Base case" determines how much the grant will be. Thinks additional cost will be even higher than max grant amount (150k)
A.3. None
A.4. None
A.5. Lack of examples from So. Calif. created awkwardness, though Mr. Hoellworth was very "up front" about the fact that few were in place.
A.6. Not technical enough for engineers.

A.7. None
A.8. None
A.9. Concepts new to him. Would not know what might have been inadequately covered.
A.10. More technical issues – he wanted this as an engineer, but felt the presentation was appropriate considering that it was himself & an architect @ the meeting.
A.11. Details of grant
A.12. Historical data, life cycle costs.
A.13. None
A.14. Practical applications: what causes you to have to drill deeper for instance or use vertical vs. horizontal piping. This was a dinner meeting. Time was an issue.
A.15. None

Q10. Overall, was attending the workshop a good use of your time? Please explain

13 answered Yes, 1 No

Appendix G

GHPC Architect's Baseline and Year One Survey

Attached please find a sample of the baseline/year one survey instrument utilized for this report.

GHPC Architect's Survey

Hello, my name is _____ from Regional Economic Research calling in regard to a geothermal heat pump program being run in the Southern California Edison service territory. I'm calling on behalf of the parties involved in the program, which is being promoted by California Public Utilities Commission, as part of an evaluation of Energy Conservation efforts in the State of California. I'm not calling you to sell you anything or to recruit you for the program.

As an architect, you have influence on the design of buildings. We would like to take just a few minutes of your time to ask you about geothermal heat pumps.

1. Yes, they will participate *(continue)*
2. No – but can participate later *(set up call back time)*
3. No

If "No – but can participate later (set up call back time)"

New Day: _____

New Time: _____

Contact: _____

(results are presented for both the baseline and year one surveys. The first number is for the total population and the second for the respondents outside of the Los Angeles urban core)

Q1. As an architect, do you normally provide recommendations or suggestions to your clients regarding space-conditioning equipment? *(Mark all that apply)*

Yes, residential new construction	base = 39/20, year one = 62/31
Yes, residential remodeling	base = 37/18, year one = 50/26
Yes, non-residential new construction	base = 39/17, year one = 63/33
Yes, non-residential remodeling	base = 39/19, year one = 58/31
No	base = 6/0, year one = 13/5
Don't know	base = 0/0, year one = 0/0

Q2. Are you familiar with the geothermal heat pump technology?

[A geothermal heat pump is different from a common air-to-air heat pump in that it uses the earth or water as its heat exchange medium instead of air.]

Yes, very familiar	base = 2/0, year one = 5/5
Yes, somewhat familiar	base = 33/17, year one = 58/34
No	base = 16/6, year one = 37/10
Don't know	base = 0/0, year one = 0/0

[If yes to Q2, then continue to Q3, else skip to Q8]

Q3. Do you consider geothermal heat pumps a reliable technology?

Yes	base = 18/9, year one = 33/23
No	base = 1/1, year one = 0/0
Don't know	base = 16/8, year one = 29/17

Q4. Do you consider them to be cost effective compared to other HVAC options??

Yes	base = 12/5, year one = 12/9
No	base = 5/3, year one = 10/4
Don't know	base = 18/9, year one = 40/26

Q5. Have you ever recommended or suggested that a client use geoexchange?

Yes	base = 13/5, year one = 16/14
No	base = 22/11, year one = 45/21
Don't know	base = 0/0, year one = 1/0

Q6. Would you consider recommending or suggesting using a geothermal heat pump?

Yes	base = 31/14, year one = 47/33
No	base = 2/2, year one = 4/1
Don't know	base = 2/1, year one = 8/6

[If no to Q6, then continue to Q7, else skip to Q8]

Q7. Why not?

Don't know enough	base = 0, year one = 0
Too Costly	base = 0, year one = 0
Not reliable	base = 1, year one = 0
Not suitable for the applications considered	baseline=0, year one=0
Other *[please specify]*	base = 1 (Mechanical Engineer), year one = 0
Don't know	base = 0, year one = 0

Q8. Have you ever heard of the geothermal heat pump technology referred to as GeoExchange?

Yes	base = 7/3, year one = 18/12
No	base = 40/18, year one = 76/27
Don't know	base = 4/2, year one = 5/5

Q9. Are you familiar with the Geothermal Heat Pump Consortium, which is promoting the geothermal heat pump technology in Southern California?

Yes, very familiar	base = 0/0, year one = 1/1
Yes, somewhat familiar	base = 1/1, year one = 9/1
No	base = 50/22, year one = 87/46
Don't know	base = 0/0, year one = 2/0

Q10. Have you received any information from the Geothermal Heat Pump Consortium or participated in one of their workshops or seminars? *(Mark all that apply)*

Yes, received information	base = 0/0, year one = 3/0
Yes, attended workshop/seminar	base = 0/0, year one = 4/3
No	base = 49/22, year one = 90/44
Don't know	base = 2/1, year one = 3/2

[If yes to Q10, then continue to Q11, else skip to Q13]

Q11. Did you consider the information or workshop/seminar useful?

Yes, very useful	base = 0, year one = 1/1
Yes, somewhat useful	base = 0, year one = 2/2
No	base = 0, year one = 0
Don't know	base = 0, year one = 0

[If no to Q11, then continue to Q12, else skip to Q13]

Q12. Why not?

Too general	base = 0, year one = 1/1
Too technical	base = 0, year one = 0
Didn't seem applicable to my needs	base = 0, year one = 0
Other	base = 0, year one = 0
Don't know	base = 0, year one = 0

Q13. Would you be interested in receiving information on geothermal heat pumps?

Yes	base = 46/18, year one = 87/46
No	base = 5/5, year one = 13/3

[If yes to Q13, note the respondent's name]_____

That completes our survey, thank you very much for your time.