Evaluation, Measurement & Verification Report for Plumas-Sierra Rural Electric Cooperative 2009

Energy Efficiency Programs

- **GeoExchange**

California Energy Commission
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Prepared for:

Jessica Nelson
Plumas-Sierra REC
Member Services Manager
(530) 832-4261

Prepared by:

Ryan McManus
Efficiency Services Group, LLC.
5734 Lonetree Boulevard
Rocklin, California 95765

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ABSTRACT

The following Evaluation, Measurement and Verification (EM&V) report for Plumas-Sierra Rural Electric Cooperative (PSREC) provides a systematic review of the GeoExchange program. Recommendations were made to more effectively capture data and to improve the accuracy of this program.

Table of Contents

Executive Summary

This report provides findings from an independent Evaluation, Measurement and Verification (EM&V) for the GeoExchange program for Plumas-Sierra Rural Electric Cooperative's (PSREC) 2009 fiscal year.

The program was evaluated using a continuous improvement approach with the goal of identifying and recommending areas where changes can be made to improve data management and ensure data quality. For PSREC, this involved a review of the overall GeoExchange program and the creation of an engineering model to more accurately estimate savings.

After a thorough review of PSREC's GeoExchange program, we recommend the following actions to improve PSREC's GeoExchange program:

- Collect additional pre-retrofit data for installations.
- Use the more conservative savings figures generated by the engineering model.

For more detail on individual recommendations please refer to Findings & Recommendations section.

Introduction & Purpose of Report

EM&V is the documentation of energy savings using direct measurements, engineering calculations, statistical analyses, and/or computer simulation modeling. EM&V is a requirement of two bills adopted during the 2005-2006 California legislative session:

- **SB 1037 (Kehoe):** Requires all publicly-owned utilities to report to the California Energy Commission and their local governing boards about current and projected energy efficiency programs, including expenditures and savings.

- **AB 2021 (Levine):** Reaffirms SB1037 mandates but also requires publicly-owned utilities to develop energy efficiency targets on a triennial basis and provide an independent assessment of measured savings.

This report provides unbiased, independent third-party auditing of programs selected by PSREC. Specifically, this report assesses savings associated with the GeoExchange program.

Program Description

GeoExchange

The GeoExchange program from PSREC provides a 30-year interest-free (non-transferable) lease on exterior ground loops for installation in both new construction and retrofits. The fee schedule is based on HVAC tonnage and loop configuration (Horizontal or Vertical). In addition, a free 85-gallon Marathon water heater or a $500 rebate is issued upon the closing of the geo loop lease.

For a full program description please refer to Appendix B.

Evaluation Standards

The requirement for utilities to provide independent third-party assessments of measured savings is relatively new and subject to some interpretation. There are published references (such as the International Measurement and Verification Protocol and the Technical, Methodological, and Reporting Requirements for Evaluation Professionals), but it is apparent from the body of previous third-party assessments that there is a range of interpretations and application of these references.

Our stance and approach is to:
1) Provide a rigorous review of the utility's programs.
2) Meet them where they are at and identify actionable improvements.
3) Minimize costs so more public benefits funds can be devoted to energy efficiency programs.

With this approach, our goal is to provide an "optimized" assessment resulting in an actionable review at minimal cost to the utility. This Continuous Improvement approach begins with process evaluation, followed by data analysis and detailed savings verification. If, in the course of evaluating a process or analyzing the data, we discover significant opportunities for improvement, we will stop and document the needed improvement actions. In such cases we do not make assumptions or otherwise fill in gaps in the data.

For example, if required program data is missing then we will document this as a needed improvement activity rather than spend additional time to estimate the data which should have been provided.

Evaluation Plan

Using the approach explained above, the specific evaluation plan for PSREC was as follows:

Process Review

Evaluate the database for overall structure and accuracy. Conduct staff interviews to identify any specific issues with the energy efficiency program and identify improvement opportunities.

Evaluation of GeoExchange

Summarize the results of the recent engineering comparison of a GeoExchange to other types of space conditioning. Review the total cost to PSREC of supporting this measure. Compare with other potential energy conservation measures.

Findings & Recommendations

Process Review - Evaluation of Program Tracking System

On December 11, 2009, PSREC's rebate database was received in Microsoft Excel format. Our evaluation resulted in the following findings and recommendations:

- **Database Structure:** There were no obvious or apparent structural errors located within the database. Information was provided in a clear and organized manner. There are no recommendations for structural improvement.

