The Architectural Committee Presents

SOLAR ENERGY
for
OAKMONTERS

Our Sun provides light, heat and, when used with Photo-voltaics (PV's), a.k.a. Solar Cells, can provide electricity.

LIGHT: Solar Tubes and Skylights can effectively bring light from the sun into dim and dark areas of our homes, such as laundry rooms, bathrooms without windows, etc., thereby reducing or eliminating the need for electric lights during daylight hours. A company called "Naturalight", a Solatube authorized dealer, located at 1929 Mark West Springs Road, Santa Rosa, provided the following information.....a 14" diameter Solatube costs about $650 and a 10" diameter Tube costs approximately $460. In addition, Solatube offers a 21" diameter model that transitions into a 2' by 2' square diffuser at the ceiling. When equipped with a Light Kit, a Solatube provides the convenience of a switched light for night use all in one illumination system.

The above data is intended to be informative only; there may be other suppliers of nature's light. A brochure from Naturalight is available in the Architectural Office.

COOLING: An Attic Fan will help keep the house cool during warm and hot periods and therefore reduce the need for air-conditioning and use of electricity. An exhaust fan, mounted on a louver in the attic will draw outside air through the vents located under the eaves and prevent heat build-up in the attic. The heat build-up radiates into the house and also degrades the roof structure. These fans have built-in thermostats and operate when the attic gets hot. They are connected to the PG&E grid. Some installations have the fans connected to a switch in the house that can be manually controlled. The thermostat is usually set to "minimum" and the homeowner can turn on the fan in the morning, on a projected hot day, and keep the air flowing throughout the day, thereby further reducing the heat build up. The purpose of the fan is to keep the attic from building up heat, not to cool it when it is hot. The attic fan runs at constant speed and consumes about 300 watts. A well insulated attic and a light colored roof will further aid in keeping the house cool. Vinyl mounted double pane windows and sliding doors, suitable shutters, blinds and drapes should be considered as part of a solar cooling system.

A Solar Powered Attic Fan called SolarStar (distributed and installed by Naturalight) is a solar powered roof top attic ventilator. It cools the attic similar to the aforementioned attic fan but operates completely from sunlight and does not require batteries, inverters or any connection to the power grid. The fan motor runs continuously when there is sunlight. There is no thermostat in the system. When the sun is low in the sky in the early morning, late afternoon and during the winter the fan motor operates slowly. When the sun is high, midday in the late spring, summer and early autumn, the fan motor speeds up and consequently provides greater cooling of the attic during the heat of the day. A single solar operated fan provides circulation of up to 1200 sq. ft. and exchanges air at 800 cubic feet per minute (cfm). In the winter, the fan runs at a low speed and helps prevent climate condensation. The SolarStar is weather resistant, leak proof and is generally compatible with all roof types.

The fan should be installed near the peak on a south facing pitched roof. SolarStar is about 12" high. A pitched fan unit is available to allow the solar panel to capture more sunlight where it cannot be directed at the sun, such as a north-facing roof. A 14" diameter hole in the roof is required. The solar fan can be used in addition to the existing grid operated attic fan or several can be used if the attic area is greater than 1200 sq. ft.

The SolarStar fan costs approximately $450 plus tax and a normal installation runs about $100. Other manufacturers also provide this type of equipment and the above is for information only. A brochure is available in the Architectural Office.

HEATING: Warmth from the sun can be used to heat water for use with the home hot water heating system. Water from the mains (cold water) is fed directly into a storage tank where in turn it is fed through pipes located in panels on the south facing pitched roof. The panels are black to absorb the heat and the hot water, on the roof, in turn is fed back into the storage tank. When water is needed for the hot water heater, it is obtained from the storage tank and is thus considerably warmer than the cold water from the "street". Thus, the temperature difference between the incoming water to the hot water heater and the output to the faucets, clothes and dishwashers, etc. is reduced. This, in turn, requires less natural gas (or electricity, if there is an electric heater) and conserves energy. The main purpose of the Solar Hot Water Heater is to pre-heat the water going into the residential hot water heater and thus keep energy usage below the baseline quantity.

