MAKING THE SOLAR LOAN

A PRIMER FOR FINANCIAL INSTITUTIONS

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ACKNOWLEDGEMENTS

Produced by: **CALIFORNIA SOLAR BUSINESS OFFICE**

for the: **THE SOLAR ENERGY RESEARCH INSTITUTE**
1617 Cole Blvd.
Golden, Colorado 80401

Writers: **Patricia Rubin**
and Hal Rubin,
Auburn, CA

Editor: **Jerry Yudelson**
Director, Solar
Business Office

Graphic Design: **Donna Rivers**
Rescue, CA

INTRODUCTION

Solar energy is destined to become a major industry in the United States and forward-looking financial institutions are already participating in lending programs for solar energy. Lenders who involve themselves now are ensuring that the solar industry will be part of other profitable but more traditional accounts.

Solar energy is a proved, working technology in California where lending institutions are experiencing increased demand for solar loans. Many banks and savings and loans are already making consumer loans for solar energy systems, some with preferential rates and special packages. California's financial institutions are creating new business by making loans to finance the development and purchase of solar-assisted residential and commercial properties. As lenders and as business leaders they are able to counsel customers who are considering the construction of new solar residences and commercial buildings or the modification of existing structures to use solar technology.

The California situation with respect to solar installations, legislation, consumer protection and solar loan programs is covered in detail as an example. Most states are now involved in promoting solar energy to some degree, and many maintain solar energy offices. There are also four federally funded Regional Solar Energy Centers which work with the states to promote solar commercialization.

This primer is based on the California experience and is produced as an aid to other states interested in involving their lending institutions in the solar loan market. It provides policy-makers, headquarters staff, branch managers and loan officers with an introduction to solar energy and to the basic information needed for making loans on solar-equipped properties to homeowners, homebuyers, small businesses, and other consumers.

SOLAR ENERGY IN CALIFORNIA

The use of sun power is not a new idea in California. The first commercial solar water heaters began appearing in Pasadena in 1895; five years later, more than 1,600 solar water heaters had been installed all over Southern California. Sales peaked at more than 1,000 in 1920. The boom lasted until the discovery of gas and oil fields in the Los Angeles Basin in the '20s. Then cheap gas all but did away with the solar water heater.

Gas is no longer cheap, nor is any fossil fuel. Subsidies which have kept prices artificially low are being reduced; supplies are less accessible. To conserve our diminishing fuel supply, we must reduce our demand for energy and substitute renewable for depletable resources as much as possible. For these reasons, we should switch to solar energy for heating water, heating and cooling buildings, and supplying some of our process heat, thermal power, and electricity. Solar technology is being re-discovered and improved. It is reliable, practical and economical.

Solar energy is a resource we can count on indefinitely. Increasing our reliance on solar energy will create jobs and fortify our economy by allowing us to invest elsewhere the capital now tied up in conventional energy facilities. The sun is an energy supply which does not pollute, and which can displace scarcer energy sources. Solar energy is not limited to California. Rather, it is a timely answer to a variety of social, environmental and energy problems that exist throughout the nation.

CATALYSTS FOR SOLAR GROWTH

With California's 55 percent solar tax credit, the largest in the nation, most residential solar applications are now economically competitive with electricity. Some are competitive with gas — particularly water heating for pools and households, and passive space heating and cooling. In these situations, solar energy systems provide high benefits in relation to cost over the life of the system. Solar applications also offer attractive tax-free rates of return, along with protection from rising utility bills. Conservation and passive solar features can be designed into many new buildings at little or no extra cost.

The Solar Business Office and the California Energy Commission estimate that more than 35,000 dwellings were served by solar energy systems by the end of 1978. As many as 40,000 additional residential units in California received solar energy systems in 1979. Many of these systems serve multi-family dwellings. The predominant applications will continue to be solar water heating systems for household use and for swimming pools, but the number of solar-heated structures in the state is increasing. At last count, more than 120 residential developments throughout California had opted for solar water heating as a standard feature.

Consumer concern about skyrocketing gas and electric bills has already contributed to the growth rate of solar installations in the state. Recent projections by the California Energy Commission and the California Public Utilities Commission indicate future costs of natural gas and electricity will continue to rise at rates of six to 25 percent annually above the rate of inflation.

IMPORTANCE OF LENDER INVOLVEMENT

Recent solar industry estimates indicate that about 30 percent of the nation's solar devices are in California. These installations are expected to exceed 50,000 annually by 1980. About 200 solar equipment manufacturers and 550 installers with solar experience are now active in the state, as are an additional 500 distributors, designers, consultants and researchers.

Encouragement by government in the form of tax benefits, market development, consumer protection programs and the widespread distribution of solar information has stimulated the growth of the solar industry. These developments make it increasingly important for the financial community to learn about solar heating systems and the new solar industry.

The market for housing and home improvements is of course sensitive to the availability and terms of consumer financing. The same applies to solar energy systems. Few consumers can afford the capital expenditure for solar systems without full or partial financing. In all likelihood the number of consumers who switch to solar will depend on the proportion of the costs that can be financed. Moreover, loan terms (interest rate, payment period, down payment) directly determine the monthly payment that a consumer will make. The size of the down payment and the monthly payment will influence whether a prospective buyer decides that a solar energy system is affordable.

Lending institutions in California have made thousands of solar loans. Financial institutions are

devising programs for solar retrofits to current mortgages, and the California Public Utilities Commission is investigating the feasibility of financing solar systems with utility resources. In addition, Congress is considering a Solar Development Bank that would offer interest rate subsidies on solar loans.

DETERMINING THE COST-EFFECTIVENESS OF A SOLAR INVESTMENT

In considering the economics of an investment in a solar energy system, several questions must be answered:

- What is the thermal load? That is, how much heat is needed in a particular building to heat the living area or the domestic water?
- How much heat will a particular solar energy system deliver at a particular location? How much sunshine is available seasonally or annually?
- Economically, what is the optimum fraction of the total heating load that should be supplied by the solar energy system? How does the cost compare with a non-solar heating system?
- How much do solar energy systems cost, relative to the amount of heat produced?

There are many ways to assess the economic benefits of solar energy. The most commonly used measures are: 1) life-cycle cost, in which the costs of the solar system are assessed against the value of fuel savings over the life of the system; 2) payback period, which describes how long it takes for the solar energy system to pay back its initial investment; and 3) return on investment.

Against these criteria, most solar energy systems show a net benefit compared to conventional systems on a life-cycle basis with the 55 percent California tax credit. Payback periods typically range from one to four years versus electricity, and five to 15 years versus natural gas, again with the tax credit.

How Financing Affects Solar Costs: Illustrative Loan Terms and Monthly Debt Service under Private Lender Financing Alternatives

	LOAN TYPE							
	FIRST MORTGAGE					2ND MORTGAGE	HOME IMPROVEMENT	
		Conventional		FHA	VA	Conventional	Title I	Conventional
Loan/Value Ratio	70%	80%	90%	93%	100%	75%	100%	100%
Interest Rate	10%	10.5%	11%	8.25%	9.0%	13.5%	11.5%	12.5%
Maturity (years)	25	25	25	30	30	10	12	5
Mortgage Insurance	—	15%	25%	5%	—	—	5%	—
Monthly Cost per $1000 Loan	$ 9.09	$ 9.44	$ 9.80	$ 7.93	$ 8.23	$15.23	$13.13	$22.50
Down payment for a $2000 Solar Energy System	$600	$400	$200	$140	0	$500	0	0
Monthly Cost for a $2000 Solar Energy System	$12.73	$15.10	$17.64	$14.75	$16.46	$22.85	$26.26	$45.00

In general, solar energy systems offer excellent rates of return (after the tax credit is taken). A $2,000 solar water heater or passive greenhouse can return $100 to $200 per year in fuel savings on a net investment of about $1,000. However, each solar system must be assessed individually. The costs and the effectiveness of a solar installation depend on the geographic location and other variables. Detailed analyses of the economics of solar water heating in California, for example, are shown on the chart.