- **Database Accuracy:** The database provided accurate information for all the categories provided, but additional beneficial data could be collected. We recommend that PSREC maintain comprehensive data on meter readings for residences before and after GeoExchange retrofits. In addition, PSREC should collect data detailing the residence's previous HVAC system. This will provide additional corroborating data to more accurately determine savings.

Process Review - Staff Interviews

On January 7, 2010 a meeting with PSREC staff was conducted. At the meeting PSREC expressed concern that previous consultant's savings results were not as accurate as they could be. Also discussed was the fact that customers can sometimes be confused about the increase in their electric bill when switching from gas to electric or when moving into the area from a warmer climate.

While the marketing material distributed by PSREC does mention the cold weather, it may be helpful to add a step, prior to issuance of the rebate, where the material is reviewed in more detail with the customer.

Evaluation of GeoExchange- Energy Savings

Separate from this report, ESG created energy models of three generic homes. Each home was modeled with a range of space conditioning systems, including baseboard heating, propane furnace and a GeoExchange system. These models took weather, typical operation hours, and other key components into consideration. The study was published and provided to PSREC titled "Plumas-Sierra Rural Electric Cooperative (PSREC) Engineering Evaluation of GeoExchange Program".

GeoExchange system energy consumption figures used in PSREC's program agreed well with the Engineering Model. However, the energy consumption figures of other types of systems, such as gas furnaces and baseboard heating, were significantly higher in PSREC's program than in the Engineering Model. As a result, the total energy savings per the program are higher than the savings per the Engineering Model. We recommend PSREC use the more conservative savings figures generated by the Engineering Model.

The results of the Engineering Model indicated that the horizontal and vertical GeoExchange installations provided an average reduction of 46% in consumption (kWh) per year over Base Board Heating. GeoExchange provides an average savings of over 4,000 kWh per year, with the vertical configuration providing slightly higher savings than the horizontal installation.

Evaluation of GeoExchange- Cost Effectiveness

PSREC charges no interest on their GeoExchange program loans as described earlier in the Program Description section. By charging no interest there is an implicit cost to the utility incurred by inflation. As detailed in Appendix A, if a conservative figure of 3% is used, PSREC is spending almost $6,000 per installation on average. When comparing money spent to demand (kW) saved, the GeoExchange program is between 15-58% more costly than other PSREC rebate programs. We are not, however, recommending this practice be changed in light of the many benefits of the program.

Appendix A – Zero Interest Loan Analysis

Units installed during the 2009 fiscal year were used to calculate total cost to PSREC of carrying the lease. The analysis assumed 3% inflation amortized over the life of the loan and used demand reduction figures from the engineering evaluation conducted by ESG.

System Capacity (Tons)	System Type (Horizontal or Vertical)	Construction Type	Floor Area (SF)	Lease Amount	Lease Amount Per Ton	SF/Ton	Inflation Cost	Cost per Watt Saved
6	H	NC	2,017	$14,994	$2,499	336	$7,764	$6
7	H	RETRO	2,723	$9,342	$1,335	389	$4,837	$3
6	H	RETRO	2,955	$7,362	$1,227	493	$3,812	$3
11	V	NC	3,818	$14,994	$1,363	347	$7,764	$3
3	V	NC	1,200	$8,982	$2,994	400	$4,651	$7
							Average	**$5**

Comparison to Other PSREC Rebates

Program	Cost per Watt Saved	% Difference from GSHP
Refrigerator	$2	59%
Washer	$4	21%

Appendix B – Analysis of Existing Savings versus Engineering Model

The following system usage figures are included in the Heating Fuel Cost Comparison portion of PSREC's marketing material. Unit consumption figures were calculated by dividing Heating Only Price by Current Price per Unit.

Plumas Ad Material

1500Ft^2

Heat Type (Unit)	Current Prices per Unit	Cost Per Million BTU	Annual Heating Only Price	Unit Consumption
Electric Resistance (kWh)	$0.114	$33.40	$1,503	13,185
Fuel Oil (gal)	$3.860	$29.96	$1,348	349
Geothermal Heat Pump (kWh)	$0.114	$9.54	$429	3,767
Kerosene (gal)	$3.860	$30.76	$1,384	359
Propane (gal)	$3.430	$40.82	$1,837	536

