GEO OUTLOOK

The Publication of the GeoExchange Industry

2004 Vol.1, No.3

Geothermal Keeps Truckee's Natural Playground Clean

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Cover photo courtesy of Truckee Donner Chamber of Commerce, © Fred Cornelius.

Geo Outlook is published quarterly by Oklahoma State University and the International Ground Source Heat Pump Association (IGSHPA), 374 Cordell South, Stillwater, OK 74078-8018. *Geo Outlook* is a joint venture of the Geothermal Heat Pump Consortium (GHPC) and IGSHPA. Send questions, story ideas, photos and comments to Editor, *Geo Outlook*, c/o IGSHPA, or call 800-626-4747. Visit our website at www.igshpa.okstate.edu.

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Directors' Forum

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By Wael El-Sharif
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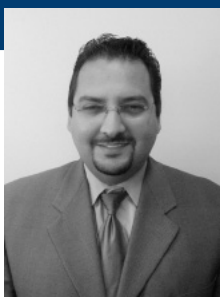

The United States government is the single largest consumer of energy in our nation, using quadrillions of Btu's each year. The federal sector is a multi-billion-dollar energy conservation market with more than 500,000 buildings, over 3.1 billion square feet that require heating and cooling, and has facilities in all 50 states, overseas, and in all climate zones. Not only is our government the largest real estate owner in the entire country, but it also emphasizes sound business management practices in regards to its overhead costs, encouraging the use of energy efficient measures in all its facilities.

The government leads by example when it comes to the support and adoption of renewable technologies like geothermal heat pumps. With U. S. Executive Orders 12902 of March 1994 and 13123 of June 1999, the 1992 Energy Policy act was reinforced and substantial increases in energy efficiency and conservation measures were mandated for all federal facilities. This call to action has helped guide and support each government agency while it develops its own program to reduce energy consumption and greenhouse gas emissions in the most appropriate fashion for that particular entity.

In early 1994, the heating and cooling systems at the Fort Polk Joint Readiness Training Center in Louisiana were converted to geoexchange. This historic facility, which has already saved millions of dollars in energy-related costs, set the stage for government-funded installations. As a result of this success, numerous facilities of varying types have been able to install our technology into their buildings, giving them more money to spend on their specific causes rather than on their operating costs.

The Canadian government is also a powerful advocate of geoexchange. Natural Resources Canada (NRCan) is the country's government department that specializes in the sustainable development and use of natural resources, energy, minerals and metals, forests and earth sciences. This department operates a program called the Renewable Energy Deployment Initiative (REDI), which promotes the development of a sustainable renewable energy industry by strongly encouraging the use of renewable technologies, such as geothermal heat pumps.

Both the Canadian and United States governments are united in their hopes for a greener environment and work together on numerous projects and initiatives. One example is at the Oroville-Osoyoos Shared Border Station in Washington, a collaborative effort between both the U.S. and Canadian governments. This station, which won the U. S. General Services Administration a 2003 Federal Energy Saver Showcase designation, uses geoexchange for its heating and cooling needs. The system is said to save 4,898,000 kWh of electricity and 300 tons of greenhouse gas emissions each year.

To aim at creating jobs, reducing energy consumption and greenhouse gas emissions, and helping facilities to lower their operating costs are good business goals for any government. Supporting the increased use of geoexchange technology can provide all of those results and more. The GHPC is proud to join our country in its mission to build a better tomorrow, and we're proud to have our industry members with us as we continue to help the government support our market today.

Directors' Forum

Notes from IGSHPA

By Jim Bose
Executive Director,
International Ground Source Heat Pump Association

The geothermal heat pump industry historically has had many champions and supporters. The first government support for what would become IGSHPA came from the Department of Energy (DOE) in 1974. DOE funded a project at Oklahoma State University titled "Solar Assisted Ground Coupled Heat Pump Systems." This program was important due in part to the federal government's push for alternative energy sources. While solar assist sounded good, its payback was not. Yet, the 1974 DOE contract jump-started the GHP industry we know today. Early work mainly involved single houses and some housing developments that were promoted by the electric utilities' incentive programs. In addition, utilities sent contractors to various training programs around the country.

The implication of electric utility deregulation changed the playing field. Electric utility support of training programs was reduced, and the responsibility for training was placed on industry heat pump manufacturers and the allied component manufacturers. Training programs started in many states and IGSHPA was formed. Due to the need for industry recognition of the technology, codes and standards, and certified training, an industry-elected advisory board was established and serves as the governing body of IGSHPA.

Simultaneously, the federal government - through the Federal Energy Management Program (FEMP) - initiated programs that saw domestic GHP shipments double between 1994 and 2000. Much of the growth came in the federal sector where GHP projects grew from $22 to $72 million in the 1996 to 2001 time frame. FEMP projects are now approaching $102 million, which includes numerous military bases in the United States and abroad. The FEMP program recently was extended another year through the efforts of the GHPC and IGSHPA members.

Now, local governments are taking the lead by supporting marketing programs and GHP installations in their facilities. Recently, a number of American Indian nations became involved in this industry in order to reduce their business energy costs. The number of large projects (600 to 1,000 boreholes) keeps increasing. It is estimated that there is over $500 million in building projects involving GHPs at this time.

The important marketing point is that GHPs are part of a well-developed industry that has had a continual growth pattern since its inception. Although a small industry, it is here and now, no more waiting for a major breakthrough in materials, training, parts and pieces. What is gratifying for our industry is that we no longer have to explain what the system is and how it works. From the federal government to the Indian nations, GHPs have arrived.

To secure industry growth, we need to continually press the U.S. Congress to support programs like FEMP and other legislation. Domestic and international government support is critical for the continued expansion of GHPs. Because the technology can provide part of the energy independence and security solutions needed worldwide today, we need to keep pushing for a larger market share.

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Richard Charles Dale

Vice President, Business Planning and Treasurer
EnLink Geoenergy Services, Inc

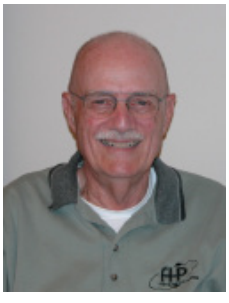
Mr. Dale began working with EnLink in May 1999 as a business development consultant after a distinguished career in the oil and gas industry that began as a geologist for Amoco, specializing in oil field development and operations. He subsequently moved in to various management roles with the international team that was responsible for developing business opportunities in Eastern Europe and throughout the former Soviet Union.

He has a Bachelor of Science degree in Geology from University of Nebraska; a Master's in Geology from University of Southern California, and has an MBA from the Jones School at Rice University.

Mr. Dale is active in the geothermal heat pump industry community, serving on the Board of Directors, as the treasurer for GHPC, and on the board of the Texas Renewable Energy Association. He is a member of IGSHPA.

Larry Eitelman

Florida Heat Pump Manufacturing



Mr. Eitelman graduated from Oklahoma State University May 1958. He was a design engineer for shell and tube heat exchangers and air-cooled heat exchangers for 23 years. He joined McElroy Manufacturing 1982 as sales engineer for fusion equipment and polyethylene pipe for earth coupled water source heat pumps. Mr. Eitelman also was responsible for instruction of field installation of earth loops and design assistance to customers utilizing Phillips Driscopipe and McElroy fusion equipment. He joined FHP Manufacturing in 1993 as Utility and Government Relations person. He represents FHP to utilities and government organizations while attending all trade shows and association meetings, providing design assistance, and training of customers for earth coupled installations. He is an IGSHPA Accredited Trainer and Certified Geoexchange Designer.

Geothermal Keeps Truckee's Natural Playground Clean

by Dara McCoy

Cover Story

On a 6,000 foot elevation plateau in the Sierra Nevada mountain range, sits a town snug amidst peaks over 8,000 feet high, where 79 degrees Fahrenheit is an average day in summer and a look outside from almost any vantage point is nothing less than breathtaking.

"It's beautiful here. It's spectacular. You have cobalt blue skies," said Rick Solinsky, Truckee, Calif., resident. "You wake up in the morning and you look outside and the sky, it's just the most incredibly deep blue you've ever seen. It's amazing."

Truckee is a favorite spot for winter and summer vacations and second homes–over half the community being second-home owners. Steve Wright, Truckee town manager, said at least six ski resorts are within 15 minutes of Truckee and numerous lakes are in and around the town limits.

"We're in the middle of the High Sierras, so anything you can do in any part of the High Sierras, you can do in Truckee," Wright said. Skiing, camping, fishing, hiking, mountain biking, golfing and kayaking are just a few of the many recreational activities, according to Truckee's Chamber of Commerce Web site.