SOLAR WATER HEATING IN NEW HOUSING

Solar With Electric Back-Up vs.[1]
Electric Water Heating

CITY[7]	Case 1: Single-Family[3] Annual Percent Solar[2]	Net Solar ($) Savings[6]	Discounted Rate of Return[5]	Case 2: Multi-Family[4] Annual Percent Solar[2]	Net Solar ($) Savings[6]	Discounted Rate of Return[5]
Bakersfield	72.7%	$ 797	44.4%	64.6%	$ 603	39.4%
Davis	70.4	739	41.3	62.3	564	39.4
Fresno	74.3	835	47.5	65.9	626	44.4
La Jolla	72.9	1436	70.6	62.2	994	57.5
Los Angeles	72.7	1296	65.6	62.1	912	52.5
Oakland	67.5	666	36.3	58.2	493	33.2
Riverside	77.7	1847	91.9	67.2	1270	78.8
San Jose	71.7	773	42.5	62.5	568	39.4
San Rafael	69.7	722	39.4	61.1	544	36.3
San Diego	82.7	1768	86.9	72.3	1242	78.8

[1] Includes 55% California residential solar tax credit.

[2] Source of data: Analysis of Economic Feasibility of Solar Water Heating in California, by B. Greene, Assessments Division, California Energy Commission, January 1979.

[3] Case 1 assumptions: 60/ft^2 collector, $2000 system, 20-year mortgage at 10% interest, 10% down payment, 20-year analysis, 30% tax bracket, 6% inflation, 3% annual fuel increase (2% in PG&E areas) above inflation.

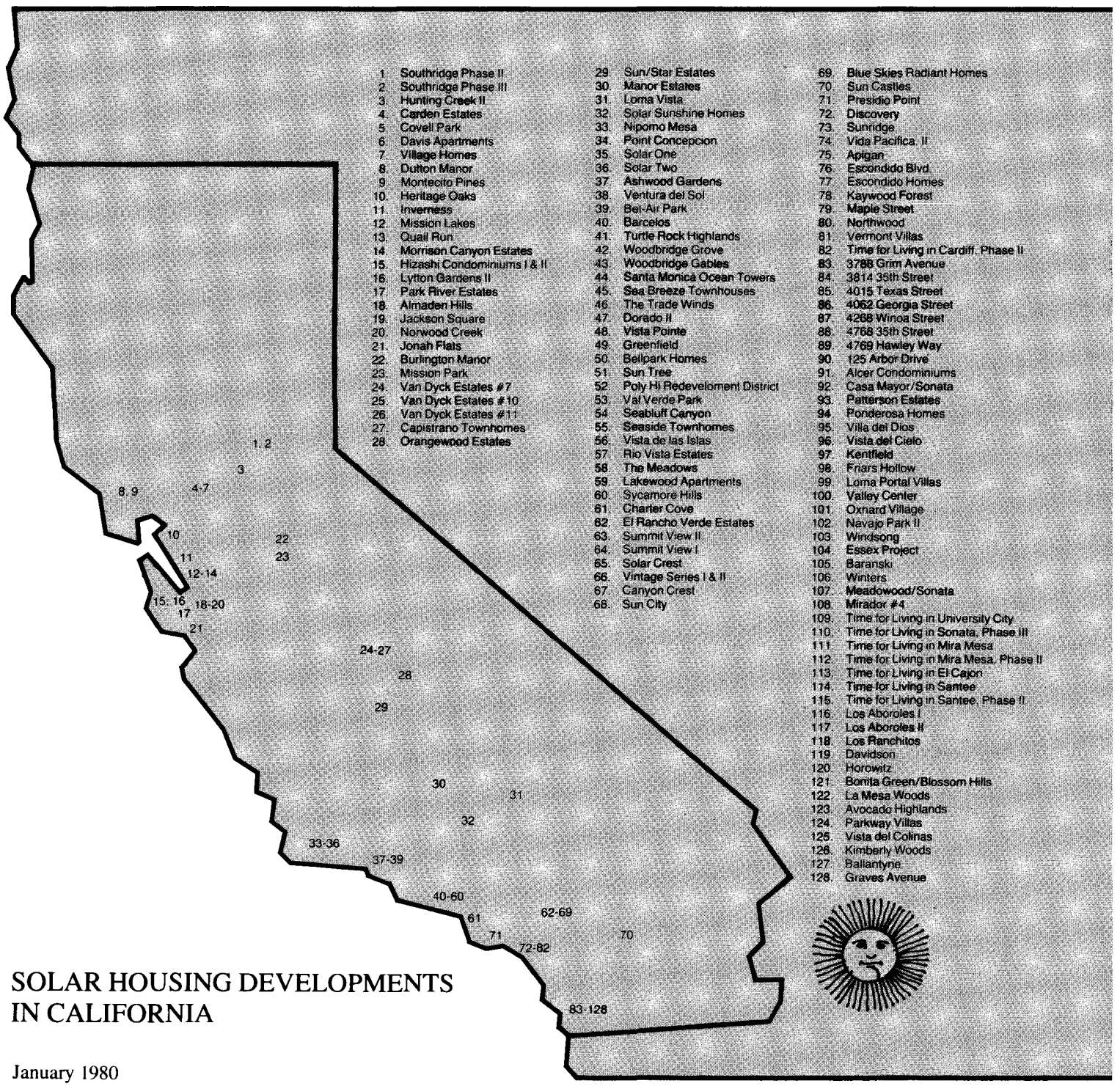
[4] Case 2 assumptions: 21/ft^2 collector, $1000 system, 30-year mortgage, at 10% interest, 10% down payment, 30-year analysis, 30% tax bracket, 6% inflation, 3% annual fuel increase (2% in PG&E areas) above inflation.

[5] Discounted rate of return is on down payment (10% of system cost).

[6] Savings in 1979 dollars; present value, over the 20-year life of the system.

[7] Solar data from California Solar Data Manual, California Energy Commission, 1978.

Chart prepared by Ethan Thorman



SOLAR HOUSING DEVELOPMENTS IN CALIFORNIA

January 1980

HOW SOLAR ENERGY SYSTEMS WORK

GETTING DOWN TO BASICS

Solar systems take advantage of the basic principles of heat transfer. The heat that flows outward from hot objects is called **radiation.** This is how the earth receives warmth from the sun, or how one's hands are warmed by a fire.

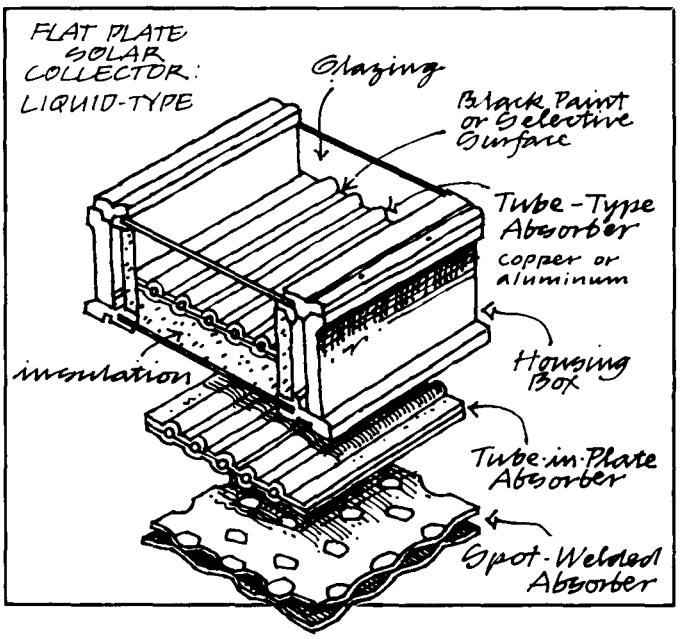
Heat flows by **conduction** directly through a substance from a hotter place to a cooler place. Heat is conducted at different rates through different materials — quickly through metal, slowly through styrofoam.

