SERVICE IN ACTION

COLORADO STATE UNIVERSITY EXTENSION SERVICE

The economics of solar heating

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Quick Facts

- Converting solar energy to useful heat is a costly undertaking.
- The cost effectiveness of any solar heating system depends on conventional energy costs.
- Home energy conservation measures, such as improving attic and wall insulation, weatherstripping windows and doors and caulking cracks around the house, can significantly reduce annual heating bills.
- The total cost of an installed active solar heating system is between $20 and $35 per square foot of collector.
- The largest portion of the annual cost of solar heating is the mortgage payment on the system.
- Retrofits may be more expensive if extensive house remodeling is necessary.
- Maintenance costs of solar heating systems depend on the quality of equipment used, how carefully it was installed and whether it is an air or liquid system.

If you have decided to install an active solar heating system in your home, there is much to be learned about its cost. In fact, the more you weigh your decision, the more you realize that although solar energy is free, converting it to useful heat is not. Buying and installing the necessary equipment can prove to be a costly, difficult and sometimes unprofitable undertaking if all factors are not properly considered.

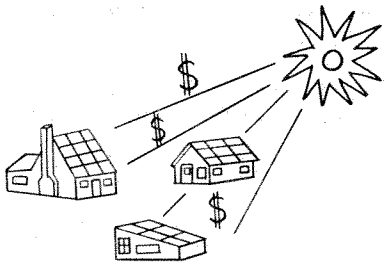

Figure 1: Converting solar energy to useful heat can be costly.

Will It Be Cost Effective

Many people forget that heating a house with solar energy involves two payments: the initial cost of expensive solar heating equipment and an auxiliary power source such as a furnace, plus the operating costs of the installed heating system. As long as supplies of natural gas are abundant and still relatively inexpensive, the high capital outlay and operating costs of solar systems cannot compete with the costs of heating with natural gas. On the other hand, efficient, durable systems that have been properly installed already are economically competitive with electricity.

SOLAR HEATING COSTS = INITIAL EQUIPMENT COSTS + MAINTENANCE COSTS

Figure 2: Heating a house with solar energy involves two major payments.

The cost effectiveness of a solar heating system is based upon the amount of heat recovered per dollar spent on the necessary equipment. A newly built house that combines good thermal design, effective insulation and an efficient solar heating system can now give substantial savings in parts of the country where energy prices are high.

In an old house, improving attic and wall insulation, double-glazing windows and eliminating drafts usually are more cost effective than retrofitting the building with a solar heating system. (See Service in Action sheets 4.652-4.660 for more information on home energy conservation measures, such as insulating floors, attic and walls, weatherstripping windows and doors, installing storm windows and doors, and caulking cracks around the house.) Retrofitting often is more expensive than new construction because homeowners may have to make a number of changes before they can incorporate the new system into their old house. On the other hand, adding insulation in the attic, caulking windows and weatherstripping doors will give large savings in fuel costs per dollar invested.

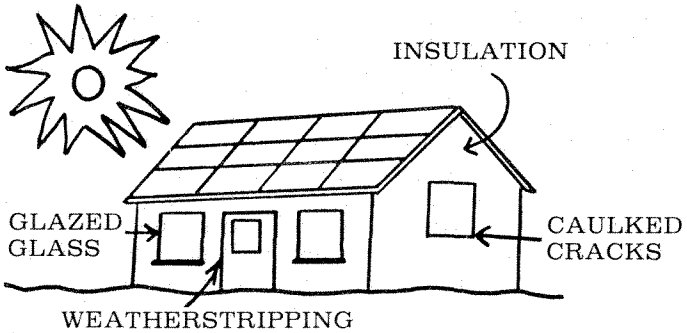

Figure 3: Home improvements can save you money.

[1/] *Hannah Pavlik, technical writer, CSU Solar Energy Applications Laboratory (12/15/78)*

Cost Estimates

There are nine companies selling solar heating equipment in Colorado and their price quotations vary widely. Prices depend on how much of the house heat is to be provided by the solar system chosen. The cost of collectors alone ranges from $7 to about $15 per square foot*, the latter ones usually being more durable and efficient, and consequently, the best buy.

Heat storage costs will add $1 to $2 per square foot* of collector to the initial investment, and other accessories, such as a hot water pre-heater and heat transport system, will cost from $5 to $8 per square foot*. The costs for installation, labor, contractor overhead and profit will be an additional $7 to $10 per square foot*. These average costs are based on air and liquid systems being installed in new, single family houses. Usually, the cost of complete systems ranges betwen $20 and $35 per square foot* of collector. Retrofits tend to be more expensive because some remodeling usually is required.

