



## Energy Crafted Home Hartford, Connecticut



### Background

Northeast Utilities in Hartford, Connecticut, promotes a program it calls the "Energy Crafted Home" (ECH). The program offers technical assistance, and rebates in certain cases, to people building new homes and helps provide a safe, healthy, and energy-efficient environment in which to live. Energy Crafted Homes feature added insulation, extra air sealing, and improved indoor air quality. When familiarized with the various energy conservation measures available for new construction, most customers select GeoExchange systems to heat and cool their Energy Crafted Home.

Typically, the home buyer has heard about the advantages of an Energy Crafted Home through a trained ECH builder or from utility marketing efforts. House plans are submitted to Northeast Utilities, or a "plans evaluator" hired by the utility. The plans evaluator works with the builder and home buyer to find cost-effective measures to meet the ECH performance standard for energy use and indoor air quality.

Once the final energy measures are agreed upon, the plans

evaluator makes up to three site visits, arranged with the builder at predetermined points in construction, to verify that ECH standards are being met. Upon successful completion, an ECH certificate is issued and rebate checks are sent to houses in eligible service territories.

For electrically heated homes in a sponsoring electric utility territory, there is no charge for ECH certification. For homes heated by fossil fuel, the certification costs average \$425.

### The Palmer Residence

A shining example of such an Energy Crafted Home is the Palmer residence in East Hampton, Connecticut. It is a two-story colonial with 2,987 square feet of conditioned space and 3,537 square feet total. Wall insulation is sprayed foam with an R-value of 20. Blown cellulose gives the attic an R-50, and fiberglass batts in the floors over the unconditioned basement result in a value of R-19. The double-pane, low-E, argon-filled windows boast a U-value (reciprocal of the R-value) of 0.36. Air sealing is verified by blower door testing, which discovers where the leaks are, so they can be sealed.

To ensure air quality in their well-sealed home, the Palmers installed a heat recovery ventilator that provides fresh, outside air without the usual energy penalties by tying into the air distribution side of the GeoExchange heat pump. The ECH measures result in a heating load of 49,614 Btu per hour and a cooling load of 30,568 Btu per hour. Dr. Palmer says, "From a health and ecological perspective, using ECH design strategies and techniques is the only responsible way to build a new home."

## The GeoExchange System

The house is heated and cooled by a 4.2-ton WaterFurnace GeoExchange heat pump. The closed-loop ground heat exchanger uses two vertical 250-foot wells and 1,000 feet of polyethylene tubing. A desuperheater preheats the domestic hot water to dramatically reduce propane consumption of the traditional water heater. The propane water heater also provides back-up space heating via a hot water coil mounted in the GeoExchange heat pump.

In the event of an electrical power outage, the circulating pump for the coil, air handler blower, and controls are connected to an emergency generator.

While prepared for any situation, Dr. Palmer has rarely had to rely on his back-up system.



## The GeoExchange System Cost

The GeoExchange equipment and ductwork cost the Palmers \$10,541, and the ground loop ran \$8,742. The total GeoExchange system cost of \$19,283 reflects the high prices experienced in the northeast U.S. However, competing HVAC systems are also more expensive than in other areas of the country. The Palmers received a quote of \$16,200 for an oil-fired furnace and electric central air conditioning system.

## Rebate

The Palmer residence qualified for two rebates under the Energy Crafted Home program. The insulation, air-sealing, and window measures earned the Palmers \$1 per square foot of conditioned space or \$2,987. The rebate for the GeoExchange system was \$713 per ton for a total of \$2,971. The GeoExchange heat pump operates at different efficiencies at each of its two speeds, and the GeoExchange system rebate per ton was based on the weighted average efficiency. The Palmer's total rebate of \$5,958 results in a net GeoExchange system cost of \$13,325 -- less than the cost of the competing oil-fired system, which would not have earned any rebates under the electric utility's ECH program.

## Operating Costs

The GeoExchange system provides a comfortable climate year-round for Dr. Palmer and his family at an average cost of \$93.52 per month based on submeter readings and an electric rate of 9.884¢/kWh. According to Dr. Palmer, "It's a healthier, more comfortable home to live in while using perhaps half the energy of a conventional house."