The principle that warm air rises is called **convection.** For example, air touching the hot metal of a furnace (or a sun-warmed window glass) becomes warmed, therefore more buoyant than the cold air around, and rises. The heavier, colder air moves down to replace it, causing natural convection circulation that tends to mix the air. In conventional heating and cooling systems, convection is usually assisted by fans that circulate the air.

In many geographic areas the total amount of solar energy striking the roof of a building annually is more than enough to supply the hot water, space heating and cooling needs of the building — if it could all be collected and used. There are two practical ways to put the sun's energy to work in residences:

- In **passive** solar systems the building itself is designed to trap and retain solar heat when desired, and to reject it in warm weather. This is the simplest and oldest type of solar technology. Houses with large double-glazed windows facing south, for example, can capture significant amounts of heat during winter.
- In **active** solar systems special equipment for collecting solar energy is added to the building. A solar collector is generally mounted on the structure in a fixed position at the proper angle according to roof pitch, geographic location, collector type and the use of the collected energy.

A solar building also needs a delivery system to move the heat from the collector area to the place of use or storage, and in active systems controls are necessary to regulate the flow of heat. In either case, on sunny days more heat than is needed can be collected. This extra heat is usually transferred to storage for use at night and during cloudy weather. Most solar energy systems are backed up by an auxiliary heating system that uses conventional fuel and takes over if the stored heat runs out.



ACTIVE SOLAR ENERGY SYSTEMS

In active solar heating collection, the function of the electric heater or gas furnace is supplemented by a solar collector system. There are two principal types of collectors: liquid and air. In both, radiant energy from the sun enters the collector and heats the absorber plate, which is a black metal surface in direct contact with channels through which a fluid is moving. The collector is designed so that as much heat as possible flows from the hot absorber plate into the liquid or air, which then carries the heat to where it is used. Each type has specific benefits for given applications.

SOLAR-HEATED HOUSEHOLD WATER

The technology for using solar energy to heat household water is well developed. Solar water heating has been used in the modern world for more than 75 years and is currently in widespread use in Israel, Australia and Japan.

A solar water heater designed to meet a specific climate and use pattern is an effective piece of equipment. Its year-round use results in a relatively quick pay-back on the initial investment (four to ten years). A typical family of four in California may use more than 80 gallons of hot water a day, which can account for up to one-third of the total heating bill. As much as 80 percent annually of this hot water requirement can be met economically by solar heating. It is possible to heat water even when the sky is cloudy. However, an auxiliary water heater using conventional fuel is usually provided to ensure a continuous supply of hot water regardless of weather conditions. Although this combination increases the initial costs, monthly heating bills are greatly reduced.

Several different types of solar water heaters are available. The simplest and least expensive types are those in which the household water is heated directly in the solar collector. There are flat-plate collector systems that operate both with and without pumps, and with various methods of preventing freezing. Low-cost passive solar water heaters that do not require pumps are beginning to appear on the market.

SPACE HEATING WITH SOLAR COLLECTOR SYSTEMS

Active solar heating systems are widely available commercially. The technology is well-developed and the costs are frequently competitive on a life-cycle basis with electrical space heating in colder areas of California. The systems use either liquid-type collectors and water storage, or air-type collectors and rock-bed storage. To control the flow of heat, active solar space heaters include various pumps, blowers, thermostats, sensors and controls, valves, and heat exchangers. An increasingly popular active solar space heating system uses the solar-heated air or water as the heat source for a heat pump, which increases the overall efficiency of both the solar system and the heat pump.

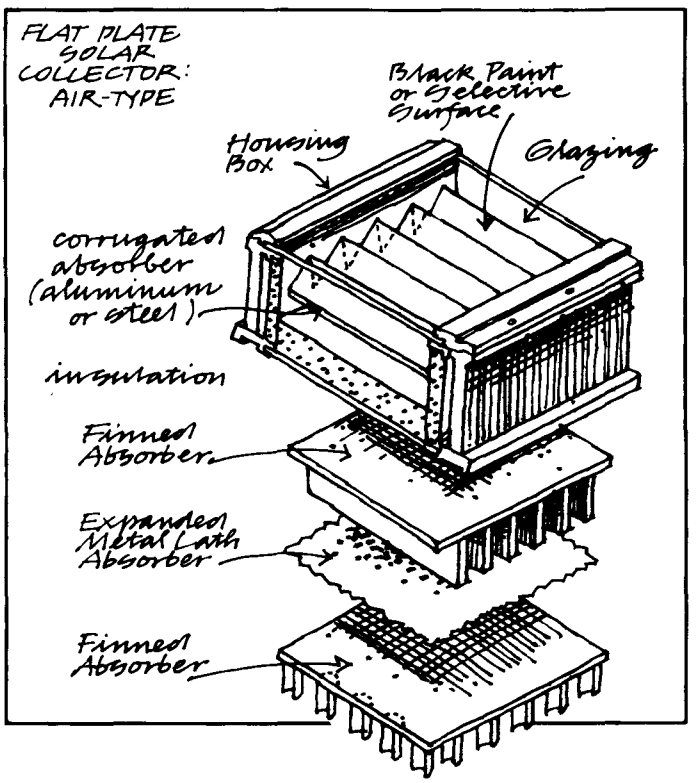
SOLAR HEATED SWIMMING POOLS

Swimming pools continue to increase in popularity even though they usually require large quantities of energy to maintain temperatures suitable for swimming. In fact, a typical residential swimming pool may use more fuel than two to four houses. Natural gas, the common pool-heating fuel in California, is increasing 20 percent per year or more in cost and eventually may not be available for this purpose. In 1979, natural gas rates for heating pools in California were increased 50 percent by order of the Public Utilities Commission.

Solar pool heating is generally considered the most cost-competitive of solar energy applications, and some 20,000 solar-heated pools now exist in California. A $3,000 solar heater for a pool kept at 82 degrees Fahrenheit from May to October in Southern California may pay for itself in less than five years at today's natural gas prices.

A number of manufacturers are currently making various types of solar collectors especially for swimming pools. Pools need only low-temperature heat, and inexpensive solar collector designs can be used. The pool collector is often a simple unglazed absorber made of black plastic. Collectors for spas, however, may be glazed and are often made of copper. Heat storage for the solar energy system is provided by the water in the swimming pool itself, and the pool's already existing pump and piping system make solar installation relatively easy.

Because pool heating is an undemanding task, almost any type of solar heating arrangement will work as long as it is large enough. The rule-of-thumb for sizing a swimming pool collector system is that the collector area should be at least 50 percent of the pool area. To extend the season beyond spring and summer, a collector area equal to that of the pool surface may be



needed. Collectors should be mounted near the pool on a surface that is tilted 10 to 30 degrees from the horizontal depending on latitude. The best orientation for the collectors is to have them face south or slightly west of south, although in California any orientation between southeast and west will work well.

