IMPLEMENTATION PLAN

The Santa Barbara County Million Solar Roofs Partnership

Solar Energy in Santa Barbara County: The Next Steps for Removing Barriers

A project of the Community Environmental Council

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Supported by a grant from the Department of Energy's Million Solar Roofs Partnership

Authors:
Tam Hunt
Jenny Phillips
Karen Feeney

Editor:
Sigrid Wright

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National Energy Conditions

According to the U.S. Energy Information Administration, nearly 90 percent[1] of our electricity nationwide comes from generation plants that burn fossil fuels such as natural gas, coal and oil, and nuclear power stations. All of these energy sources present a number of environmental, economic and political problems – some of which are becoming increasingly urgent.

In order to better understand the increasing movement toward renewable energy sources such as solar power, it is necessary to take a hard look at what we can expect our future to look like if we do not aggressively and immediately change course from our current energy path. Some of the most pressing concerns – today and more so in the future – include:

- **Reduced national and world security.** The U.S. imports almost 60 percent of its oil — much of it from unstable Middle East countries such as Saudi Arabia, Iran, and Iraq. Other countries with large oil and gas reserves include Russia, Venezuela, and Nigeria, with political and environmental problems of their own. By relying on unstable foreign countries, or nations with governments anathema to our values, we diminish our national security. We also strengthen claims by some that the United States fights foreign wars, at least in part, to secure oil supplies. In addition, nuclear power generation produces wastes that can be converted into bombs that can be used to devastating effect.

- **Increasingly vulnerable national economy.** Experts predict that at current consumption rates, a global peak in oil production may be achieved very soon, or may have already been reached. Others, such as the U.S. Energy Information Administration, state that the peak may not arrive for another decade or more. What is clear, however, is that global oil production will indeed peak in the not-too-distant future. Consequently, the cost of a barrel of oil is expected to continue to increase over the next decade, which will continue to increase the negative impacts we've begun to witness in the U.S. economy. Moreover, our national trade deficit is due in significant part – more than 25 percent according to recent figures – to our oil imports, further weakening our economy as we become beholden to other nations for finances to subsidize our ever-growing trade and budget deficits. Our economy and economic growth are clearly connected to cheap sources of energy. If these go away, so does our economic vitality.

[1] The remaining 10 percent of our electrical supply comes from geothermal, hydroelectric, and other renewable sources such as solar and wind.

- **More climate change.** The burning of fossil fuels is known to release carbon into our atmosphere, which in turn is known to affect our climate. While the magnitude of these changes is unclear, we know that globally we are already experiencing some of the effects of global climate change: increased temperatures, particularly near the poles; retreating glaciers and polar ice caps; more intense hurricanes; more intense droughts; and the loss of amphibian species. We cannot even hope for a reversal of global warming without a major transition to renewable energy.[2]

- **Air pollution.** Car exhaust and sunshine add up to smog, and California has plenty of each. What's worse, thermal inversions in many parts of the state trap the air and lead to a higher concentration of pollutants. While the tri-counties region enjoys cleaner air than its neighbors to the south, our region still exceeds allowances for ozone pollution and particulate matter. If we continue to rely on fossil fuels as our population grows, we can expect an increase in car exhaust and emissions from marine shipping in the channel, leading to worsening air quality. What's more, burning gasoline and diesel creates particulate matter that has been identified as the number one airborne carcinogen in California, and has been associated with heart and respiratory problems among normally healthy people.

State and Local Energy Conditions

Like the rest of the nation, Californians have many reasons to pursue renewable energy resources, but an increasingly important incentive is the rising cost of fossil fuels. With 42 percent of California's electricity generated from natural gas — and with natural gas prices reaching $14 per million BTU in 2005, prompting much higher electricity rates[3] — renewables are proving to be increasingly cost-effective. And California is not the only region seeing this trend. Recently, one of Colorado's major private utilities, Xcel Energy, announced that customers who had signed up for a 100 percent wind power

[2] A recent study has found that nuclear power plants using high-grade uranium ore emit half as much carbon dioxide, when the full lifecycle is considered, as natural-gas combined cycle power plants. With lower grade ore, nuclear power plants may emit as much, or more, carbon dioxide as natural gas power plants. (van Leeuwen, Jan Willem Storm, and Smith, Phillip, http://www.stormsmith.nl/.) Time will tell whether these authors are correct in their analysis.

[3] Southern California Edison, our South County utility, has requested a 15 to 20 percent rate increase for 2006, and PG&E, our North County utility, has requested an increase in rates as much as 20 percent shortly.