Naturally, a large part of how economically your solar system can supply your house with heat depends on how much of an energy hog you are, and also on the location and architecture of your house. Siting a house on the sheltered or south-facing side of a hill, limiting the height of ceilings and the size and location of glass windows and sliding glass doors, can make a significant difference in your heating requirement. So will proper insulation. (See Service in Action sheets 9.935 and 9.936 for more tips on how to site, design and build your house with energy conservation in mind.)

The largest portion of the annual cost of a solar heating system is the repayment of the loan taken out to install it. Many bankers are still reluctant to finance solar systems because they cannot accurately appraise the value of individual commercial systems and also because they are uncertain about their performance. Some banks will include the cost of solar equipment in a loan for a new house but will not finance the equipment alone. Others will not lend to do-it-yourselfers. Be sure that you are well-informed and ready to negotiate with a reputable solar manufacturer when you talk to your banker about a loan.

There are several other points to bear in mind when considering the economics of solar heating systems.

Tax Credits

The yearly cost of a solar heating system includes such items as the mortgage payment, electricity for motors, operating and maintenance costs, property tax, insurance and perhaps some savings on federal and state income taxes paid on the loan from your bank. Auxiliary heat also must be purchased. Some states give additional tax credits to owners of solar systems. Colorado has not provided income tax credits to solar users so far, but solar heating equipment is practically exempt from local and state property taxes. Federal tax credits for installing solar heating equipment at home will soon be available through the government's recently approved energy bill. The bill provides solar homeowners with a non-refundable tax credit of 30 percent on the first $2,000 and 20 percent on the next $8,000 for a total credit of $2,200 on $10,000. This tax credit applies to both active and passive systems installed between April 20, 1977 and December 31, 1984, and it can be spread out over a two-year period, if desired. The bill also includes federal government loans of up to $8,000 on active and passive solar heating systems.

Mortgage Payments

Your bank loan may be based on the total cost of your new house heated by solar energy, or on the solar heating system alone. For example, a system with 500 square feet* of collectors might cost between $10,000 and $17,500 (500 square feet multiplied by the average installed system cost of $20 to $35 per square foot* of collector). A 25-year loan covering the purchase and installation of a $12,000 system at 9 percent interest would mean a monthly mortgage payment of $102.

Property Taxes

Property taxes are based on a fraction of the assessed value of the solar system you have chosen. Colorado law encourages use of solar energy for house heating by limiting the property taxes on solar equipment. Equipment is currently assessed at only 5 percent of its value rather than the 35 percent normally applied to houses and their contents. County treasurers should be able to provide all the information needed to assess valuation and tax rates.

Insurance

At present, insurance rates on houses with solar heating equipment are the same as for houses without, that is, they depend on the condition of the house and on location. Very few insurance companies have established insurance rates for solar systems. Generally, building damage resulting from leaks in pipes or storage tanks would be covered in a standard comprehensive homeowners' policy. Although many factors have to be considered, your annual home insurance premium, including solar equipment, might be between 0.1 and 0.5 percent of the value of the house and its contents.

Operation and Maintenance Costs

The cost of operating a solar liquid heating system includes the cost of electricity required to run the pumps and the central heat distribution fan. In an air system, operation costs cover the energy needed to run motorized blowers. The energy required to collect, store and distribute solar generated heat (called parasitic power) varies from 5 to 10 percent of all the solar energy collected. Higher amounts of parasitic power would be considered excessive. Sooner or later, your heating equipment will require some maintenance. These costs depend essentially on the quality of equipment used and how carefully it was installed.

**NOTE: To convert to metrics, use the following conversion: 1 square foot = .09 square meter.*

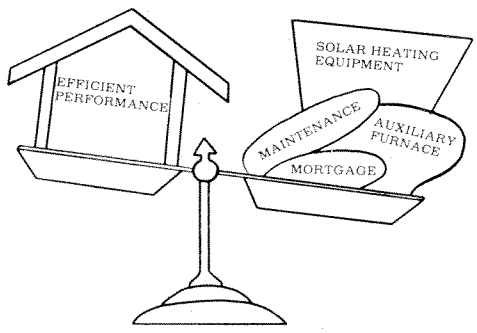

Figure 4: Potential buyers should weigh the economic facts carefully.