Heat, water and chemicals are continually being lost from the warm swimming pool to the cooler surroundings. Reducing some of this heat loss is essential. In a solar pool-heating system, energy conservation measures will decrease the size (and therefore the cost) of the solar heater as well as the supplemental gas required to maintain a desired temperature. Wind screens and pool covers are among the devices that can lessen heat loss; pool covers are eligible for the California solar tax credits and should be used in conjunction with a solar pool heating system.

PASSIVE SOLAR ENERGY SYSTEMS

A building naturally heats up whenever the sun is shining. The amount of sun entering a building (and therefore the building temperature) is controlled in a passive solar energy system through careful design of the structure. This includes its orientation, shape, shading devices and overhangs, the materials used, amount of insulation and the size and location of windows. Essentially, the structure itself becomes a solar collection, storage and distribution system.

In one common type of passive solar house, winter sun enters directly through south-facing windows where it heats the room air by raising the temperature of the walls and floors, which are made of materials that can hold a great deal of heat, such as masonry, tile or concrete block. When the sun is not shining, heat will flow by radiation and convection back into the room. Heat flow out of the building is stopped by ceiling, wall and floor insulation and by movable insulated drapes or panels which cover glazed areas at night.

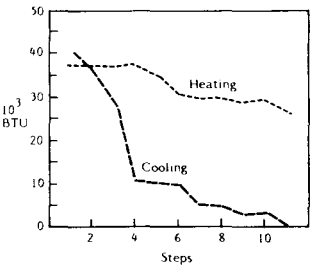
Summer heat entry into the building is minimized mainly by insulation and by overhangs that shade the windows. Since the sun is higher in winter than in summer, blocking the summer sun can be accomplished without blocking the winter sun. Cooling takes place by natural convection as heated air leaves the top of the building and cooler air enters below through strategically placed vents, and by radiation from exterior surfaces to the clear night sky.

PASSIVE SOLAR DESIGN CAN DRAMATICALLY REDUCE HOUSEHOLD ENERGY USE

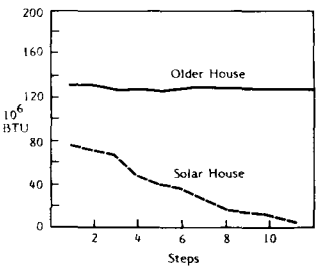
Simple Steps to Passive Solar Use

Steps	Item	Step	Extra Cost	Initial Cost Savings*
1.	Orientation	1	0	-0
2.	Orientation	2	0	$200
3.	Orientation	3	0	100
4.	Window Shading	4	$42	425
5.	Slab Insulation	5	136	0
6.	Double Pane Windows	6	548	125
7.	Tile Floor, Mass, Shading	7	292	125
8.	Add 1.3 Tons Mass	8	250	0
9.	Add 1.3 Tons Mass, Double Glass	9	370	275
10.	Add 1.3 Tons Mass, More Double Glass	10	474	0
11.	Thermal Drapes and Shutters	11	500	0
			$2612	$1250

Peak Heating and Cooling Demand
San Bernardino/Riverside



Total Annual Energy Use for Heating and Cooling-San Bernardino/Riverside

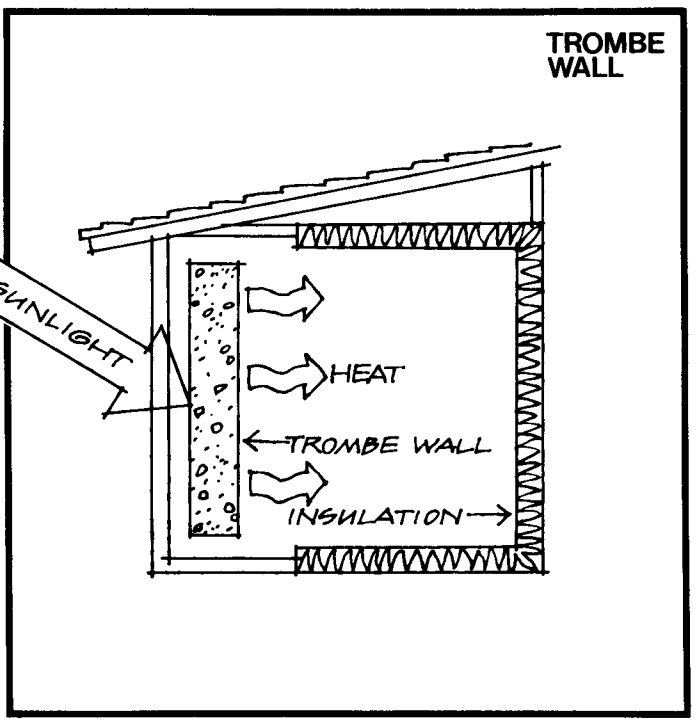


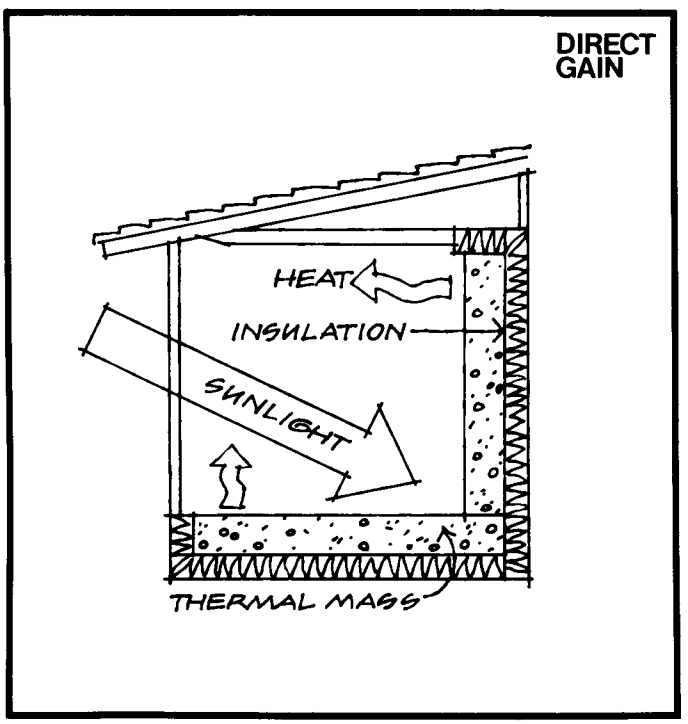
Passive solar homes are not always readily distinguishable from conventional homes. Depending on location, some passive homes may have a marketing edge because of their high comfort levels and low utility bills. Such houses do not always cost more to build or buy than conventional homes.

PASSIVE SPACE HEATING SYSTEMS

The number of passive solar buildings is increasing, for they have been demonstrated to be comfortable, reliable, durable, competitively priced and very cost-effective. A passive solar building is designed to let the sun penetrate directly through windows and onto interior walls or floors. Enough insulation, heat storage materials, shading and ventilation are included to maximize net heat gain in winter and minimize it in summer. The passive solar design takes advantage of the natural processes of heat transfer — by radiation, conduction and convection. The impact of passive solar design is shown in the charts and tables.

Direct gain is the simplest and probably most common type of passive system, and the easiest to apply to production housing. It has a large expanse of double-glazed windows in the south wall of the living space, allowing the sun to shine into the rooms. A roof overhang keeps out the summer sun. Proper insulation is essential. Vents help cool the building when the temperature is high; nighttime ventilation during warmer months minimizes the temperature rise during hot days.