It is the same environment the infamous Donner Party wasn't prepared for that draws enough visitors to make tourism account for what Wright said was over 50 percent of the local economy. Horrible winter storms and closed passes that led to hunger and cannibalism were what the California-seeking Donners found in the Sierra Nevada area, 12 miles north of Lake Tahoe in 1846. But when people end up in Truckee, Calif., today, they usually find more pleasant things.

Protecting a Valuable Environmental and Economic Resource

The town council recently created a green building citizens advisory committee and about 60 geothermal heat pumps have been installed in the community that has a population of about 15,000.

Scott Terrell of Truckee Donner Public Utility said, "We're taking a huge step forward, matter of fact, I would say that we're way ahead of the top 1 percent of all communities in the nation in terms of making that commitment and moving forward in that direction."

"Business people who are in tourism businesses, they need the area to stay nice and clean because that's what brings people up here," said Terrell. "If we impacted the environment here and it started to look not so nice, then that would have a big impact on tourism."

With the geoexchange system, citizens don't have to worry about their personal heating unit burning fossil

Courtesy of Jonah Newcomb

Rick Solinsky volunteers his home, which utilizes solar and GHP technology, for the utility district's Energy Smart Home Tour.

Courtesy of Truckee Donner Chamber of Commerce, © Jeff Dow

fuels and tarnishing the vivid sky. "I have 270 degree views on the mountain top all the way around me. I got a really spectacular location," said Solinsky of his two-story, 2,700 square-foot, log and stucco home he built in 1998 on 10 acres near Truckee.

Solinsky may have an even greater environmental vision than the average resident. He not only installed a 5-ton, Waterfurnace geothermal heat pump but also a 2,500 watt wind turbine and solar panels. Though he can't power his heat pump solely from his own generated electricity and someday wants to be completely off the electric power grid, Solinsky said he still pays half the winter utility bill of a neighbor with a similar size house.

"A ground source heat pump is an extremely efficient way to heat your house," he said. "It's good for somebody who's buying power off the grid because it's a cheaper option than anything else out there."

Geothermal Heat Pumps in Truckee/Tahoe Area

Extreme cold, scenic views, clear skies and the natural environment's tourism value make environmental issues important to the high-mountain valley town, which is why citizens and businesses in Truckee are taking the ground source heat pump into account when constructing new facilities. The biggest GHP project currently taking place in Truckee is the installation of a 300-ton system in the new 67,000-square-foot Alder Creek Middle School.

Squaw Valley USA, a ski resort just 12 miles from Truckee, installed Waterfurnace units in a child care facility and ski lift area. Four, 12-ton geothermal heat pumps were placed in their two-story, 15,000-square-foot children's center and were used with 8,000 square feet of snow melt in 1993, said Hardy Herger, Squaw Valley's technical director of engineering. "This was the largest heat pump unit in California in the last ten years," he said.

Herger said at night, the resort uses a separate 12-

Courtesy of Nathan Kendall

The resort's ski lift utilizes GHP technology to melt snow and ice from walkways and to cool electrical panels.

ton, water-to-water heat pump for heating the building and for the snowmelt at the base of their ski lift, the Gold Coast Funitel. "During day operations, we take the heat from the 2,000 horse power motors and feed two, 5-ton air-to-water heat pumps to heat the same system that the 12-ton heats at night," he said. "Using the cold exhaust air from the two, 5-ton units, we cool all the electrical panels at the Funitel."

Squaw Valley received a $15,000 rebate from the Sierra Pacific Power Co. for installing the energy-efficient heat source in the children's center. Herger said he calculated both facilities' energy savings at almost 51 percent when compared to using propane for heating needs.

Herger said problems with potential propane fuel spills were considered in the decision to install geothermal. According to the resort's Web site, geothermal was chosen as an environmental and safety measure over propane, especially with the number of children using the facility.

Courtesy of Truckee Donner Public Utility District

The children's center at the Sqauw Valley USA ski resort is safely and efficiently heated by geothermal.

The Truckee Donner Recreation and Park District installed a 5-ton, water-to-air ground source heat pump in 1999 for its 3,000 square-foot Teen Activity Center. The center is an after-school student union of sorts where 6th through 10th grade students can watch

movies, use computers, and play games such as pool, air hockey and ping pong, said Steve Randall, the District's general manager.

He said the geothermal heat pump cuts their energy bill by 50 to 70 percent, which is money that can be better spent offsetting the costs of running the facility free of charge to students. "A lot of the money just goes into helping fund other programs and helping fund the teen center," said Randall.

Promoting Renewable Energy in Truckee

The Truckee Donner Public Utility District's educational and marketing efforts coupled with what Solinsky said was Terrell's honest and sincere approach when promoting GHPs have all played a role in the growing interest in the technology. "We see new installations every year," said Terrell. "It's not a fast-growing technology in the community but there's plenty of interest out there in it."

Solinsky supports renewable energy in Truckee by volunteering his home for the utility's Energy Smart Home Tour. The tour is a one-day visit to energy and environmentally "smart" homes in the community that utilize ground source heat pumps, solar panels or other energy saving technologies. The utility started research and educational programs with geothermal heat pumps

in 1993 and still markets the technology today with a $200 per ton of installed geothermal equipment rebate.

"The ultimate goal was to create a market transition for geothermal heat pumps in the area so that we could start to see a critical mass of people putting these in because they offer so much value to individuals in the community," Terrell said. Though the GHP, an electric heating and cooling unit, is obviously beneficial to the utility company, Terrell promotes GHPs with a clear conscience.

"They're the most energy efficient, commercially available heating technology that most of us are aware of," he said. "We wouldn't have done it if we didn't feel it was in the best interest of our customers in the community." With Truckee being one of the most consistently cold spots in the country Terrell said even with upfront installation costs, the ground source heat pump makes a lot of sense in the area's climate.

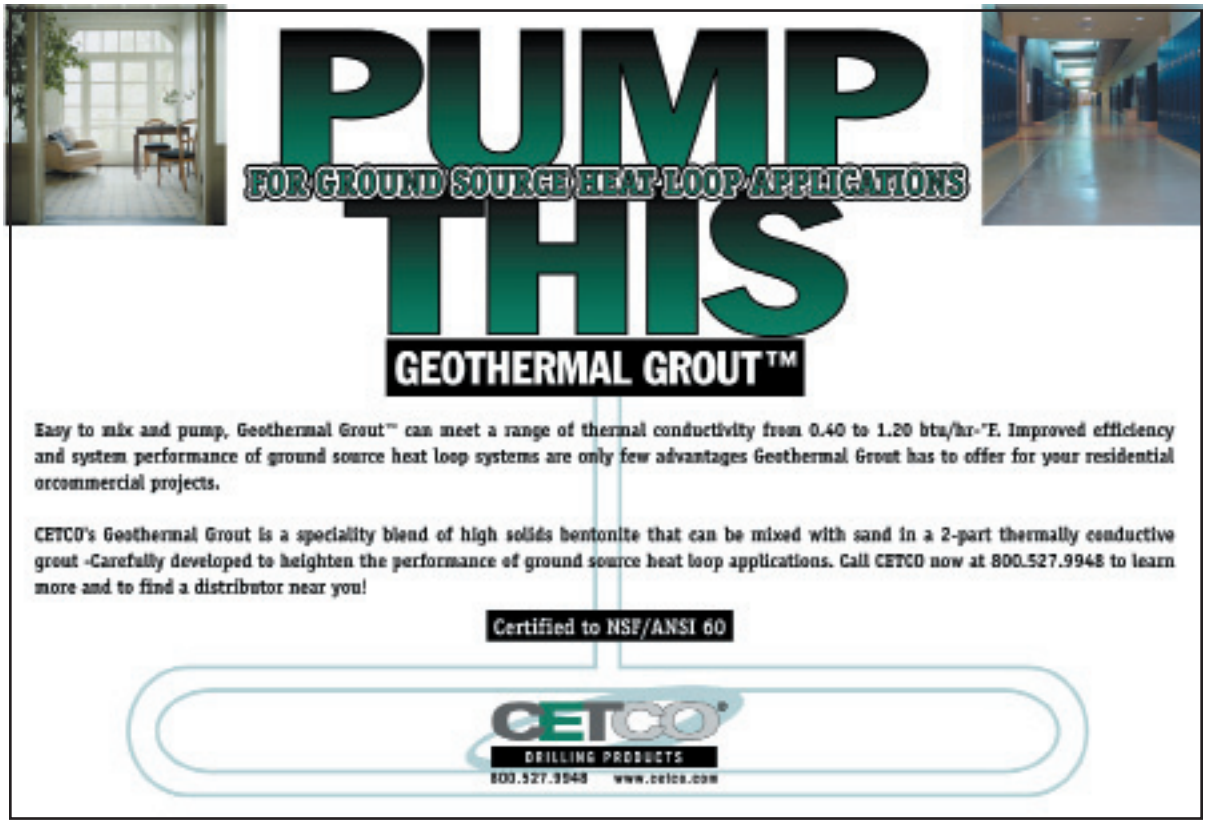
"With the extreme cold climate, we have a lot of heating degree days, meaning we have a lot of heating requirements for buildings up here," said Terrell. "When you have a lot of energy being used, you recover your investment a lot quicker."