2000Ft^2

Heat Type (Unit)	Current Prices per Unit	Cost Per Million BTU	Annual Heating Only Price	Unit Consumption
Electric Resistance (kWh)	$0.114	$33.40	$2,004	17,580
Fuel Oil (gal)	$3.860	$29.96	$1,797	466
Geothermal Heat Pump (kWh)	$0.114	$9.54	$573	5,023
Kerosene (gal)	$3.860	$30.76	$1,845	478
Propane (gal)	$3.430	$40.82	$2,449	714

3000Ft^2

Heat Type (Unit)	Current Prices per Unit	Cost Per Million BTU	Annual Heating Only Price	Unit Consumption
Electric Resistance (kWh)	$0.114	$33.40	$2,939	25,784
Fuel Oil (gal)	$3.860	$29.96	$2,636	683
Geothermal Heat Pump (kWh)	$0.114	$9.54	$840	7,367
Kerosene (gal)	$3.860	$30.76	$2,706	701
Propane (gal)	$3.430	$40.82	$3,593	1,047

The engineering model produced the following energy usage figures. kWh per square foot was calculated for each scenario and an average calculated.

Area	Gas Furnace	Baseboard	Heat Pump	GSHP Horizontal	GSHP Vertical
Ft^2	kWh	kWh	kWh	kWh	kWh
1,200	9,701	8,060	5,590	4,111	3,648
2,000	12,562	9,360	7,100	5,210	5,070
3,000	14,581	11,430	7,340	6,290	6,120

Area	Gas Furnace	Baseboard	Heat Pump	GSHP Horizontal	GSHP Vertical
Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2
1,200	8.1	6.7	4.7	3.4	3.0
2,000	6.3	4.7	3.6	2.6	2.5
3,000	4.9	3.8	2.4	2.1	2.0
Average	6.4	5.1	3.6	2.7	2.5

The marketing material provided by PSREC was used to determine the expected energy usage for similar types of space conditioning. Where unit usage was provided in units other than kWh, the conversion factors supplied in their material (Appendix B) were used. This produced the following energy usage and energy usage per square foot figures:

Area	Electric Resistance	Fuel Oil	Kerosene	Geothermal Heat Pump	Propane
Ft^2	kWh	kWh	kWh	kWh	kWh
1,500	13,185	14,330	14,186	3,767	14,336
2,000	17,580	19,107	18,915	5,023	19,115
3,000	25,784	28,023	27,742	7,367	28,036

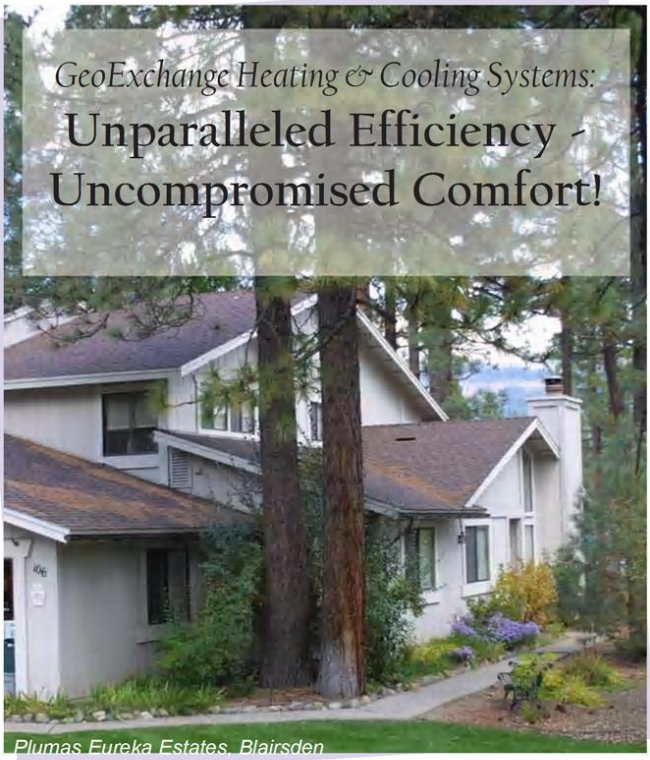
Area	Electric Resistance	Fuel Oil	Kerosene	Geothermal Heat Pump	Propane
Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2	kWh/Ft^2
1,500	8.8	9.6	9.5	2.5	9.6
2,000	8.8	9.6	9.5	2.5	9.6
3,000	8.6	9.3	9.2	2.5	9.3
Average	8.7	9.5	9.4	2.5	9.5

Finally, comparisons were made between similar systems, yielding the following results:

Propane	Gas Furnace	Percent Difference	Electric Resistance	Baseboard	Percent Difference	Geothermal Heat Pump	GSHP Horizontal	Percent Difference
kWh/Ft^2	kWh/Ft^2	%	kWh/Ft^2	kWh/Ft^2	%	kWh/Ft^2	kWh/Ft^2	%
9.6	8.1	18%	8.8	6.7	31%	2.5	3.4	-27%
9.6	6.3	52%	8.8	4.7	88%	2.5	2.6	-4%
9.3	4.9	92%	8.6	3.8	126%	2.5	2.1	17%
9.5	6.4	48%	8.7	5.1	72%	2.5	2.7	-8%

While the GeoExchange numbers assumed by PSREC are fairly close to those produced by the model, those used for Gas Furnaces and Electric Resistance Heating were significantly different from the model.

Appendix C – Marketing Material



For most people, heating represents the largest energy expense – up to 36 percent or more of one's total annual energy bill.

Winter in the Sierra Nevada can translate into seven months or more of stoking fires or paying sky-high propane or oil heating bills.

WHAT IS GEOEXCHANGE?

Approximately 400 homeowners in our service territory have discovered an alternative to the mess and inconvenience of burning wood, the rising cost of fossil fuels, and the inefficiencies of some forced air furnaces. GeoExchange is a modern heating and cooling technology with surprising efficiency that surpasses most traditional and alternative systems, while delivering year-round comfort.

Heat pumps, air conditioners and refrigerators all operate similarly in that they use a refrigerant to help transfer heat. The GeoExchange heat pump, however, is more efficient in that it uses the earth as a heat source and heat sink, rather than the outside air. The refrigerant helps the GeoExchange system take advantage of two primary principles of heat transfer:

1. Heat energy always flows from areas of higher temperature to areas of lower temperature; and
2. The greater the difference in temperature between two adjacent areas, the higher the rate of heat-transfer between them.

GeoExchange heat pumps are becoming increasingly popular due to their heating and cooling energy efficiency, and related environmental and ownership benefits, especially where soil conditions are favorable or ground water is available. In the heating mode, a geothermal heat pump extracts energy from the earth, typically using a buried water loop, and moves it indoors. In the summer, geothermal heat pumps move heat from indoors into the relatively cool earth, via a water loop. The result in both seasons is that less energy is needed than with conventional air-to-air heat pumps, natural gas, or oil heating systems.

WHO NEEDS IT?

GeoExchange is taking the nation by storm. While it is wildly popular in Southern states for its ability to extract heat and humidity from homes and businesses and transfer it back to the earth, now it is sweeping the Northwest because its role is reversed in the colder climates, where it moves heat from the earth to warm the home or office.

Plumas, Lassen, Sierra and Washoe counties are ideal climates for this technology. The difference between the refrigerant temperature in the loops and the ground temperature remains relatively high in the Sierra Nevada in both winter *and* summer, creating good heat transfer rates. The ground below the frost line (about 3 to 5 feet below the surface) remains at a nearly constant earth temperature ranging between 45° and 50°F in our area. This relatively constant temperature allows GeoExchange heat pumps to operate more efficiently than other heating systems.

Many factors affect the design of an efficient GeoExchange Heating and Cooling system. These include the design, construction and size of your home; its orientation; the climate where you live; the geology in your area; and the amount of land available.

WHY YOU WANT IT:

Cost Savings

Because they tap the Earth's renewable energy, GeoExchange systems are more efficient than furnaces or conventional heat pumps. They don't burn fossil fuels, nor do they try to extract heat from cold winter air or reject heat to hot summer air. They simply move heat from the earth to the building's interior in winter, and pump heat from the interior to the earth in summer. So they cost less to operate. GeoExchange systems offer significant savings to homeowners in both the heating and cooling modes compared with conventional systems.

In addition, a "desuperheater" can be added to your GeoExchange system to supplement the home's conventional water heater, saving on hot water costs every year. During the summer, the heat that is taken from the house is used to heat the water.

GeoExchange lowers electricity demand by approximately 1 kilowatt per ton of capacity.

Maintenance savings

With a GeoExchange system installed, homeowners can also look forward to saving money in maintenance, repair, and replacement costs.

Properly installed GeoExchange systems rarely need service. The underground loop piping that carries heat to and from the earth is made of high-density polyethylene, typically guaranteed for 25 years and expected to last 50 years or longer. (It's the same material used for cross-country natural gas lines.)