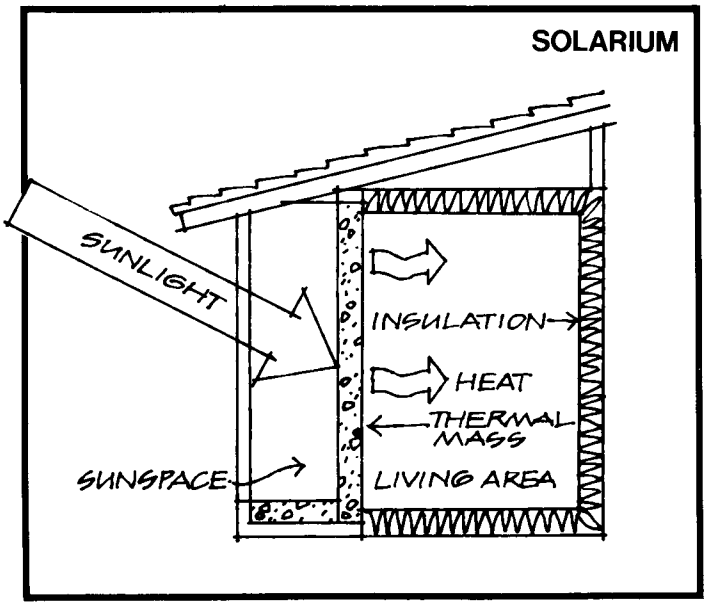




In the **Trombe Wall** type of passive building, heat collection and storage are both provided by a south-facing wall protected by glazing. The wall blocks and absorbs solar radiation. It is painted a dark color to improve heat absorption and can be made of either poured concrete, filled concrete block, masonry material or containers of water. Vents at the top and bottom allow air to circulate by natural convection between the Trombe Wall and the glazing. The wall can contain windows or it can be solid.

A third option in the passive solar design is a **solarium,** sun space or solar greenhouse. This is a glazed room attached to or integral with the south side of the building. It may be used for plants, for a pool or as a living area. Heat is collected directly through the glazing and is stored within the greenhouse in massive floors, walls, benches or in water tanks and rock beds. Shading keeps out unwanted sun. Heat flows from the solarium to the building as needed directly through a thermal wall (an uninsulated wall), by air circulation through vents or directly in the case of an integral solarium.

The solarium can produce a substantial amount of



heat for the structure. It helps cool the building in the summer by protecting the south wall. Adding a solar greenhouse is inexpensive ($7 to $10 per square foot for materials), increases comfort, lowers fuel bills and adds space and value to the home.

Typically, a solar greenhouse will provide 60 to 90 percent of annual heating and 50 to 80 percent of annual cooling needs. In some designs, 100 percent of heating and cooling needs can be provided with a temperature range of 63 to 78 degrees F.

WATER HEATING SYSTEMS

In a passive solar water heating system, also called an integral or direct-storage system, the storage tank is the collector. An unjacketed hot water tank is placed under glass or plastic and in an insulated case, so that it collects and holds the sun's energy. This system is essentially a preheater and can be used with either gas or electric backup.

The direct-storage water heater system can be installed usually for $1,000 to $1,500 and will provide about 40 to 50 percent of annual needs (with about 50 to 60 sq. ft. of glazing). It is a cost-effective solar water heating system, but cannot match the temperatures or overall heat output of active systems of similar size. It is completely reliable and requires no special freeze-protection measures.

SPACE COOLING

Using solar energy to drive air conditioning equipment is an attractive idea because cooling is most needed in summer when sunshine is most plentiful. But the technologies for active solar cooling are currently much less economical than two other cooling techniques: solar control and nocturnal cooling.

Solar-Control techniques are common sense measures that many people are using to decrease fuel bills. These include:

- Interior drapes to reflect sunlight or exterior shades or blinds to keep summer sun out;
- Special glazings and coatings on windows to reduce the amount of sunlight coming in;
- Deciduous trees, bushes and vines that provide summer shade when fully leafed and let in winter sun when bare;
- Movable exterior shading such as awnings or bamboo shades that screen out summer sun, then are removed to let in winter sun.

Nocturnal Cooling encourages heat flow from a warm building to the cool nighttime environment. Techniques involve water evaporation, radiation of heat from building masses to the night sky, and ventilation with cooler night air. They function best in a dry climate.

STATE GOVERNMENT AND UTILITY PROGRAMS

Solar energy is receiving increasing public support as a major energy source. State and Federal governments, are taking solar energy seriously enough to provide tax and price incentives, codes, and consumer protection programs. Consumers can feel more confident about purchasing solar equipment with these government back-ups. Private and public utility companies are also lining up behind solar energy. Many offer demonstration programs as well as solar loans.

STATE PROGRAMS

Special government programs have also helped spread information about solar energy systems. California's **Solar Business Office,** organized under the cabinet-level Business and Transportation Agency, works to promote commercialization of solar energy. The office works with homebuilders and lenders, as well as with the solar industry, in the areas of business assistance, market development, financing and government regulations.

The **California Energy Commission** (CEC) 1977-80 effort has concentrated on promoting solar water heating and passive solar space conditioning for new residential buildings. The Commission's target is 200,000 solar water heaters and 150,000 space conditioning installations by the end of 1981.

As part of its program, the Commission tests equipment, works to educate consumer and professional groups, provides information to the public and develops regulations and legislative proposals. Together with the Office of Appropriate Technology it conducted in 1979 a statewide competition for passive solar home designs applicable to tract housing.

The **Office of Appropriate Technology (OAT)** has prepared a solar training curriculum in the skills necessary for entry-level positions in solar-related fields. OAT's Design Team gives technical assistance on solar designs to other state agencies.

The **Office of the State Architect** designs and constructs new state office buildings to include passive and active solar heating and cooling. The State Architect is required by law to install solar water heaters on all new state office buildings larger than 10,000 square feet.

The **Department of Consumer Affairs** maintains a solar/insulation unit to answer questions about solar energy and insulation, reviews advertisements for solar products, operates a solar hot line, and mediates consumer complaints.

The **Office of Business and Industrial Development** assists solar manufacturers with their plans for expansion, relocation and marketing in California, and the **Employment Development Department** operates several solar community action programs and job development programs through its state and local CETA offices.

STATE LEGISLATION

The California Legislature has pioneered in promoting solar energy. The 1974 Warren-Alquist Act gave the California Energy Commission a major role in the development of alternative energy sources. Past legislation includes SB 150 (1977), which requires solar energy use, when feasible in all new state buildings, and SB 373 (1978), which provides interest free loans of up to $2,000 to disaster victims who are rebuilding their homes.

The major catalyst for growth of solar energy perhaps has been the 55 percent state solar tax credit, the most generous in the nation. This credit is subtracted from the amount of income tax owed by an individual. The California tax credit may not exceed 55 percent of eligible costs, up to $3,000 per function for expenditures on residential solar systems.

California's tax credit became law one year prior to the passage of the federal solar tax credit. The federal credit is generally more restrictive than the state credit. Franchise Tax Board statistics indicate that 13,000 taxpayers took advantage of the state credit during income year 1977 and 29,000 during income year 1978.

In 1978, California solar legislation resolved other issues in solar development:

- AB 2225 allows banks and savings and loans to increase new home loans to finance solar energy systems.
- AB 2321 protects solar collectors from future shading.
- AB 2851 increases Cal-Vet loan ceilings by $5,000 to allow for installation of solar equipment.
- AB 2984 authorizes the Public Utilities Commission to regulate private utility involvement in solar energy sales.
- AB 3247 requires the PUC to investigate the feasibility of long-term, low-interest loans to consumers by private utilities.
- AB 3324 requires the Energy Commission to develop in 1979 a plan for maximum feasible solar use in California by 1990.

LOCAL GOVERNMENT ORDINANCES

Two local government programs in California have resulted in landmark ordinances that strongly support solar energy and conservation measures. These are expected to serve as models for other city and county programs.