Truckee's True Color

Green can be the color of many things in Truckee, from dollar bills of financial savings to pine forests of environmental preservation to the cash cow of tourism. Green, even when it's covered in snowy white, fits the landscape in Truckee.

"It's a very beautiful area and everybody wants their little cabin in the mountain," said Terrell. "In a lot of ways, it becomes a sort of a playground for a lot of people outside the area. A lot of people just enjoy this nice environment up here and want to protect it."

In Truckee, citizens and businesses alike are reaping the financial and environmental benefits of green energy with ground source heat pumps while keeping their piece of the Sierra Nevada a place that traveling parties still find themselves in today.



Oceana Naval Base Hosts Ribbon-Cutting Ceremony

By Kathryn Jones

The Oceana Naval Air Station held a ribbon-cutting ceremony on July 22, 2004, to honor the station's new geothermal heat pump system installed through an Energy Savings Performance Contract with Trane. "This is an exciting day," Oceana's commanding officer Captain Tom Keeley, told *The Jet Observer*, the base's newsletter. "It's about changing the way we do business." Rear Admiral Stephen Turcotte added: "This is where the rubber hits the road. This is pretty special–it's a pilot program. It's very good for us and the environment, and it will burn fewer fossil fuels."

Courtesy of Geo-Enterprises, Inc.

Bob Harvey, Energy Project manager of Oceana Public Works, cuts the ribbon at Oceana Naval Base's ceremony.

The master jet base–the key land base for aircraft carriers on the East Coast, as well as the main repair and service center–eliminated nearly a dozen miles of 40-year-old steam pipes used to heat and cool the buildings. The geothermal project cost $8.2 million, but is expected to save the base $920,000 a year in maintenance and energy costs. Phil Schoen, the geothermal contractor for the project, said that no additional costs were added to the project after it began. "We just transferred costs from one area of the project to another and made some compromises," he said. "There were no changes in costs for the Navy. That's a compliment to both the geothermal team's efforts and the Navy."

Bob Harvey, the energy manager of the Navy Public Works center, said it was becoming more and more expensive to keep the steam pipes running, and geothermal was a more efficient choice. "It's definitely cheaper to have a small unit at each building than a larger distribution system," Andy Porter, an engineer for the Navy Mid-Atlantic Region's Public Works Center, told *The Virginian-Pilot* newspaper.

Schoen said some were skeptical of the heat pump system's abilities, but he said he gives "credit to Bob (Harvey) for being so tenacious and sticking with it." Jay Althof of Trane added, "This project will show others how GHPs work."

Back in the Loop

by Dara McCoy

When he took over as director of the U.S. Department of Energy's (DOE) Geothermal Program in February 2003, the program's focus was high-temperature electric or hot rocks geothermal energy. Now, Dr. Roy Mink wants to bring heat pump technology and the rest of the low-temperature geothermal industry back into the loop.

"Coming in to DOE a year ago, it seems like they had drifted away from the industry," Mink said. "I'd like to bring it back, to have that as a part of the mix we have in geothermal."

Mink may even change the name of the department's geothermal marketing outreach, GeoPowering the West, which is focused on high-temperature geothermal systems in that part of the country, to something like GeoPowering America in the near future. "We have a potential here of a national program, and I kind of want to move it to a national perspective not just a Western states perspective," he said.

That's something Dr. Jim Bose, executive director of International Ground Source Heat Pump Association (IGSHPA), is glad to hear. The energy department played a big role in establishing the ground source heat pump industry and the association he now directs. The business really got started when the first contract in 1974 made it possible to develop a laboratory, construct a couple of buildings, and garner support for the development of IGSHPA, Bose said. But he added that the last funding, received in the mid-90s, might have been the most helpful. "The last funding was the most important because it allowed us to get some research started and completed," he said.

Courtesy of U.S. Department of Energy

Dr. Roy Mink, director of the Department of Energy's Geothermal Program.

The DOE's funds coupled with several other organizations' contributions allowed what Dr. Bose called "experimental verification." They completed testing on soil thermal behavior and did grouting to reduce bore-hole lengths, both of which eventually lowered costs, and got design software funded to develop training programs. "We jumpstarted the industry with that money," Bose said. "We gave it some science."

The heat pump industry started growing, and about three years ago, it started slipping out from under the DOE's radar. Dr. Bose said the industry's maturity and government cutbacks were two of the reasons the department stopped funding.

"Consequently, the market was to develop on its own, and it has," Bose said. "It has grown with significant percentage each year, and the whole idea is that with more money it ought to grow faster. We could reach different markets."

That's where Dr. Mink and his geothermal program are shifting the complete focus of high-temperature geothermal to include low-temperature geothermal energy.

"The ground source heat pump, really the technology is there already," Mink said. "It's just a matter of promoting that we can put these across the country. The high-temperature stuff is still in the research phase."

Getting the Word Out

Mink is talking marketing and deployment. He wants to teach people about the industry so they can be more comfortable in considering heat pump installation and get the technology out to the end-user instead of it sitting on a shelf.

"With respect to marketing, I want to bring that in and be more aggressive marketing the heat pump systems," Mink said. He said of all alternative technology, the heat pump was the most established and had demonstrated its viability. "A lot of people are very much encouraged about the technology, but discouraged in that word hasn't got out as well as they hoped," Mink said. Demonstration and education of the heat pump are areas Mink said his program needs to provide assistance. "People are still hesitant in using them because they still think it's new," Mink said. "They don't realize the success record that we've had with geothermal. So, that's the major push I would like to get involved with, that whole area of outreach education."

Mink said the involvement may come from changing GeoPowering the West to include the whole nation, developing a broader advertising campaign, expanding IGSHPA's training opportunities and funding some fine-tuning research that could make ground source heat pumps more competitive. "I think there are a lot of opportunities out there in the low-temperature and the geothermal heat pump area that we need to be promoting," Mink said.

Look to the Hill for Help?

Courtesy of U.S. Capitol Historical Society

Government legislation could boost alternative energy and ground source heat pumps.