The GeoExchange system hardware has few moving parts and should remain virtually maintenance-free for 20 years or more. The homeowner's only routine maintenance chore is changing the air filter every three months. Electrostatic filters are also available, which further decrease maintenance costs because the filters can be rinsed and re-used.

Added Value

A GeoExchange system, like other energy-efficient features, can also add value to your home. Recent studies indicate an increase of $20 in home value for every $1 in annual energy savings.

Peace of Mind

A properly designed system:

- Is endorsed by the U.S. Department of Energy & the Environmental Protection Agency
- Is ENERGY STAR® certified
- Completely eliminates the heating system as a potential source of carbon monoxide fumes within the home, making it much safer for you and your family
- Is environmentally safe
- Preserves the home's aesthetics and beauty of land – loop trenches or boreholes are covered with earth and landscaping of your choice; unit can reside in a small closet, beneath the home or in a basement or a garage

Goldmountain - Clio, CA

Comfort

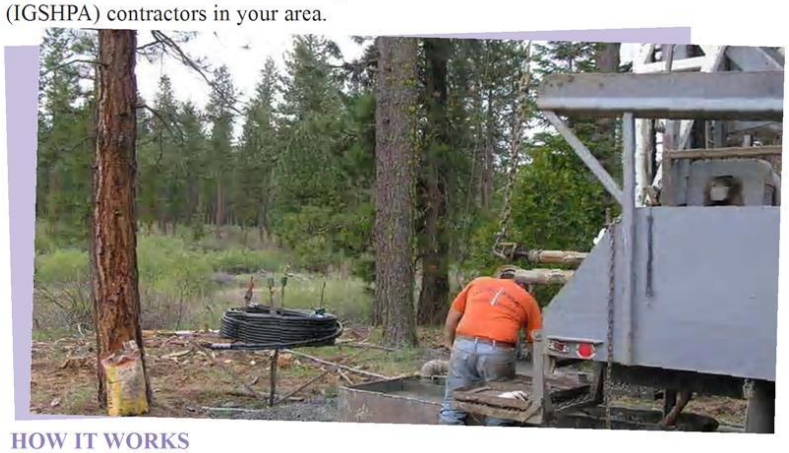
Choosing a heating and cooling system is like Goldilocks sampling the porridge. The air that a furnace system sends through the ducts is heated to as high as 130° F, and may feel too hot or dry. Most conventional heat pumps circulate air through the ducts at about 92° F—too cold and drafty for many people. With good construction and proper duct design, GeoExchange systems circulate air heated to about 105-110° F-just right for almost everyone.

Additionally, you can use your GeoExchange system for cooling during the summer months, a comfort many people in the Sierra's don't enjoy. If you already have an air conditioner installed in your home, your new GeoExchange system would be much more efficient and affordable to operate. Or, you can choose to save money and switch your system off during a mild summer.

WHEN YOU SHOULD DO IT:

It is important to discuss the design of your heating and cooling system during your initial conversations with your contractor. Call Sharon at Plumas-Sierra Rural Electric Cooperative today at 530-832-6054, or visit www.GeoExchange.org if you are interested in learning more about GeoExchange heating and cooling systems. We will send you an informational packet with a list of accredited Ground Source Heat Pump Association (IGSHPA) contractors in your area.

GeoExchange is one of the most efficient heating technologies available on the market today and a perfect fit for most new construction, as well as many remodel and retrofit applications. Special incentives and loop financing through the Cooperative make GeoExchange a valuable option. Doing it through the people you trust makes choosing GeoExchange the right choice.

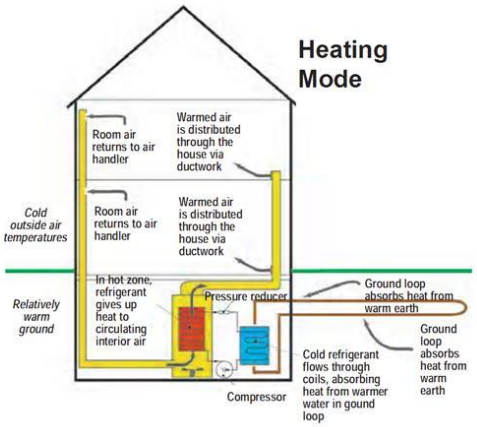


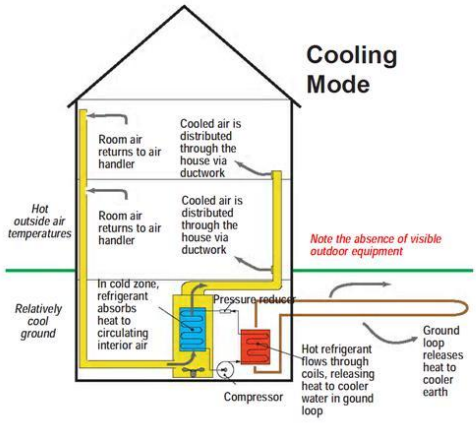
Drillers prepare to install loops in boreholes at Goldridge Estates - Blairsden, CA