San Diego County Water Heating Ordinance

The San Diego County Board of Supervisors adopted an ordinance, effective October 1979, requiring solar water heating to be used in all new subdivisions where natural gas is not available. Beginning October 1980, solar water heating will be required in all new subdivisions regardless of the availability of natural gas. This is the first such ordinance in the nation, and it appears that many other local governments will follow suit in 1980. Savings of up to two billion cubic feet of natural gas annually (worth more than $600,000 in January 1980 prices) are expected in the San Diego area alone. The ordinance affects about 9,000 new homes built each year.

City of Davis Energy Conservation Ordinance

All new construction must meet energy conservation standards specially designed for the Davis climate. This is in addition to the state energy conservation standards for new buildings, which are the most stringent in the country.

In addition to these programs, two other important local government proposals will speed solar development. One is priority processing, which gives new home builders who use solar energy systems priority in the processing of their subdivision maps. The second involves a proposed ordinance in several counties and at the state level which would require all new heated swimming pools to use solar energy systems. Solar energy pool heating, used in conjunction with a pool cover, already pays for itself in all parts of California.

CONSUMER PROTECTION

Collector Testing and Certification

The California Energy Commission (CEC) administers two programs designed to help consumers purchase solar equipment. TIPSE (Testing and Inspection Program for Solar Equipment) is a voluntary program that enables manufacturers to have their glazed flat-plate collectors tested. The tests are performed by independent laboratories. As of December 1979 more than 40 manufacturers with more than 100 models of solar collectors had been certified by the California Energy Commission as to safety, reliability and performance.

The California Solar Energy Industries Association (CAL-SEIA) operates the CAL-SEAL program in cooperation with the CEC. A CAL-SEAL label means that a solar installation meets the technical requirements for the California solar tax credit. It adds an important element of consumer assurance to the solar industry.

Installer Training and Certification

The Contractor's State License Board has begun a supplemental solar energy classification for solar installers in addition to a regular contractor's license. State tax credit regulations require installation by licensed contractors, except in owner-installed systems.

Building Codes and Standards

Building codes are designed to protect the health and safety of the community. Solar equipment and systems must meet conventional building and mechanical codes as well as regulations specifically written for solar energy installations.

In California the most commonly used code is the Uniform Building Code (UBC). Solar energy systems must also comply with the Uniform Mechanical Code and the Uniform Plumbing Code.

The Uniform Solar Energy Code was adopted in September 1976 and revised in 1979 by the International Association of Plumbing and Mechanical Officials (IAPMO). This code has been adopted in whole or in part by the cities of Los Angeles, San Francisco, San Diego and the counties of Orange, Marin and San Bernardino. Many other local jurisdictions also accept this code and the IAPMO equipment certification. The primary concerns for active systems are fire safety, structural integrity of the building, prevention of water leakage and protection of the potability of the household water supply.

In 1977 the U.S. Department of Housing and Urban Development (HUD) issued the Intermediate Minimum Property Standards for Solar Heating and Hot Water Systems as a companion to its usual standards. These regulations are intended to provide a sound technical basis for planning and designing of HUD-funded housing. California Energy Commission conservation standards affect all new buildings constructed after March 11, 1978. Residential standards control the use of non-renewable energy by limiting the amount of energy the dwelling may expend.

UTILITY PROGRAMS

The role of the public and private utilities in solar development is increasing. Pacific Gas and Electric Company gives seminars and training sessions for company personnel that mainly concern solar energy for heating domestic water. PG&E has built several active and passive solar demonstration homes in its service area. The utility also has a solar hotline for technical information and for contractor referrals.

San Diego Gas and Electric Company has an extensive solar research and development program. The company collects solar radiation data at seven sites in San Diego County and makes it available in annual reports.

The Southern California Gas Company is actively involved in solar research and development, solar engineering and testing, public information and solar industries marketing support. Its SAGE (Solar Assisted Gas Energy) program includes well-monitored installations in multi-family applications. SoCal's MED (Minimum Energy Dwelling) project is a single-family home that uses both solar energy and conservation to reduce total energy requirements by 50 percent. Reports that describe the project are available from the company. The utility also has a hotline and provides brochures to customers on request. The solar industry support program provides cooperative solar advertising with the industry and stresses the importance of the natural gas back-up role with solar energy systems.

Southern California Edison Company considers itself a catalyst in bringing together the customer, the solar manufacturer and the contractor. It provides brochures on the use of solar energy, and sponsors a program that features a five-year service agreement to purchasers of solar energy systems used in tandem with electric water heaters.

In addition, PG&E, SDG&E, and SoCal Gas have each instituted Energy Efficient Builder Programs such as Premium Energy Conservation Home, Energy Efficient Builder Award, and the Concern Award.

All California utilities will soon begin offering lists of qualified solar contractors and in 1980 they will be working with the new State Energy Extension Service to provide solar energy audits free of charge to homeowners and building owners. Other roles for utilities will be set by the California Public Utilities Commission in 1980.

MAKING THE SOLAR LOAN

The usual place to borrow money to finance a solar energy system is a commercial lending institution: a bank, a savings and loan or a credit union. Some California lenders lead the solar loan market with discounted or preferential rates. Some have developed regular solar loan policies; others have made only a limited number of loans.

In a March 1979 survey conducted by the Solar Business Office, some lenders reported that they offer preferential terms (such as discounts on interest rates and longer payback periods) for loans on solar and other energy-conserving devices in both new and older buildings. Among those lenders offering special inducements for solar and energy conservation loans were: Home Savings, California Federal Savings, Home Federal Savings, San Diego Federal Savings, American Commercial Bank, Guarantee Savings, River City Bank, Santiago Bank and United California Bank. Twenty-two other lenders indicated their willingness to offer low-interest loans for new pool construction that incorporate either solar heating or other energy-conserving measures (a pool cover, for example).

HANDLING SOLAR LOANS

There is nothing mysterious or complicated about a solar loan. Such loans may require more attention at first because solar energy is a new field, but they are no more difficult than loans for a new roof or for an extra room. Solar loans are easily accommodated within existing formats and fall under one of the following categories:

New Home Loans

Increasing numbers of new homes will have some type of solar system. Solar water heating is the most popular application. The Solar Business Office estimates that more than 15,000 new solar water heaters will be installed in 1980, most of them in tract housing. The Office recently published a map identifying more than 120 new housing developments around California that feature solar water heating as a standard item. Financing will most often be incorporated into conventional mortgages.

In its March 1979 survey the Solar Business Office also found that 74 California lending institutions had made loans on new single-family homes that have either passive solar design features or active solar equipment; 20 had loaned on new multi-family construction, and 16 had made solar loans for commercial properties. Twenty lenders had financed new residential subdivisions that include solar equipment or passive solar design.

The criteria for a purchase mortgage on a solar home are identical to those for granting a mortgage on a conventional home. The primary concern is still the borrower's ability to repay the mortgage. If monthly energy costs are also considered in underwriting decisions, solar homes have added appeal. Few lenders are factoring in utility costs because until recently such costs have not significantly affected the value of the home as an investment. However, home energy costs may increase 20 percent a year for the next few years.

Another major concern is the resale value of the home and the soundness of the investment. Data are still lacking about the effect of solar energy systems on a home's resale value, but information is being collected as more solar homes are resold. Lenders report they do not expect any special problems reselling solar homes, and that the solar system should add to the home's value.

Home Improvement Loans

Solar is a good use for home improvement money because it reduces future energy expenses. Home improvements involving solar energy will range from a standard solar domestic water heater to a large active solar space heater. Most lenders agree that solar energy systems add value to an existing home. Several leading savings and loans give special home improvement loans for solar energy.