Table 1 shows the simulated performance of the GeoExchange system installed at the Palmer residence compared to that of three alternative HVAC systems. Keep in mind that the alternative systems are simulated as if installed in the energy-efficient ECH house, but would not have earned the Palmers any rebate and, therefore would have cost much more than the GeoExchange system.

Energy Crafted Home rebates resulted in a GeoExchange system first cost lower than that of the oil or gas systems, which did not qualify for rebates

## More Education Needed

Lori Vogel, a Realtor from Middletown, Connecticut, learned about GeoExchange systems through her contact with the Energy Crafted Home program and Northeast Utilities' Buck Taylor. However, Lori says that most of her clients and many of the builders she talks to are not aware of GeoExchange systems or their benefits. She admits that it took a demonstration and a few conversations before the real value of GeoExchange systems become clear to her.

Ms. Vogel urges the use of a simple message in GeoExchange education efforts. She is working with Buck Taylor to develop a simple, one-page flyer to get her clients interested in finding out more about GeoExchange systems. Lori envisions a picture of two similar houses -- one a conventional house and the other an Energy Crafted Home with a GeoExchange

system. Beside the picture of each house, a table would summarize a year's worth of monthly energy bills. The headline would ask, "Which house would you rather own?"

Lori Vogel also thinks that the GeoExchange industry should focus on increasing the use of GeoExchange in low to moderate income housing -- one of the more active areas in today's residential real estate market. The GeoExchange industry is making every effort to address this very important market sector, as evidenced by several of the other case studies in this booklet.

### **Conclusion**

Similar to many of the other case studies, the Palmer residence combines a well-insulated, tightly sealed building envelope with the energy-efficient GeoExchange system to increase comfort and lower utility bills. While the added insulation reduces the size and cost of any heating and cooling system, it lowers the cost of the GeoExchange system by a much larger percentage since the ground loop can also be downsized. GeoExchange systems and a tight thermal envelope make quite an energy-efficient partnership.

### **More about GHPC**

The Geothermal Heat Pump Consortium is a non-profit organization with participation and support from the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Nation's utilities. GHPC's mission is to promote the use of GeoExchange — the most energy-efficient, environmentally-friendly heating and cooling systems available anywhere.

All of the GeoExchange manufacturers and many qualified architects, engineers, designers, and installers are members. You're welcome to join with us too — and at no cost. Call for an application today.

#### **Key Players**

##### **Utility:**

Marshall C. (Buck) Taylor  
Northeast Utilities  
P.O. Box 270  
Hartford, CT 06141-0270  
Phone: (860) 665-2719

##### **Loop Contractor:**

Mike Ryan  
MKR Enterprises  
266 3rd Avenue  
Troy, NY 12182  
Phone: (518) 233-0916

##### **GeoExchange System Manufacturer:**

WaterFurnace International, Inc.  
9000 Conservation Way  
Fort Wayne, IN 46809  
Phone: (800) 934-5160

##### **Area Realtor:**

Lori Vogel  
William Raveis Real Estate  
48 Main Street  
Middletown, CT 06457  
Phone: (860) 344-1658

##### **HVAC Contractor:**

Guy Wanegar  
A&B Heating and Cooling  
101 Loomis Street  
Manchester, CT 06040  
Phone: (860) 649-8691

**Table I - Operating Cost Estimates**

<u>HVAC System</u>	<u>Annual Costs</u>					<u>Monthly Costs</u>	
	<u>Heating</u>	<u>Cooling</u>	<u>Water Heating</u>	<u>Domestic Energy</u>	<u>Total Operating</u>	<u>Htg., Clg., &amp; DHW</u>	<u>Total Operating</u>
GeoExchange System Dual Fuel Back-Up	\$978	\$189	\$243	\$537	\$1,947	\$118	\$162
Oil-Fired Furnace & Elec AC	\$1,162	\$236	\$207	\$572	\$2,142	\$131	\$179
Gas-Fired Furnace & Elec AC	\$1,025	\$247	\$169	\$572	\$2,013	\$120	\$168
Electric Resistance	\$2,983	\$230	\$626	\$537	\$4,376	\$320	\$365
Elite© simulations provided by Northeast Utilities. Domestic energy includes energy use for lighting, appliances, cooking, and receptacle loads.							