HOW IT WORKS

GeoExchange heat pumps operate similar to air-to-air heat pumps, *moving* rather than *creating* heat. However, GeoExchange uses the earth itself (closed loop) or ground water in the earth (open loop) as a heat source and heat sink, rather than the outside air. And, because the earth's temperatures are much more constant year-round, warmer in winter and cooler in summer, geothermal heat pumps operate more efficiently.

The GeoExchange unit pumps a nontoxic water/refrigerant mixture through a closed loop system, creating two distinct temperature zones – a cold zone and a hot zone. In the winter, the heat exchanger can extract two-thirds or more of the energy needed from the earth to warm the home through the ground loops and transfer it to the refrigerant cold zone. Only one-third or less of the energy needed is purchased power, primarily used to run the compressor. This process is reversed in the summer, carrying heat from the refrigerant hot zone of the home, back to the ground through the ground-loop piping.





HEATING FUEL COST COMPARISON

This comparison uses the efficiency, or coefficient of performance, (COP), of the heating device, as well as the type and cost of the energy used. These fuels, commonly utilized in the Sierra's, have the following approximate heating content:

Average Btu Content of Fuels

Fuel Type	Number of Btus / unit
Electricity	3,412/kwh
Fuel Oil (No. 2)	140,000/gallon
Kerosene	135,000/gallon
Propane	91,330/gallon

http://www.eere.energy.gov/consumerinfo/factsheets/cb5.html

Not all of the energy potentially available in a pound of coal, a cubic foot of natural gas, or a gallon of oil ends up as usable heat in the home. Energy is lost in a number of places in the conversion and distribution process. The efficiency of a heating system is the ratio between the amount of usable heat produced and the amount of potential energy in the fuel.

A common index of the cost of heat is "dollars per million Btu of useful heat." To calculate "useful heat," (heat actually delivered to the house), it is necessary to adjust for the efficiency of the heating device and the cost of the energy. The following equations and values can be used:

USEFUL HEAT

Electric Resistance	$\frac{293 \times \$/kwh}{1}$
Fuel Oil	$\frac{7.14 \times \$/gal.}{Efficiency}$
GSHP	$\frac{293 \times \$/kWh}{COP}$
Kerosene	$\frac{7.41 \times \$/gal.}{Efficiency}$
Propane	$\frac{10.95 \times \$/gal.}{Efficiency}$

EFFICIENCY VALUES

New Standard	78%
Moderate	84%
High	92%

GSHP COP VALUE

Cold Climate	3.5

Eureka Springs - Blairsden, CA

CURRENT FUEL PRICES

Averaged 10/9/08

Electricity	$.114/kWh
Fuel Oil	$3.86/gal
Kerosene Oil	$3.86/gal
Propane	$3.43/gal

1500ft^2 HOME (45 million Btu annually)

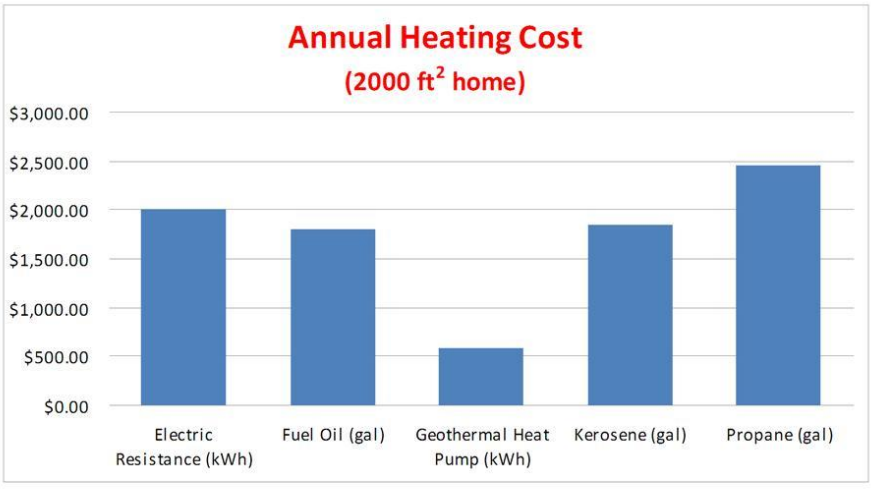
Heat Type (unit)	Current Prices per unit	Cost Per Million Btu	Annual Heating Only Price	Convert to Geoexchange for Annual Savings of:
Electric Resistance (kWh)	$0.114	$33.40	$1,503.09	$1,073.64
Fuel Oil (gal)	$3.86	$29.96	$1,348.06	$918.61
Geothermal Heat Pump (kWh)	$0.114	$9.54	$429.45	NA
Kerosene (gal)	$3.86	$30.76	$1,384.00	$954.54
Propane (gal)	$3.43	$40.82	$1,837.10	$1,407.65