Personal Loans

A solar water heater could be purchased with a personal loan, but the interest on a home improvement loan is much lower than the interest on a personal loan. The advantage of a personal loan is that it leaves the home's equity undisturbed.

LOAN PROGRAMS

Solar Bank

The Congress and the Administration are considering legislation to establish a National Solar Bank, which would provide interest rate subsidies for solar loans. The program will probably begin in October 1980.

Federal Housing Authority (FHA)

Title I Home Improvement Loans

The FHA will insure loans up to $5,000 for certain non-luxury home improvements, which include solar heating systems, for a maximum term of 15 years at an interest rate no higher than 12 percent.

FHA — Mortgage Insurance

The National Energy Conservation Policy Act of 1978 allows the FHA to increase the ceiling on basic insured mortgages by 20 percent if the increase is used to cover the cost of solar systems (passive or active). The system must meet the standards of HUD and the Department of Energy.

Farmers Home Administration (FmHA)

The National Energy Act authorizes FmHA to develop a program similar to that of FHA, with a 20 percent increase for solar energy systems on rural housing.

Veterans' Administration (VA)

VA-guaranteed loans have been expanded to include solar energy and energy conservation features. VA will also guarantee loans for home improvements for solar water heating. VA recognizes the reduced utility expenses in its credit underwriting standards.

HUD Standards for Rehabilitated Housing

The Department of Housing and Urban Development has prescribed mandatory energy conservation standards, setting insulation and other requirements for rehabilitating residential housing under five HUD programs. Rehabilitation work will generally have to meet HUD standards to obtain financial assistance.

California Housing Finance Agency (CHFA)

CHFA offers a below-market mortgage lending program for home improvements, which includes solar energy. For example, a $2,000 to $2,500 loan for a solar water heater could be obtained at 7-3/4 percent for seven years. This mortgage program is funded by the sale of tax-exempt bonds. CHFA pays a fee to the private lender for processing and serving the loan. The program is available only in areas where the city or county participates. An income ceiling is established for each locality.

Cal-Vet Home Purchase Loans

The California Department of Veteran Affairs, under AB 2851 (1978), must exclude the value of solar heating equipment from the market value of a veteran's home. This prevents the cost of a solar heating system from causing the market value of the home to exceed the Cal-Vet statutory maximum of $53,000.

SECONDARY MARKET FINANCING

A primary concern for many lenders is their ability to sell mortgages for solar-equipped homes on the secondary mortgage market. Until the passage of the National Energy Act of 1978, the government agencies involved in the secondary market did not purchase loans for solar homes. The consensus was that solar technology was new and unproven. Now these agencies have been ordered by the Congress to purchase mortgages on solar homes. A major stumbling block for lenders has been removed.

There are three major mortgage companies in the secondary mortgage field — the Federal National Mortgage Association (FNMA), the Federal Home Loan Mortgage Company (FHLMC) and the Government National Mortgage Association (GNMA). GNMA is part of the U.S. Department of Housing and Urban Development. FNMA and FHLMC are federally chartered private corporations with responsibilities to Congress. These agencies in 1976 held about 10 percent of the housing mortgages. Their broader power is in providing local banks with liquidity and assuring a steady supply of credit for the home-building industry.

GNMA can now purchase solar loans of up to $8,000 each from banks and other lenders for resale in the secondary lending market. Interest rates vary from about 9.5 to 12 percent. The maximum term is 15 years. GNMA can also purchase loans of up to $2,500 for energy conservation measures with the same terms. The same law aplies to FHLMC and to FNMA for purchase of Title I FHA home improvement loans or conventional home improvement loans made for qualified solar energy systems.

FHLMC revised its appraisal form for first mortgages in October 1978 to include space for the evaluation of energy-efficient devices and systems. FNMA will buy mortgages for up to 75 percent of a home's value, and up to 95 percent with private mortgage insurance. For 1980 the agency is developing a home improvement loan that will include energy conservation and solar improvements.

APPRAISING SOLAR INSTALLATIONS

The **market value approach** is the most common appraisal technique for residences. Here the value of the home is determined by the sales prices of comparable properties. Usually there are too few solar homes in the single locality to make this technique easy to use. Obviously solar energy systems add to the value of a home — the questions is, how much? Federal Housing Authority Appraisal Guidelines recommend adding the market value of a comparable non-solar property to the difference in cost between the total heating system costs for the two properties. Until solar energy installations become commonplace, and market values can be determined by prices of comparable solar homes, appraisers will probably use discretion in determining value.

FHA Appraisal Guidelines devotes one section to solar energy equipment. It is intended as a starting point and is not meant to be complete or definitive. These guidelines may not apply to new passive solar homes.

Some solar appraisals may be made using the **cost approach** in the absence of sufficient market value data. There is little difference between evaluating a solar home and a non-solar home with this method, since the value of the system is set equal to its cost. Solar energy systems will not depreciate any faster than other building components. It may be necessary to give appraisers proof of benefit from the solar systems in the form of projected energy savings to avoid the characterization of solar energy systems as over-improvements.

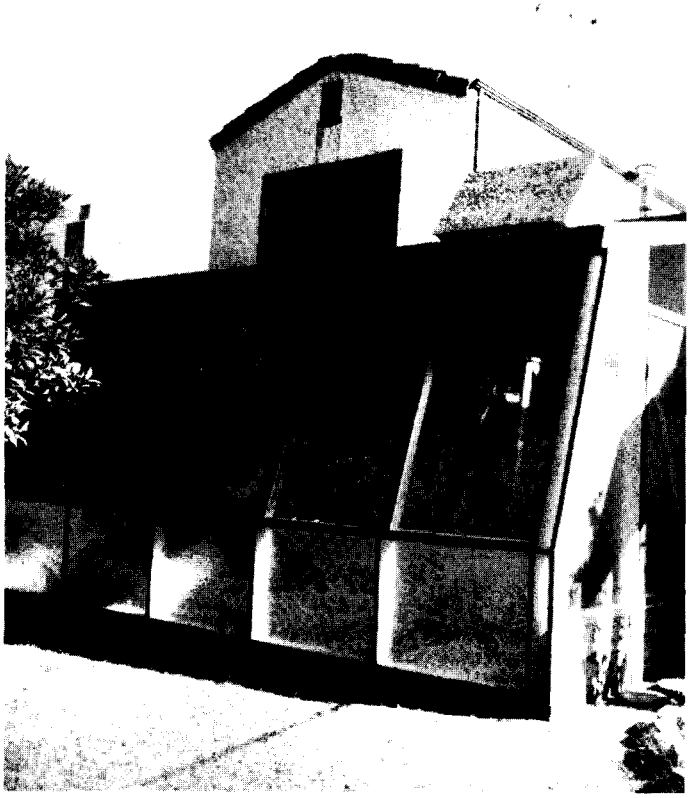
The lender should note that costs of solar energy systems are included in **property tax assessments** of new construction. The systems add value to the home and are included in the appraisal so that their costs can be included in the mortgage and their value considered upon resale. But the resulting higher property taxes (1 percent of value per year) will slightly reduce the economic benefit of the solar investment. Some retrofit projects, especially of solar water heaters, will not add to the property tax assessment if they replace existing water- or space-heating equipment.

BORROWER'S CONCERNS

Lending institutions can benefit by making sure that loan procedures for customers are handled smoothly. Lenders who are familiar with solar energy systems and know where to go for information can more effectively answer consumers' questions. Some of the solar basics are:

Site

The collection surface must have adequate access to the sun and not be shaded by trees or other buildings. A solar easement should be obtained if a tree or building improvement on an adjacent property could in the future cast a shadow on the solar collector surface. The possibility of shading is easy to determine by visual inspection.