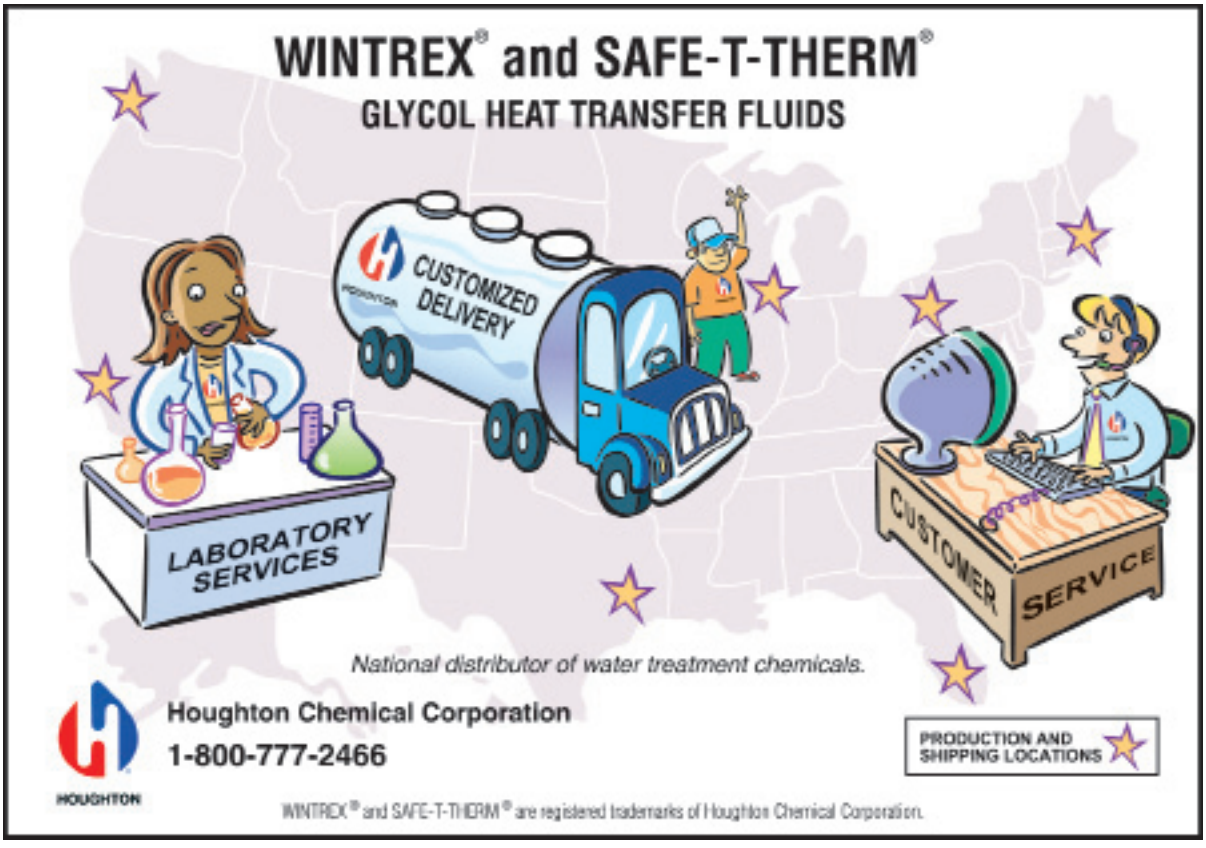
More government help could come from Capitol Hill in the form of the Energy Policy Act of 2003 that includes an incentives plan for alternative energy development. "If you look at the Energy Bill, it definitely has some strong components in there with respect to encouraging alternative energy systems and trying to lead us away from total dependence on petroleum," Mink said.

"There's a lot of language in there that really would benefit geothermal and other alternatives," he said. Mink said geothermal needs to be on a level playing field with other technologies in the areas of incentives and renewable portfolio standards by states, which would allow people considering geothermal to have the same advantages that solar, wind, biomass and other technologies in competition with fossil fuels can provide.

But the Energy Bill is still in Congress, only introductory remarks had been made on the measure in June 2004, and much debate is taking place over the bill. "It's unfortunate that it hasn't passed, and it's unfortunate that there are the continued discussions going on within Congress," said Mink, who believes the bill would be a big benefit to the development of alternative energy. He said he sees a lot of hesitation in developing alternative energy because people are waiting to see what comes out in the Energy Bill and how Congress will position the nation.

Renewed Government Interest

Whether it's through the DOE's geothermal program



or legislation, the government seems to have renewed interest in helping renewable energy, including the geothermal heat pump industry. "I think that DOE, especially Dr. Mink, has a real appreciation of this industry now, of what it is and how it's grown," Bose said. He said Mink's attendance at the April 2004 IGSHPA Technical Conference and Expo was the first time such a high-level member of the energy department had attended. "We couldn't have done any better or had a better conference than this one," Bose said. "He came here at the right time."

Mink said he liked the upbeat, positive attitude and enthusiasm at the conference. "It's been real valuable to meet with people and receive a lot of insight, a lot of ideas that need to be followed up on, and I don't want this to be the last," said Mink, who came to the conference to get updated on the industry and discover issues the industry could use help with. "I want to continue an open dialogue with the industry."

Government help could be on the way for the heat pump industry and at the very least, geothermal heat pumps are back in the loop in Washington. Current military conflicts and political debate have put the nation's energy issues in the forefront and the heat pump industry may have its place in the solution to the energy independence our nation craves.

"It definitely has a niche and a niche that could be very important with respect to helping solve our whole energy dependence on fossil fuels," Mink said. He said he needs to work with the industry to develop mid-year, long-term and national goals. "That's something that I'll continue to be working with the industry on and with other groups on relative to the future goals of what this industry can do to satisfy our national goals to reduce the amount of dependence on fossil fuels and tying that together," he said.

But Mink said the goals must be realistic and the renewable energy industries need to realize they might not be the sole solution. "Some of these goals I've seen out there with the alternative energy, solving the nation's problems by itself is not going to happen, but we can make a huge impact," he said. ◆

Fort Polk Still Shining Moment in Geothermal Success

by Dara McCoy

The 6,600-ton closed loop system was the largest geothermal installation in the world, a groundbreaking experiment in the geothermal industry and a huge door-opener into the federal government for ground source heat pump technology. Today, 10 years later, the geothermal systems in residential housing at Fort Polk, La., have stood the test of time as proof of the success that comes with geothermal heat pumps.

"I think geothermal heat pumps are now seen as the Cadillac or preferred heating and cooling system in the federal government, at least for family housing, and increasingly for the commercial side as well," said John Shonder, senior mechanical engineer at Oak Ridge National Laboratory. "It has low maintenance costs, low energy costs and a good reputation for performance."

In 1994, Fort Polk needed to replace the aging air-source heat pumps and natural gas forced-air furnaces with something that could lower energy and maintenance bills without cutting into service or salaries on the base, according to a 1997 article in the International Ground Source Heat Pump Association's (IGSHPA) publication *The Source*.

That's where geothermal heat pumps and the development of the Energy Savings Performance Contract (ESPC) came to the rescue. Each of the base's 4,003 residential housing units received a new ClimateMaster ground source heat pump in an installation that required more than 8,000 boreholes at depths ranging from 130 to 325 feet and about six million feet of polyethylene pipe.

Courtesy of Ft. Polk Media Relations

The Fort Polk project was a landmark installation for the GHP industry.

Saving Energy, Saving Money and Saving Air

When the system was installed, the GHPs' savings were expected to reach $44 million over the expected 20-year lifespan by reducing energy consumption. At the 10-year mark, Shonder said: "They definitely have met their goal of reducing their energy use by 30 percent. I can honestly say, based on the data we've collected, things are going swimmingly there at Fort Polk."

Shonder and colleague Patrick Hughes collected and analyzed data prior to the retrofits, in 1996 when the installation was complete and again in 2003 to

make comparisons at Oak Ridge National Laboratory, a multi-program science and technology lab managed for the U.S. Department of Energy (DOE). The results from the 1996 analysis showed that the family housing areas of Fort Polk were using 33 percent less electricity than before, and had reduced peak demand by 7.55 MW, which is about 44 percent of pre-retrofit peak demand.

The savings are visible in maintenance costs too. The Army paid about $336 per year to maintain the old air-source heat pumps, but pays only $258 today with the GHPs. "People might question whether that reduction is due to the fact that you replaced old air-source equipment with new geothermal heat pump equipment," Shonder said. "The geothermal heat pumps have already been operating for almost 10 years, and the maintenance costs are still less than those for the air-source heat pumps. That's what the Fort Polk study can offer now-confirmation that the technology has longevity."

Courtesy of Ft. Polk Media Relations

Fort Polk's residential housing may soon be receiving additions that could include geothermal again.

The housing units with the GHPs are using about the same energy they did in 1996. "On some feeders, there have been slight increases, which you would expect as a result of load growth," said Shonder. "People are always using more and more appliances, but the increase is well under what we estimated it would be back in 1996."

Don Laurent, a design engineer at Fort Polk, was there when the GHPs were installed in 1994. He said he would recommend that other federal facilities consider geothermal, especially for housing. "We know we have saved quite a bit of money and energy in the housing area throughout the life of the contract so far," Laurent said.

The GHPs were also predicted to reduce pollution and benefit the local air quality. They were estimated to decrease approximately 38,480 tons of carbon dioxide, 100 tons of sulfur dioxide and 90 tons of nitrogen oxides, according to the 1997 *The Source* article.

The ESPC and Super ESPC

The government paid no upfront costs for the $18-million geothermal installation through the newly developed performance savings contract. A private company financed the installation through the ESPC in return for a monthly fee that Fort Polk pays from the savings received on the GHPs' performance.

"They didn't have the funds to replace all that equipment," Shonder said. "So, an ESCO (energy service company) came in, purchased all the new heat pumps, installed them and agreed to perform the maintenance."

This was one of the first performance savings contracts ever implemented for geothermal heat pumps. "Some have cited it as the catalyst for the DOE's technology-specific GHP Super ESPC," Shonder said.