The following information was obtained from Marty, "The Solar Man" at B.E.S. Solar, Santa Rosa, CA. With a 40 gal. in-house Hot Water Heater an estimate is that a two person household will use about 20 gals. of hot water per day. A 52 gal. storage tank is required and is usually mounted in the attic. Forty square

feet of solar panels should do the job. The solar panels and mounting hardware is one foot high. Various temperature and pressure safety relief valves are included. A "drain back" system is incorporated so that the fluid in the panels do not freeze in the winter. A heat exchanger may be used in the storage tank. Electric pumps are required to circulate the water and they are tied to the PG&E grid. An estimated cost for the aforementioned system is on the order of $3,000 installed.

Additional information for Solar Domestic Water Heating Systems and Solar Swimming Pool Heating Systems is available from the California Energy Commission under the "Solar Energy and Distributed Generation Grant Program." A copy of "Overall Program, Solar Energy Program Element and Distributed Generation Program Element" Guidebooks is available in the Architectural Office. There are probably other suppliers... look in the Yellow Pages.

ELECTRICITY: Photovoltaic (PV) cells convert the light of the sun directly into electricity. PV technology produces the flow of electrons (electricity) freed by the interaction of the sunlight with certain semi-conductor materials, such as silicon. The electricity produced is direct current (DC) and cannot be used as is for most home appliances. Many PV solar cells are wired together to produce a "module". Modules are linked together to produce an "Array".

A complete PV System. consists of an Array connected to an Inverter that changes the DC produced by the cells to 120 volts, 60 Hz (cycles per second) to power home appliances and be compatible with the PG&E grid. When no sunlight is available, the Array cannot generate electricity, e.g. at night, and the utility grid, or in some instances back-up batteries, will have to be used. Batteries are often included in the PV System in the event of a utility grid outage, when the sun is not shining or providing maximum power (early morning, late afternoon or in the winter). When batteries are used a Charge Controller is needed to regulate the flow of electricity to the batteries.

PV arrays should be installed on sloping south facing roofs but small amounts of additional power can be obtained if the arrays are added on east or west facing roofs.

In California, the average residential customer uses about 6000 KwHrs per year. A 2 Kw roof top system would probably provide 50% of an "average" customer's total demand and may cost about $15K-$20K installed. To get an approximate "feeling" about electricity use... a Fridge uses about 0.7Kw when operating, an electric clothes dryer about 4 Kw, a wall mounted oven about 5Kw, a 100 watt output incandescent bulb 0.1Kw, an equivalent 100 watt light output fluorescent bulb about 0.03 Kw, a Cable Box with the TV "on" about 0.4 Kw, etc.

One square foot of a PV module produces about 10 watts of power in bright, direct sunlight. Therefore, a 2 Kw system would require about 400 square feet of roof area, considering we're hardly ever in direct sunlight throughout the day or the season.

A PV system can be installed on any type of roof, but some are less expensive and easier to work with . Composition shingle roofs are the easiest, slate roofs the most difficult. . PV units, recently on the market, can be used in place of the usual roofing material in both new construction and re-roofing.

The California Energy Commission Emerging Renewables Buy-Down Account will reduce the up-front price consumers pay to purchase a PV System. For example, though not necessarily pertinent in Oakmont, in the Sacramento Municipal Utility District (SMUD) the customer's cost to buy a typical 2 Kw Solar PV System is about $4.8K. The full cost of the system is about $9.0K with SMUD contributing a buy-down of about half.

New Metering allows a PV system to integrate with the Utility grid and feeds any surplus PV generated electricity into the grid. In essence, the PV user is banking the excess power and can use the amount of electricity, later, at no cost. Net Metering allows the electric meter to spin forward when using the grid generated electricity and backward when the PV system is supplying it.

Most of the aforementioned information has been obtained from the California Energy Commission's Handbook "Buying A Photovoltaic Solar Energy System, A Consumer's Guide", dated April 2001. A copy of this Handbook is available in the Architectural Committee Office for perusal and provides all information necessary for purchase, installation , sources for PV Solar Systems, buy-down, Net Metering , costs and applicable forms.

GENERAL: Civ. Code 714 states "Any covenant, restriction or condition... that effectively prohibits or restricts the installation or use of a solar energy system is void and unenforceable." Consequently, Oakmont cannot restrict said use but it is recommended, at this time, that solar panels be flush mounted on roofs. Thus, Approval from the Architectural Committee is not required but when an installation is proposed the Committee should be informed and a member participate in the selection, design etc. in order that we may gain information and learn about renewable technology.

7/13/01