Design

Space heating energy conservation measures such as perimeter, wall and ceiling insulation, double glazing and weather-stripping (or flow restrictors and pipe insulation for water heating) will reduce the energy system required.

The energy load should be determined in accordance with generally accepted engineering procedures. Collectors on the roof may require additional structural support, and must be accessible for repair or maintenance.

Legal

Such concerns relate to the need for a solar easement and to the requirement for building permits generally necessary for new construction or home improvement. Permits ensure that plans for the project comply with local building health and safety codes.

Business

Customers should deal only with licensed contractors and compare several written estimates. A written contract will minimize later misunderstandings. The contract should specify the work to be completed, brand names of the equipment to be used, the work schedule, the total price and the payment schedule. Final payment should be withheld until the system is operating and has been pressure-tested for leaks. The buyer should obtain a written warranty that details coverage of the equipment, length of coverage, as well as manufacturer and installer responsibilities. State labeling and certification programs offer some assistance in determining system quality. However, they are both voluntary, so a system's lack of approval by them does not necessarily indicate a problem.

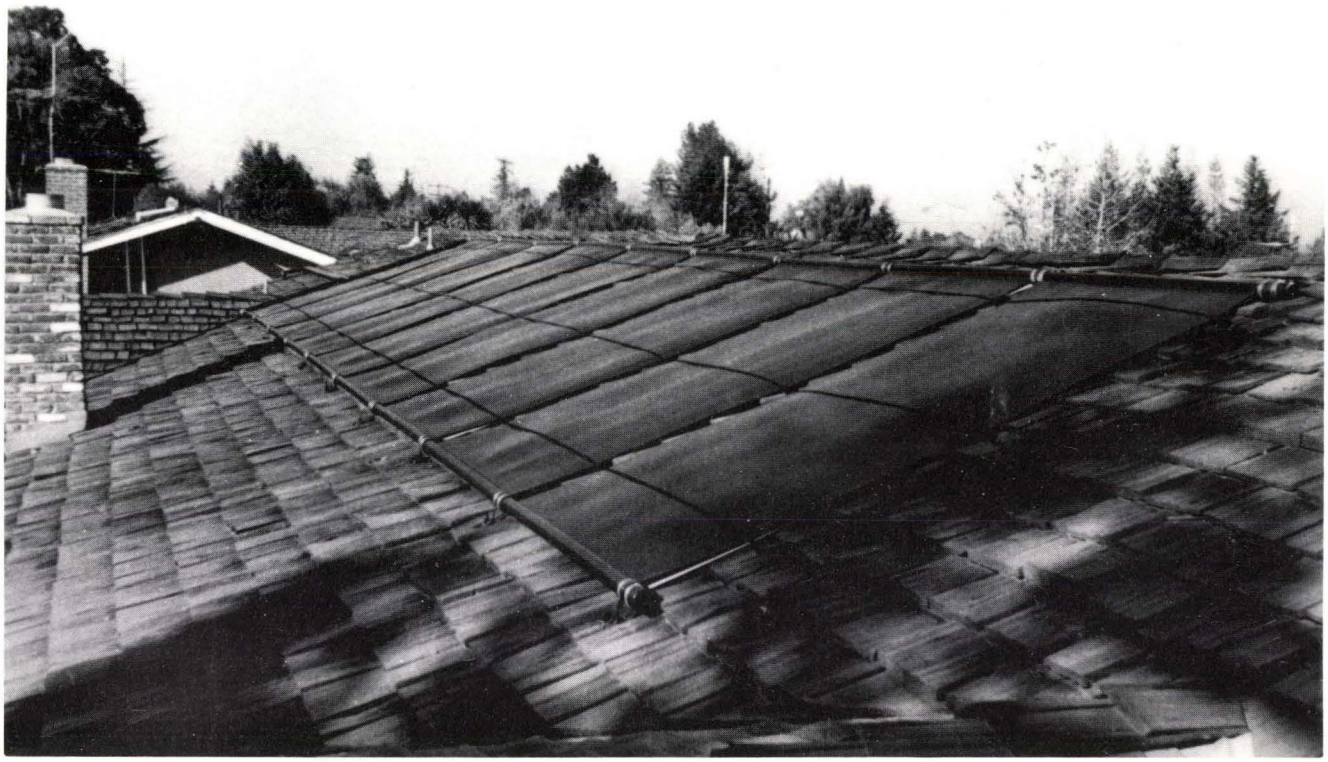
Economics

The costs of the solar system should be reasonable relative to comparable systems and to annual projected savings. Obviously, the system's lifetime should exceed the loan period. Most solar energy systems are designed to ensure durability and low maintenance requirements.

POLICIES AND PROGRAMS OF LENDING INSTITUTIONS

More and more lending institutions are adopting expanded solar energy programs. Based on a review of lenders' activities to date, such programs may have the following elements:

- An internal educational effort to acquaint headquarters staff, branch managers and loan officers with solar energy systems and lending procedures.
- A public information effort for solar loans, including newspapers and radio advertisements, payment bill stuffers, loan brochures for both branch use and consumer information pamphlets.
- A special effort to convince all homebuilders financed by the institution to incorporate solar water heaters and passive solar design elements in new construction at least as options and preferably as standard features.
- Use of passive or active solar systems in all new branches.
- Allow interested solar installers to set up a lobby display for one to four weeks in branch offices, but make it known that the exhibit is not an endorsement.
- A new home mortgage program that loans on 100 percent of the solar features (i.e., no extra down payment, in essence a slightly higher loan-to-value ratio) and that includes monthly energy savings in assessing a buyer's qualifying income.
- A general solar home improvement loan program with reduced interest rates (1/2 percent or more) and longer terms, up to 15 years.
- A special home improvement loan program for an institution's mortgages that lends on the solar improvement at the current mortgage rate (rather than the higher home improvement rate), incorporates the solar loan into the existing mortgage and extends the term of the existing mortgage to keep current monthly loan payments constant. Usually a processing fee of $50 to $200 is added to cover costs.



There are many other methods to promote solar energy and energy conservation. Such programs make good business sense, they protect valuable investments in real property and they can aid marketing efforts.

No crystal ball is necessary to forecast continued escalation in the cost of power produced by fossil fuels. This situation is spurring widespread application of solar energy. All regions of the nation can reduce their dependence on conventional fuels by tapping the sun's energy.

America's financial institutions have a unique opportunity plus an obligation to help steer the nation through this critical era of over-dependence on foreign sources of energy. By putting their weight behind solar energy the nation's banks and savings and loans can do well by doing good.

APPENDIX

SOLAR ENERGY INFORMATION SOURCES

CALIFORNIA ENERGY COMMISSION

General Information	(916) 920-6011
Tax Credit Information	(916) 920-6027

SOLARCAL COUNCIL

Solar Policy and Citizen Participation	(916) 920-7621

SOLAR BUSINESS OFFICE

Solar Business Assistance	(916) 322-9725

DEPARTMENT OF CONSUMER AFFAIRS

Solar/Insulation Unit Consumer Assistance	(800) 952-5567
Consumer Information	(800) 952-5670

DEPARTMENT OF VETERANS' AFFAIRS

Cal-Vet Solar Loans	(916) 445-2347 or (916) 920-7621

FRANCHISE TAX BOARD

Solar Energy Tax Questions	
From area codes: 209, 408, 707, 916	(800) 852-7050
From area codes: 213, 714, 805	(800) 852-5711

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Solar Energy Research Institute
1617 Cole Boulevard
Golden, Colorado 80401

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