2000ft^2 HOME (60 million Btu annually)

Heat Type (unit)	Current Prices per unit	Cost Per Million Btu	Annual Heating Only Price	Convert to Geoexchange for Annual Savings of:
Electric Resistance (kWh)	$0.114	$33.40	$2,004.12	$1,431.51
Fuel Oil (gal)	$3.86	$29.96	$1,797.42	$1,224.81
Geothermal Heat Pump (kWh)	$0.114	$9.54	$572.61	NA
Kerosene (gal)	$3.86	$30.76	$1,845.33	$1,272.72
Propane (gal)	$3.43	$40.82	$2,449.47	$1,876.86

3000ft^2 HOME (88 million Btu annually)

Heat Type (unit)	Current Prices per unit	Cost Per Million Btu	Annual Heating Only Price	Convert to Geoexchange for Annual Savings of:
Electric Resistance (kWh)	$0.114	$33.40	$2,939.38	$2,099.55
Fuel Oil (gal)	$3.86	$29.96	$2,636.21	$1,796.39
Geothermal Heat Pump (kWh)	$0.114	$9.54	$839.82	NA
Kerosene (gal)	$3.86	$30.76	$2,706.48	$1,866.66
Propane (gal)	$3.43	$40.82	$3,592.55	$2,752.73



Disclaimer:
PSREC does not guarantee the above stated annual heating only savings. These are estimates only. Type of construction, square footage, floor plan, number of windows, lack of window coverings, high ceilings, insulation, ducting, lifestyle, occupants and many other variables will affect actual heating costs.

Fascinating Facts about GeoExchange

According to the US Environmental Protection Agency, geothermal heat pumps:

- Are the most energy-efficient, environmentally clean, and cost-effective space conditioning systems available.

- Significantly reduce greenhouse gas and other air emissions associated with heating, cooling and water heating residential buildings, compared with conventional technologies.

- Are an average of 48% more efficient than the best gas furnaces on a source fuel basis, and over 75% more efficient than oil furnaces, even taking all losses in the fuel cycle into account.

- Generate no on site emissions and have the lowest emissions among all heating and cooling technologies.

- Can reduce energy consumption- and corresponding emissions- by up to 70% compared with electric resistance heating with standard air-conditioning equipment.

Other Facts:

- Polls consistently show that more than 95% of all GeoExchange customers would recommend GeoExchange to a family member or friend.

- During the heating season, GeoGxchange systems take the heat that the earth absorbs/stores from the sun at an efficiency of about 350%, and returns it during the cooling season.

- Currently, more than 900,000 GeoExchange systems are installed in the U.S., which has resulted in the emissions reduction of more than 5.2 million metric tons of carbon dioxide annually.

- These 900,000 systems also annually reduce energy consumption by more than 7 billion kWh and 36 trillion Btu's of fossil fuels, as well as reduce electricity demand by 2.3 million kW every year.

- The enormous impact of the current use of geothermal heat pump technology is equivalent to:

    - Taking more than 1,165,000 cars off the road
    - Planting more than 346 million trees
    - Reducing U.S. reliance on foreign oil by 19.3 million barrels per year.

From: The Geothermal Heat Pump Consortium, http://www.geoexchange.org/documents/GB-003.pdf

Eureka Springs - Blairsden, CA

Gold Mountain - Clio, CA

PLUMAS-SIERRA REC MAKES GEOTHERMAL HEAT PUMPS EVEN MORE COST-EFFECTIVE BY PROVIDING FINANCIAL INCENTIVES TO MEMBERS:

New Construction and Retrofits

- Receive a FREE 85-gallon, super energy efficient lifetime warranted Marathon water heater, valued at over $800.00!
- If you choose not to take advantage of the FREE water heater, we will either credit your electric bill $500.00 or mail you a $500.00 rebate check. The credit or check will be issued upon the closing of your geo loop lease.
- Receive a 30-year INTEREST FREE (non-transferable) lease on the exterior loops, see prices below.

