

Summary of Field Tests of EarthLinked® Heat Pumps by Connecticut Light & Power

Project Year: 2002-2003

Location: Connecticut Light & Power Company service territory, U.S.A.



This report presents the results from field monitoring the performance of four EarthLinked® geothermal heat pump installations using climate friendly refrigerant 407C in the Connecticut Light & Power territory. This project represented the first field experience of EarthLinked Technologies (then ECR Technologies) with that refrigerant and provided the information that formed the basis for changes in engineering calculations for future projects.

The performance of the systems along with the operating conditions were recorded over a complete cooling and heating season in order to determine energy use, efficiency, capacity, and water heating impacts. Fossil fuel furnaces and air-source heat pumps were used to compare operating costs of alternative systems at the demonstration sites.

EarthLinked systems ranging from 3.0 to 5.0 tons were installed in houses ranging from 2,500 to 3,000 square feet. All of the EarthLinked heat pump systems used a direct expansion ground loop heat exchanger charged with Refrigerant 407C. The first system applied was similar to a conventional residential air source heat pump system, and utilized an air handler to distribute heating and cooling. Two of the monitored systems were designed for hydronic slab heating only. The fourth system was added to one site to heat the basement zone only and remove load from the main geothermal heat pump unit.

Annual heating savings for three of the sites averaged 62% compared to electric resistance and 52-58% relative to air source heat pumps. Average operating cost savings compared to natural gas were 26% with a conventional furnace and 15% with a condensing furnace. Savings against propane averaged 44%, due to the high fuel cost, and savings compared to number-two fuel oil were 5%. Resistance heat control issues at one hydronic unit reduced annual space conditioning savings significantly below these numbers.

The annual EarthLinked cost savings varied with the fuel with which it was compared. Annual savings compared to electric resistance heating averaged \$1,369, and \$609-783 in comparison with air source heat pumps. Savings versus natural gas averaged \$90-\$215/year; compared to number-two fuel oil, the savings were \$145/year; and against propane the annual savings were \$718/year.

The dedicated water heating mode of the EarthLinked heat reduced annual water heating cost by an average of 47% compared to electric resistance water heating. DHW savings averaged \$188 per year.



A 4-ton EarthLinked unit, air handler and heat exchanger for forced-air space heating and cooling, and domestic water heating.