Because of the difficulty of setting up individual, site-specific ESPCs and the government interest in Fort Polk's geothermal experiment, the DOE's Management Program (FEMP) developed an "umbrella" contract with pre-selected contractors that could be used by the federal government for similar installations. "The credibility that the Fort Polk project gave to the technology was a major factor in the development of the tech-specific Super ESPC," Shonder said.

Fort Polk 10 Years Later

Only 3,641 of the 4,003 housing units are still standing and talks of building new units have begun. "There

are about 2,500 new residences that are going to be built at Fort Polk," said Shonder. "Although nothing has been completely decided yet, there's a good chance that those are going to be with geothermal heat pumps as well."

Though the years haven't affected the efficiency and durability of the ground source heat pumps, Fort Polk will face some changes when building the new additions. Shonder said the Army is now privatizing all housing, and that the private company that buys the base's housing will receive a stipend from the Army to pay for energy and maintenance.

Financing the new housing will need to be reworked. Shonder said the ESPC authority expired in October 2003 because the comprehensive energy bill failed to make it out of Congress, but reauthorization of ESPCs under a separate bill is anticipated to be completed soon. There are many who hope the ESPC authority is reinstated quickly because a lot of projects are in the works. "There's a lot of demand for geothermal heat pumps in the federal government," he said.

Fort Polk's Legacy in Geothermal

Fort Polk's success with its GHPs has become a beacon for the federal government in its continuing search for energy efficiency. GHPs had never been deployed on the scale of Fort Polk and independent evaluations of the technology were rare, said Shonder. "I think this report that Patrick Hughes and I did gave a lot of credibility in the federal government, to the technology and to its use in federal applications," he said.

Vice President Gore even awarded the Fort Polk project team members with the Hammer Award in 1997. According to a 1997 Geothermal Heat Pump Consortium article, "the Hammer Award is bestowed on innovative teams that make government 'work better and cost less', and symbolizes efforts to 'hammer away' at unnecessary bureaucracy and costly inefficiency."

Since the Fort Polk project was completed, the government's total investment in GHPs has grown to more than $200 million for about 40,000 tons of geothermal capacity in federal facilities. The Oceana Naval Air Station, Fort Jackson, an ambassador's residence in Seoul, South Korea, and the Albany Marine Corps Base are just a few of the Super ESPC sites. Laurent said several other military bases have discussed installing geothermal pumps with him in the last three to four years.

"Fort Polk paved the way for the rest of the military and the federal government to go with geothermal heat pumps," Shonder said.

Fort Polk will always have its place on the timeline of a growing ground source heat pump industry. It was the biggest. It was innovatively financed. It is one of the most credible testaments to one important fact: geothermal works. And today, with years of data to back it up, Fort Polk proves geothermal doesn't just work; it excels. ◆

Key Players:

- DOD Project Engineer-Environmental Engineering, Ft. Polk, La., Greg Prudhomme
- DOD Program Manager-U.S. Army Corps of Engineers, Huntsville, Ala., Bob Starling
- Project Engineer-Applied Energy Management Techniques, Corvallis, Ore., Richard Gordon
- Energy Services Company-Co-Energy Group, Santa Monica, Calif., Tom Mitchell
- GeoExchange Manufacturer-ClimateMaster, Oklahoma City, Okla., Brian Haggert
- Technical Advisors-U.S. Army Cold Regions Research and Engineering, Hanover, N.H., Gary Phetteplace and Oak Ridge National Laboratory, Oak Ridge, Tenn., Patrick J. Hughes
- SERDP GeoExchange Project Manager-Sandia National Laboratories, Albuquerque, N.M., Dr. William N. Sullivan

Geothermal System for New Central York High School

By John H. Berry

The new 230,982 square-foot facility for New Central York High School is relying on a renewable energy geothermal heat pump system to provide low energy consumption space conditioning for many years into the future. Studies show that approximately 70 percent of the energy used in a geothermal heating and cooling system is renewable energy from the ground. The money saved by installing a geoexchange heating and cooling system will provide additional funds to be utilized for education instead of running a conventional heating and cooling system.

Mike Rash of Morrison Inc. explained that in a typical eastern Pennsylvania winter the ground soaks up solar energy. It is much easier to grab warmth from

Courtesy of CETCO

CETCO prepares to grout the loops for the high school's geothermal unit.

the ground at 52 degrees Fahrenheit than from the open air when the temperature is below freezing. The geothermal system at New Central York High School will push warm air through the school's ventilation system, even when the outdoor air temperature is extremely cold. On the other hand, in summer the ground heats up more slowly. The somewhat cool ground accommodates the school's surplus heat from the four well fields more willingly than the balmy outdoor air.

Courtesy of CETCO

The loop field after it has been grouted.

Installation

Morrison Inc. of Duncannon, Penn., was responsible for drilling and installing the vertical boreholes, placing the casing and double coil loops into the boreholes, grouting the boreholes, and installing and connecting the piping. The grout was 1.00 Btu/hr-ft-F thermally-enhanced Geothermal Grout™, which is trademarked by CETCO. Each double coil loop is manufactured from high density polyethylene resin with u-bends fused to the ends. Rash was responsible for the geothermal installation. Rash is an IGSHPA Accredited Installer and has been involved in the geothermal industry for the last 21 years.

The subsurface installation of the loop field started with air rotary drilling 256 boreholes, 5 5/8 inch in diameter, to a depth of 600 feet. Over 58 miles of pipe were installed in the vertical boreholes. Four well fields were positioned around the school consisting of 64 boreholes in four rows of 16, spaced 15 feet on center. The 64 loops were fed into a central manifold at the end of the well field, then into the building ending in pipe flanges. Morrison's air rotary drilling rigs designed for high production. Jace Bittle, the superintendent for Morrison Inc., said his rigs were designed to drill fast, typically more than 700 feet per day.

Soil Conditions

Only an average of 10 feet of saprolitic top soil was deposited on top of the dolomite bedrock at this site. The top 5 to10 foot layer of dolomite was weathered. After that, it was hard and massive to the bottom at 600 feet. Water was encountered around an average of 35 feet.

Grouting the Wells with Thermally-Enhanced Grout

After the loop was filled with water, it was pressure tested, inspected for leaks, and inserted into the borehole. Then the holes were grouted from the bottom to the top.

First, 22 gallons of freshwater were pumped from a nearby fire hydrant into a paddle-mixing tank of a commercial grout mixer equipped with an automatic sand feeder. The grout mixer was capable of mixing two batches of thermally-enhanced grout at a time. For this project, the normal recipe for one batch was 22 gallons of freshwater plus 50 pounds of thermally-enhanced grout plus 300 pounds of a 40/60 silica sand. This yielded 38 gallons of a 65.2 percent solids grout at 14-lb/gal with a TC of 1.00 Btu/hr-ft-F. The grout was mixed for about three minutes, as the sand was added into the grout tub by the automatic sand feeder at a steady rate. The grout was mixed for another two minutes to obtain a consistent mixture, then pumped with a positive displacement pump through a 1.25 inch (I.D.) tremie pipe over 650 feet long at a rate of 5 to 15 gallons per minute.

Courtesy of CETCO

Pennsylvania's New Central York High School proudly displays this sign showing contributing parties for the project.

The efficiency and system performance of closed-loop, ground-source heat pump systems is improved by matching, at a minimum, the thermal conductivity and permeability of the surrounding soil. Depending on site soil conditions, thermally-enhanced grout can be mixed and adjusted to meet individual thermal conductivity requirements. It improves the transfer of heat between the fluids circulated in the loop and the surrounding soil for optimum system performance.

Geothermal technology has the endorsement of the U.S. Department of Energy and the Environmental Protection Agency. Today, the geothermal industry is busy mainly due to Executive Order 12,902, which mandates substantial increases in energy efficiency and conservation measures at federal facilities.

Geothermal heating and cooling systems generate no burning or smoke. This aids in decreasing greenhouse gases, carbon dioxide and sulfur dioxide emissions in the atmosphere. With never-ending increases in energy costs, the public should like the fact that geothermal systems drastically reduce our reliance on the earth's limited stock of fossil fuels.

◆

John H. Berry is a hydrogeologist/geologist and regional manager for CETCO Drilling Products

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Geoexchange Breaks New Ground in Canada

By Jessica Frick

Canada is encouraging everyone inside its borders to "talk the walk" on climate change. In addition to asking individuals to do their best to use less energy and to conserve water and other resources, the government is stepping up to the challenge and is putting its money where its mouth is. Canada's mounting focus on the increased use of renewable energy technologies is not something that has only recently been implemented. Canadians have been installing geothermal heat pumps since the late 1970s, but this pioneering country's market did not get its most successful push until the late 1990s.