PSREC'S LOW COST MONTHLY LOOP LEASE PROGRAM

Horizontal Loop
Normal Conditions
MAXIMUM LEASE AMOUNT $14,994

Heat Exchanger Size	Monthly Price
3 ton	12.45
4 ton	14.95
5 ton	17.95
6 ton	20.45
7 ton	22.95
8 ton	25.95
9 ton	28.95
10 ton	31.95

Vertical Loop
Normal Conditions
MAXIMUM LEASE AMOUNT $14,994

Heat Exchanger Size	Monthly Price
3 ton	24.95
4 ton	29.95
5 ton	36.95
6 ton	41.65
7 ton to 10 ton	Call for Pricing

This loop lease is only available to members who utilize one of the certified contractors listed on the following page. Residence must be owner occupied, no leases offered for developer homes. Owners must maintain a valid and continuing homeowner's insurance policy on the residence at all times, including during construction, no exceptions. PSREC cannot guarantee that all building sites, due to soil, rocky or cobble conditions and county requirements will be able to utilize GeoExchange technology. Monthly charges and program details subject to change without prior notice.

TIPS ON CHOOSING AN INSTALLER

- Make sure your system is installed by certified professionals who are accredited by, and follow procedures established by, the International Ground Source Heat Pump Association (IGSHPA).

- Ask for references from other homeowners or communities where the contractor has installed GeoExchange systems. Then visit or call these references.

- Expect an evaluation so your contractor can make the best recommendation. This should include checking ducts, insulation and other features for energy efficiency.

- Get written cost estimates from at least two contractors. Ask for a breakdown between equipment and labor and get clarification on any questions.

- Get a written contract (including all terms, costs and start-stop dates) and a written guarantee (on the system and the installation). Also ask for an owner's manual.

- Call Sharon at Plumas-Sierra Rural Electric Cooperative at (530) 832-6054 or toll-free at (800) 555-2207 ext. 6054 if you have any other questions or concerns.

CERTIFIED GEOTHERMAL CONTRACTORS IN OUR SERVICE TERRITORY

COMPANY NAME	PHONE NUMBER	FAX NUMBER
Almanor Energy Plus, Inc	(530) 596-3128	(530) 596-4340
Dryden Plumbing & Heating	(530) 993-4048	(530) 993-4048
Heat Transfer Systems	(530) 283-3665	(530) 283-5172
JH Heating	(530) 257-7202	(530) 257-1812
Madden Plumbing & Heating	(530) 283-1605	(530) 283-2485
Sierra-Air	(775) 356-5566	(775) 356-7940
Thomas Heating & Air	(530) 832-5095	(530) 832-5336

This list has been complied by PSREC for the primary purpose of providing information on qualified geothermal contractors whose services may be available for the planning, design and installation of geothermal systems in its service territory. PSREC does not promote any particular company on the list and assumes no liability and provides no warranty for the work performed or claims made by any of these companies.

The list user is responsible for reviewing and verifying the qualifications, references, installation experience, and any other pertinent information of any selected geothermal contractor.

On the following page there are some useful questions to ask your contractor.

USEFUL QUESTIONS FOR YOUR GROUND SOURCE HEAT PUMP CONTRACTOR

- What heating capacity (Btu per hour) does my home require and how is this determined?
- Will auxiliary heat be required for my home?
- What is the brand name and efficiency of the system?
- What type of duct system will be installed and what is the insulation value?
- How do you seal your ductwork and do you test to verify the seal?
- How many supply and return vents will be installed and locations?
- Is my system a single or dual capacity unit?
- Is my blower (fan) motor standard or variable speed?
- Discuss "zoning" with your contractor.
- There are many air filtration options available, discuss these with your contractor.
- Ask if they have a maintenance plan and how much it will cost?
- What type of warranty is provided with my system and what is covered?
- There are many options in thermostat control, discuss these with your contractor.
- Will the system be connected to the 85-gallon Marathon water heater PSREC provides to you for free (a value of over $800.00) as an incentive for installing a Ground Source Heat Pump?

Revised 12/2/08