

## **Case Study #2 - Geothermal Heat & AC Retrofit with Photovoltaic Power Generation**



In 2008, ELCO Geothermal retrofitted a 25 year old 2 story colonial style home located in Hampden, ME. The 4000 square foot home's former heating system consisted of an oil fired boiler with perimeter hot water baseboard fin tube radiation throughout. The home sets on a rural 38 acre lot, so installing a new horizontal closed loop heat exchanger was the best and most cost effective option for the required ground heat exchanger. A two stage water-to-water ground source heat pump geothermal heating system was installed, utilizing two 3 ton Climatemaster model GSW heat pumps, and an 80 gallon Vaughn water thermal storage/buffer tank. The existing perimeter fin tube baseboard radiation heat delivery system was supplemented by (3) new 15M BTU fan coil units (primarily for AC purposes), and a 1000 square foot gypcrete radiant floor overpour of the main living areas (done in conjunction with a kitchen upgrade). Formerly, the home consumed an average of 1200 gallons of heating oil annually, plus 2 chords of hardwood through wood stoves located in the living spaces. After the geothermal conversion, the operating costs for the home were reduced by 62% or \$2,900 annually.

Three years later in 2011 at the same home, ELCO Geothermal installed a separately metered, ground & fence mounted, 21 KW grid connected photovoltaic electrical power generation system. The purpose of the photovoltaic system is to provide the total electricity needs of the home, for both the lights as well as all heating and air conditioning costs. The local electrical utility allows the PV power producer credits for excess electricity delivered in summer, with equal value credits to be utilized in the winter during the heating season. Any excess power produced beyond what is consumed by the home's total electricity needs, is credited to the customer's business account.



After the combined geothermal and photovoltaic power generation retrofit; the customer consumes no oil, no hardwood, and no electricity.

Although the simple payback calculation for the combined retrofit works out to 12.7 years, the customer is now earning a 7.9% tax free rate of return on their investment. All future escalation costs associated with energy supplies are eliminated. The customer will realize \$129,404.00 of savings over the useful life of the combined geothermal and photovoltaic systems. The reliability of the sun coming up every day, eliminates all potential disruptions associated with transportation, delivery, and the geopolitics of imported oil supplies. The home now has central air conditioning, all within the same cost budget and from the same equipment as used for heating. Both cleanliness and safety considerations of geothermal heating are superior to the soot byproducts of burning oil and wood inside the home. The systems are maintenance free for the 30+ year useful life of the equipment. No annual cleaning and tune-up necessary. The customer's pollution and carbon footprint are reduced to zero. The home now has a much higher resale value, regardless of the whims of the housing market, should the homeowner ever decide to sell. For all of the above reasons, the customer expects to fully recover the cost of his investment, should a decision be made to sell the property.