On Dec. 11, 1997, Canada, along with more than 150 other countries, adopted the Kyoto Protocol on climate change, an agreement among nations to limit their greenhouse gas emissions relative to the levels emitted in 1990. Canada's target is a reduction of net greenhouse gas (GHG) emissions of 6 percent below 1990 levels by the 2008-2012 commitment period. As a result of this promise, Natural Resources Canada (NRCan) created the Renewable Energy Deployment Initiative (REDI) program. REDI was changed to stimulate the demand for renewable energy systems in order to develop a more dynamic and self-sustaining renewable energy industry in Canada. The initiative was first announced in Dec. 15, 1997, and came into effect on April 1, 1998.

Since then, the multi-million-dollar program has progressed, with the help of industry associations and local utilities, in its mission to encourage investments in renewable energy systems. This has been achieved primarily through programs that stimulate market demand and ensure that strong industry infrastructures are in place to meet consumer needs. In order to make certain the program fulfilled its promise, only four non-process technologies (ground source heat pumps (GSHP), biomass combustion systems, active solar water systems, and active solar air systems) were chosen to participate in the national campaign.

These select four were targeted because they were ready for the commercial market but were not well known or understood by end-users, and because they produce thermal energy for purposes other than direct use in an industrial process. NRCan believes geoexchange can help Canada so much that it released a statement in a study about global warming impacts saying, "There is unlikely to be a potentially larger mitigating effect on greenhouse gas emissions and the resulting global warming impact of buildings from any other current, market-available single technology, than from ground-source heat pumps."

Although this program offers incentives for some forms of renewable technologies, none are currently offered exclusively for geoexchange systems.

"When NRCan started REDI, all of the other industries involved wanted rebates," said Wael El-Sharif, executive director for the Geothermal Heat Pump Consortium, who was instrumental in the creation of the Canadian Geoexchange Coalition. "Since Canada wanted

Canada's green policy is working to protect environments, like the Banff National Park in Alberta.

to model their market after that of the United States, the Canadian geoexchange market wanted NRCan to spend its allocated portion of funding on market mobilization."

Initially, it was unclear as to whether or not such a proposal would be allowed, but in March 1999, Marbek Resource Consultants prepared a report called the "Ground Source Heat Pump Market Development Strategy." Marbek dubbed its text, "a blueprint for the development and implementation of collaborative actions designed to establish a viable geoexchange industry in Canada."

The strategy was strong enough to convince NRCan that market transformation was the best use of the allocated funds, believing it could help to make the industry grow into a solid, supported and successful Canadian market. Armed with the knowledge to reproduce the growing U.S. market model, utilities joined together to support the initiative and begin the building of market infrastructure.

Since then, the increasing demand for geoexchange systems, coupled with the emergent reputation, is creating hundreds of jobs per year for Canadians while strengthening the American geoexchange manufacturing industry.

Bill Eggerston, the executive director of the Earth Energy Society of Canada (EESC), calculates, "approximately 90 percent of Canadian-installed geoexchange boxes are from America, while almost 85 percent of the installation and maintenance costs are given to Canadian workers."

Although the job market is steadily on the rise in the geoexchange field, the industry is pushing for more people to get accreditation and certification to match the resulting demand predicted from Canada's current initiative to increase the use of GHPs. The EESC, along with the Canadian Geoexchange Coalition (CGC), Natural Resources Canada (NRCan), and various Canadian utilities and individual companies, are working hard to transform the geoexchange market by overcoming market barriers and promoting NRCan's REDI program.

Poised for Continued Growth

"In order to get out of the gates, we had to emulate the market transformation success that the United States has had," said Roy Stavely, the late executive director for the CGC. "We are grateful to have a strong alignment with the U.S., other associations and utilities, and we know that our allies are the reason we will succeed in our goal of a 75 percent market transformation rate."

In addition to U.S. assistance and guidance, Canadian government organizations are setting some standards of their own to ensure a successful deployment of the technology.

In the 2004 annual report delivered to the Canadian Parliament*, the Honourable R. John Efford, minister of NRCan, committed Canada to a goal of 25,000 new geoexchange systems on Canadian business and institu-

Photo © 1998 PhotoDisc, Inc.

tional facilities by 2008. This commitment came as an answer to the country's resolution to minimize the use of fossil fuels and the resulting greenhouse gas emissions from buildings.

Although the Minister recognizes that certain market barriers still exist in the country's geoexchange market, NRCan plans to use the REDI campaign to overcome them. In order to achieve emissions reductions through energy efficiency, renewable and alternative energy, and carbon sequestration, the REDI campaign will work with partners to build awareness of renewable energy technologies and to build the market for these technologies. Once that success has been fully realized, the technology's price will fall and demand will increase–thereby displacing fossil fuel use and reducing greenhouse gas emissions.

The plan anticipates that this goal, once achieved, will increase the momentum of awareness of, use of, and demand for renewable technologies, including geothermal heat pumps. It will also further the development of a self-sustaining renewable supply in Canada, creating more competitive and profitable businesses with lower energy costs.

The REDI program is scheduled to continue through March 31, 2007, and NRCan doesn't expect an end earlier than that, although it is subject to sunset clauses. In fact, the program is eligible for additional extensions, depending on how the program continues to mitigate the market barriers, bringing renewable technologies onto the front line.

In the meantime, the CGC plans to go on with its efforts to maintain a strong relationship with other renewable technologies, utilities and other associations. The coalition holds fast to its belief that the collaborative approach will provide the ability to leverage renewables off one another in an attractive packaging drive, positioning geoexchange in a leadership role amongst its planet-saving peers.

"The success of geoexchange is mutually advantageous for all renewable technologies and for the consumer, who will undoubtedly be able to come into more attractive pricing opportunities once the market has transformed a bit more," said Stavely. "Ultimately, we all are coming together to create a wonderful economic vision for Canada's future and geoexchange will be able to receive the credit it deserves."

Fortunately for the industry, the success stories are continuing to pave the way for the professionals. Successful businesses are admittedly a result of the astounding testimonials sprouting up. Consistently supportive feedback from consumers will undoubtedly ensure that the sky will be the limit for the Canadian geoexchange industry, helping the Canadian ground eagerly open up for more.

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**The full 2004 annual report delivered to the Canadian Parliament can be downloaded by visiting: www.nrcan-rncan.gc.ca/sd-dd/pubs/strat2004/english/toc_e.html*

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Actions Speak Louder than Words

by Dara McCoy

Ground source heat pumps may have received their highest profile endorsement to date as President George W. Bush has installed not one, but two of the systems. After installing a GHP when he built his ranch home in 2001 in Crawford, Texas, President Bush chose geothermal once again for a new office building that will serve as the Western Oval Office of the "Western White House."

"I was real pleased he decided to do it again," said Lonnie Ball of Ball Drilling Co., who did the drilling for both installations. "I think that speaks well of what he thought of the first installation. I'm sure he wouldn't have done it again had he been dissatisfied."

David Heymann, architect for Bush's ranch home, said geothermal was just one environmental and energy conserving aspect of the home. Household wastewater and collected rainwater is used for irrigation and high-efficiency windows were also installed. Heymann said the home was built to fit into the natural landscape, which makes the absence of an outdoor unit another plus for the geothermal system.

Besides environmental benefits of the heat pump, the Bush family seems to be enjoying the energy savings. Heymann said the original GHP was estimated to use a third to half of normal energy usage for a similar home. Paul Wieboldt of Tradesman Heating and Air Conditioning, the HVAC installer for both installations, said, "I've been told they're really happy with the utility bills."

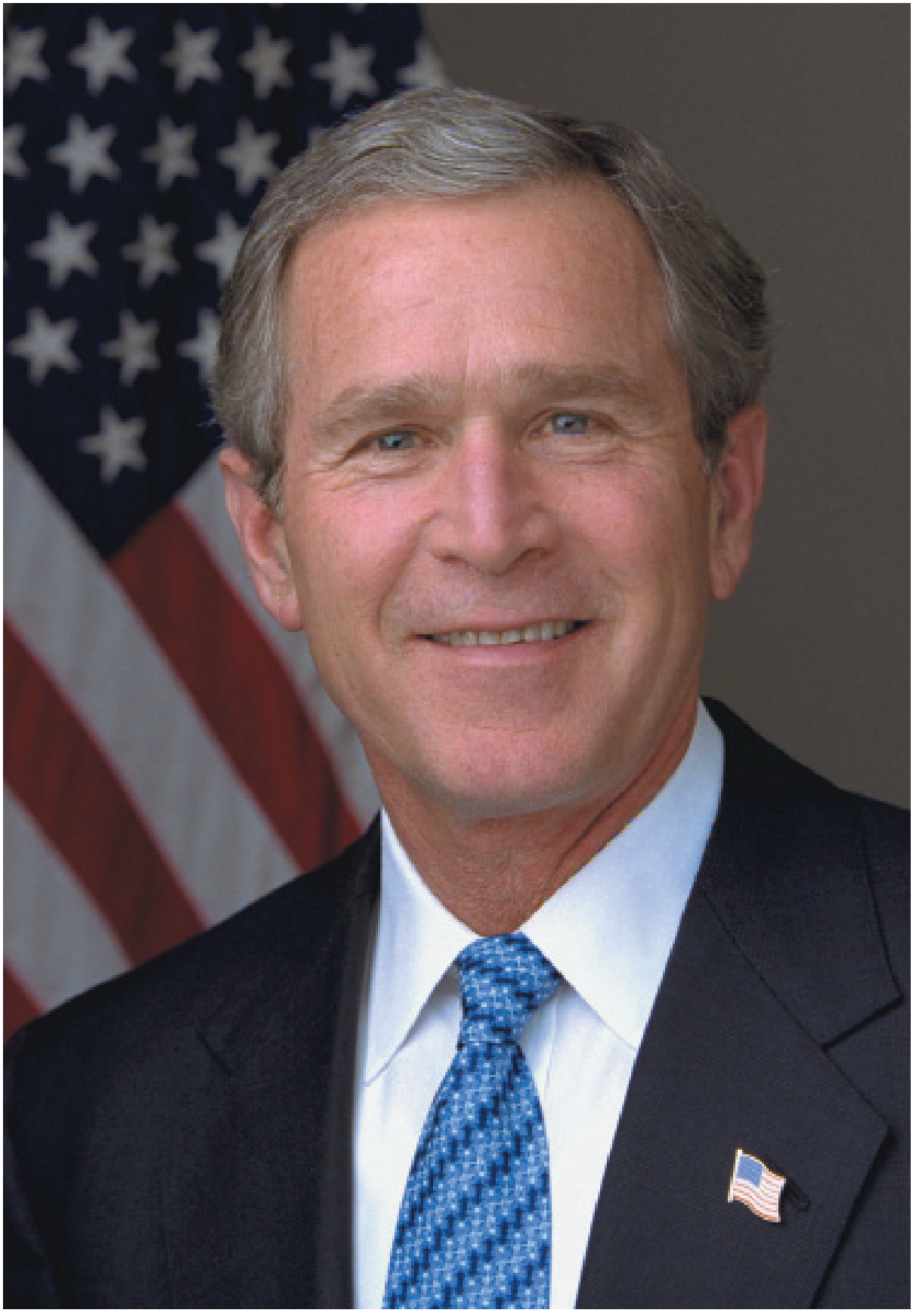
Wieboldt said the original system has worked well for the Bush family. "We've seen the house operating under all seasonal conditions and it just runs great," he said. "The loop temperatures are wonderful."

Comfort Wanted

When the president's family retreats from life in the public eye to their Texas home set on the sprawling 1,583-acre ranch, they seek what most families want from their home-comfort.

Wieboldt and his crew focused on providing the same comfort that the presidential family enjoys in their home in the office. He said his crew has attended Certified Air Balancing courses provided by the National Comfort Institute to learn more about properly balancing the air in a building. "We want to pay special attention to air flow because we think that's the other side of geothermal," Wieboldt said. "If you don't have your air and duct design correct, you're never going to have the efficiency, savings and comfort that you want."

Comfort, energy savings, environmental benefits and the success of the president's GHP are all good reasons why the president chose geothermal again for his office addition. President Bush wasn't the only one impressed with geothermal. Heymann, who is now



Courtesy of the White House

Courtesy photo

The president's ranch home also is equipped with a ground source heat pump.

designing a second home with geothermal in Houston, said: "I love geothermal. It's such a great idea."

The construction for the 2,400-square-foot office building, which will be separate from the house, was first planned at the beginning of 2004. The office should be ready for the President and his staff by this summer.

Wieboldt said unexpected rainfall in the area caused some delays. "We've had incredible weather, June being a near record-breaking month for rain, and having to overcome that was pretty interesting," he said. The rain delayed Ball's drilling team between drilling boreholes and trenching, but the GHP was expected to be functional by early July.

A 4-ton, water-source Trane unit with an energy efficiency ratio of 17.2 was installed for the office, which required five boreholes drilled to a depth of 300 feet and more than 2,000 feet of one inch, unicoil CPChem Performance Pipe. Wieboldt described the office as a "house-like structure" with multiple offices instead of rooms inside. "The Manual J-8 load calculation was showing per square foot that we didn't need a very large air conditioner, but we wanted to be sure that we could still provide the comfort if they had a few extra people in there," Wieboldt said.

Though no one knows for sure what exactly the office will be used for, Wieboldt's crew is making sure it can handle large meetings or even a quick press conference. "We provided remote returns in the offices where we know there will be a closed door, for obvious reasons, and we wanted to make sure the comfort was maintained whether the doors were open or not in all the offices," Wieboldt said.

Not the Usual Jobsite

Though most geothermal installations don't require background checks for clearance onto the jobsite or secret service agents guarding the area, neither Wieboldt nor Ball seemed too star struck. "Obviously, it's the highest profile person I've ever worked for," Ball said. But he said other than getting clearance to the site, it was no different than any other job.

Wieboldt said, "I think we approach the job just the way we do any other, doing our homework up front, doing the proper calculations, making sure the size is right, but on a project like this we go over everything three times instead of twice." Not that anyone could say they would do different on a job for the United States' commander-in-chief.

Wieboldt seems confident in the geothermal system and the work his crew did. "The geothermal system gives them the best of both worlds: comfort and economy," he said. "It's like having the comfort of a luxury car with the gas mileage of a little economy model."

Whether it's President Bush, a foreign dignitary or the family's Scottish terrier, Barney, visiting the Western White House and office, geothermal will be assuring their comfort while efficiently saving energy and dollars at home, which is surely a relief for a man whose work involves federal deficits and rising world energy prices. ◆

Key Players

- General Contractor: John Taylor Construction-John Taylor
- HVAC Installing Contractor: Tradesman Heating and Air Conditioning-Paul Wieboldt
- Driller: Ball Drilling Co.-Lonnie Ball
- Heat Pump Supplier: Trane-Shawn Blue
- Pipe Supplier: Geo-Enterprises Inc.-Phil Schoen

Cross Timbers Municipal Complex

By Kathryn Jones

Even though the new $20 million facilities project in Edmond, Okla., will be one of the largest municipal facilities projects in the city's history, taxpayers in the area are not worried.

Covering the costs of the 135-acre Cross Timbers Municipal Complex will be a three-fourths cent sales tax that voters approved in 2000. But voters and taxpayers will be happy to know that their tax dollars will be used more efficiently thanks to the facilities' geothermal systems. "Geothermal was chosen for the facility because we owe it to our customers to use energy wisely as a city," said Bob Corff, Edmond Electric's energy services manager. "We chose to go with the wisest heating and air conditioning system that we could."

Jason Bose, vice president of sales and service at Global Logic, has been working with the design engineers on the geothermal portion of the complex. He said that Corff was really excited about the possibility of having geothermal facilities. "When you have Bob pushing geothermal, it makes our job a lot easier," Bose

Courtesy of the City of Edmond, Oklahoma

Michael Albertson of Global Logic and Bob Corff of Edmond Electric go over plans for the geothermal system.

said. "We worked with him early on to convince his higher ups to go with a geothermal system. It was an easy sell." He added, "They are spending a little money now to save a lot of money later."

Saving More than Just Energy

In addition to geothermal increasing the building's efficiency, the project will also be efficient in how business activities are carried out at the complex. This will include combining multiple sites, centralizing facilities, consolidating administration, facilitating shared equipment and cross training. According to a study conducted in 1997, this increased efficiency in the facility could save Edmond taxpayers as much as $20 million over the next 20 years. "We will realize increased efficiencies through a more effective, flexible workforce and less downtime," said Clay Coldiron, City of Edmond's public works director. "The savings in these efficiencies, as well as the long-term savings in the geothermal energy efficiency, means better service for our customers–the residents and taxpayers of Edmond."

Courtesy of ClimateMaster

Titian Burris of ClimateMaster and Clay Coldiron of City of Edmond talk about the benefits of geothermal.

Building on the project has begun, but completion is set for summer of 2005. Bose said that everything on the project has been "so far, so good," except for the trees on the site.

The Cross Timbers Municipal Complex was named for the historic Cross Timbers Forest where the complex will be located. The city wanted as many of the trees around the complex to remain on the site as possible, because they covered parts of the city before the 1889 Oklahoma land run. Bose said accommodating this forest was probably the design team's biggest challenge. "The city hired an arborist, whose sole function is to make sure the trees were preserved adequately," Bose said. "The well field placement was originally designed with no regard for the trees, so the contractor has been moving the wells around in order to make this happen." He added that they moved one of the well fields about 150 feet over to the side of a small hill and thus changed some pipe lengths, adding extra distance to the header piping. Adding this extra distance required a review of the pumps to make sure they were properly sized to accommodate the designed water flow for the system. Bose said: "It was nothing really. We just got together with the architects and engineers and made sure we had their blessing."

What the Complex Will Include

The complex will house administrative and training offices for the fire department, the community's fifth fire station, a new animal welfare facility and a public service center. The largest part of the complex is the public service center, which will consolidate the public works departments, water resources and Edmond Electric, the city's municipal electric utility. The center will also house a central warehouse for materials and supplies to alleviate each department having to allocate space for warehousing or hire personnel for managing inventory control.

According to a press release from the City of Edmond, the fire department's new facilities will include a 50-acre training complex, which will serve as a training center for firefighters, city employees and other agencies

Courtesy of City of Edmond Fire Department

Firefighters in Edmond, Okla., will have technical rescue teams on-site at the complex to deal with materials for WMDs.

in the region. This station will house Edmond's fire service administration and five firefighter personnel. "We are very excited about moving," said Arnie Postier, assistant fire chief. "Hopefully, we will be out there in about six months. (The builders) have got it all stepped out with 80 wells. They've been installed and ready to be hooked up to the building." Specialized technical rescue teams will also be housed on the site to respond to cases involving hazardous materials for weapons of mass destruction. Postier said the station has already received federal and state grants to assist in funding for these special rescue teams.

The project will also include a new animal welfare facility, which will be over three times larger than the over 30-year-old present facility. The new facility will have two rooms for potential adoptive families to interact with animals, as well as an exam room, bathing room and outdoor pens for livestock. "Our dog pens are so small now, but they're going to be two times bigger with the new building," said Rick Spence, supervisor for the animal shelter. "Our volunteers will also be able to take the animals outside. We have been waiting for years to get a new place, so the staff is ready to go."

In addition to the geothermal installation, the city will have a state of the art building automation system installed that will not only control the facilities' HVAC systems, but also manage the energy consumption of the buildings. The building automation system will monitor and record electric meters, gas meters and water consumption for the entire facility, as well as the usual HVAC equipment and building lighting systems.

Geo-gantic Benefits for Edmond

Corff said the project's energy savings will be $25,000 to $30,000 a year in operational costs and will have an estimated payback period

Drillers at the complex get set to drill one of the 80 wells for the project.

between 9 and 10 years. The total installation cost of the HVAC systems was about $600,000, Coldiron said. A closed-loop vertical system was chosen, with 80 wells for the fire training center and 90 wells for the public service center, and the depths will be 300 and 350 feet. The fire facilities were over-designed to encompass expansion later on with an additional 35.5-ton surplus capacity, Corff said. The total tonnage of the project was 140 tons for the public service center and 80 tons for the fire service center.

Charlie Burgett, director of Edmond Electric said: "As a municipal electric utility, we are in the business for a purpose and not for a profit. That is the reason Edmond Electric promoted the geothermal heat pump system to reduce energy cost for the city. We believe that BTUs provided by the earth will have more stable costs in the future than BTUs purchased from any energy company."

Key Players

- General Contractor: Timberlake Construction
- Driller: C&S Mechanical - Scott & Darrin Beller
- Building Architect: Hornbeck-Blatt - Tony Blatt
- Local Utility: Edmond Electric: A City of Edmond Utility
- Heat Pump Supplier: ClimateMaster
- Geothermal Designer: Global Logic - Jason Bose, Michael Albertson
- Pipe Supplier: Air Product Supply

Geothermal Incentives

Bob Corff of Edmond Electric said that they also provide their customers with incentives for those who wish to install geothermal. The incentives can be applied to both new and retrofit units. For high efficiency heat pumps between 11 and 11.99 seasonal energy efficiency rating (SEER), the rebate is $100 per ton, and for 12 SEER and higher, the rebate is $150 per ton with an additional $50 per installation going to the HVAC contractor. Corff added that Edmond Electric is in the process of revising these rebates to reflect the January 2006 mandated minimum SEER of 13.

Hit Your Mark with Geo Outlook

New for 2005!

Geo Outlook's

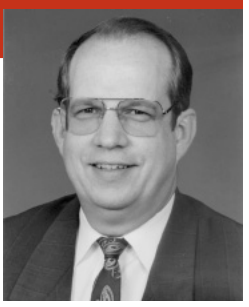
Geothermal Buyer's Guide & Product Showcase

These two supplements will be published in conjunction with the third and fourth quarter issues of the Geo Outlook. The Buyer's Guide, published in the third quarter, will feature company listings along with descriptions of their services and/or products. The fourth quarter issue will contain the Product Showcase, which will highlight the best in geothermal and related industry products.

Geo Outlook is the geothermal heat pump industry's most comprehensive publication, so these issues are sure to be used as reference throughout the year. Don't miss this opportunity to include your company and its services and products in these two special issues.

For more information visit www.igshpa.okstate.edu/publications/home.html or call 1-800-626-4747.

Earth Insights



By Phil Rawlings

If you have a question about geothermal installation, design or troubleshooting, send it to Phil Rawlings in care of *Geo Outlook*, Oklahoma State University, 499 Cordell South, Stillwater, OK 74078 or via e-mail to insight@igshpa.okstate.edu.

1. Should I require a P.E. to design my ground heat exchanger?

The P. E. designation carries no indication of experience with or proficiency in geothermal loop field design. The designation for the highest level of qualification in geothermal heat pump system design (requiring understanding, knowledge, and experience) is the Certified Geothermal Designer. This credentialing is administered by the Association of Energy Engineers (AEE), with joint sponsorship by the International Ground Source Heat Pump Association (IGSHPA) and the Geothermal Heat Pump Consortium (GHPC). If the P. E. is not a CGD, be sure to evaluate their qualifications, experience, and references. Also, do not exclude highly qualified CGDs that are not P. E.s!

2. If the P. E. is a good, highly qualified mechanical engineer, what's the problem?

A lack of understanding and/or experience in the field can result in poor system design. The most common mistakes are not adhering to IGSHPA installation standards and recommendations by:

- Using standard instead of extended range water source heat pumps.
- Using unnecessary boiler/chiller or boiler/cooling tower type mechanical room and heat pump connection components and accessories.
- Using "utility" class trenching specifications for loop field header piping.
- Using "hard" (metal, PVC) loop pipe testing criteria on the flexible, expansive (under pressure) high density polyethylene piping specified in IGSHPA Standards.
- Ignoring or misinterpreting state or local well drilling/casing/well sealing regulations.
- Inappropriate loop design approach resulting in incorrect loop length, pipe size, grout, header design, etc.
- No reverse return header connections to balance flow through each borehole in a multi-borehole grid
- No "step-down" of loop field header piping sizes to facilitate purging
- No accommodations in the mechanical room for high volume flushing/purging

3. Do state or local drilling and/or water well codes have jurisdiction on federal facilities?

Maybe!!! If personnel at a federal facility indicate they are not governed by state or local codes/regulations, get it in writing! Then check it out with the state or local jurisdictions to verify the information is correct. If you get conflicting information, you must work with both parties to reach a clear and mutually agreed understanding, in writing, of who has jurisdiction.

4. What type of ground heat exchanger is most common on federal facilities?

Typically, vertical ground heat exchangers. Some facilities have been able to use pond loops where bodies of water are available. Other applications have used standing column wells or conventional pump-and-dump open loop ground water systems with reinjection wells. Space and dense underground utilities typically prohibit using horizontal loops.

Mr. Rawlings has over twenty-five years experience in the geothermal industry. He is a Certified Geoexchange Designer (CGD) and an IGSHPA Accredited Installer and Trainer.

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