[4] Denver Post, October 24, 2005, online edition.

product will pay on average *15 percent less than regular customers* in light of rate increases prompted by higher natural gas prices.[4]

Also like the rest of the nation, Californians are feeling the effects of increasing transportation fuel costs. In the next few years we may see some of those fuels replaced by electricity, as may be the case with a new version of the hybrid car now being developed. With this technology, additional battery capacity in a standard gas/electric hybrid vehicle could be recharged at home or at a public recharging station, drastically reducing the need to refuel the car with gas except for on long trips. In this scenario, renewable energy sources such as solar photovoltaics could generate the electricity needed to charge the battery – possibly at far less cost per mile because electricity is, per unit of energy produced, far cheaper than gasoline. Whether electricity produced from solar power will be cheaper than gasoline, for use in plug-in hybrid vehicles, remains to be seen, but other renewables, such as wind power, are cheaper today.

As the cost of traditional fuels continues to rise, California will need to aggressively pursue other energy sources to meet its electricity needs. In Santa Barbara County, solar power may be the best (and in some cases only) option for local renewable power for the most populated segments of the region. The solar industry offers some of the most developed and most promising renewable energy technologies on the market today, including solar photovoltaics (electricity), solar hot water (thermal energy), and concentrating solar power (for utility-scale generation) — all of which are feasible in this region.

Solar photovoltaics in particular are in a period of exponential growth in some parts of the world – particularly in California, Japan and Germany. (See figure 1.) This phenomenal growth can be attributed to a number of factors, but a primary one for California has been the residential and business rebates provided by the state government to reduce the up-front cost of solar installations – as well as the tax benefits provided by both the state and federal governments.

California's rebate program is financed through a small Public Goods Charge paid by all electricity customers in the state. This tax finances not only rebates for PV systems, but also energy efficiency projects and the above-market costs for renewable power purchased by the utilities under the state-mandated renewable energy goals (the Renewable Portfolio Standard, currently requiring 20 percent renewable electricity by 2010).

Since taking effect in 1998, rebates have achieved part of their goal by strongly incentivizing the installation of new solar power systems. They also have

lowered the cost of solar equipment (although prices have actually increased in the last year due to silica cost appreciation and increased demand). The long-term price depreciation trend should resume before too long. As can be seen from the chart below, the recent cost increases have not affected the sharp rate of growth of PV in California.

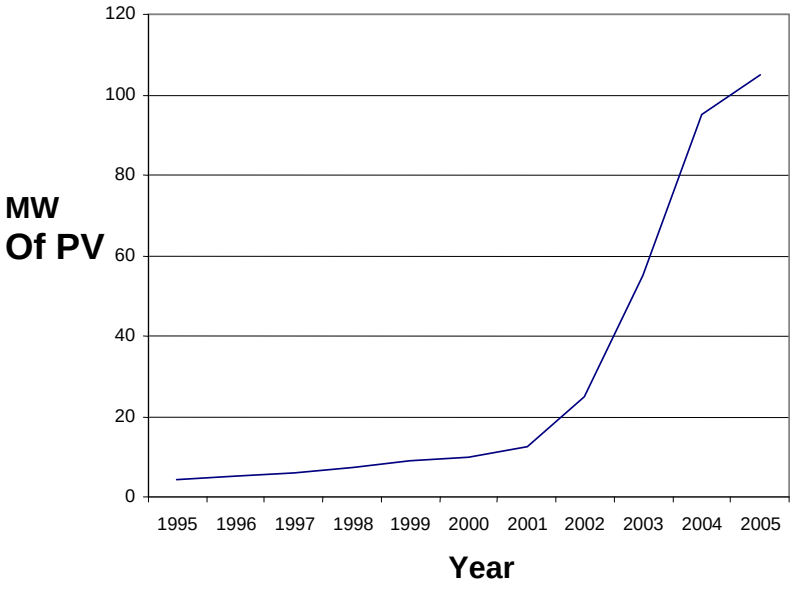

Figure 1. Cumulative installed PV capacity in California.
(Source: California Energy Commission.)

About the project

The U.S. Department of Energy's Million Solar Roofs Partnership (MSR) is a collaborative venture of state and local partnerships that brings together business, government, community organizations and the energy industry with a commitment to install solar energy systems on one million roofs in the U.S. by the year 2010. The federal project supports states and local communities as they develop and sustain efforts to advance the use of solar energy technologies.

In October 2004, the Community Environmental Council (CEC) received an MSR grant to increase the use of solar in Santa Barbara County. In the first year of the project, CEC met with local partners to identify the technical, economic and political barriers to the use of solar energy in the county and recommend action steps for overcoming these barriers. An initial outline of these barriers and initial suggested actions for overcoming them was released in December 2004.[5]

This report expands on that outline and serves as a roadmap for developing and strengthening local solar energy markets. It is an implementation plan that sets specific goals, and which includes a strategy for assessing, prioritizing, and measuring these goals. The report and project focus on the two technologies currently available to the average consumer: solar photovoltaic electric systems (which produce electricity from sunlight) and solar thermal systems (which produce heat for domestic hot water, space heating, or swimming pools). We do not examine concentrating solar plant technologies because, while we consider that technology very promising, it is beyond the scope of the Million Solar Roofs program.

[5] *Removing Barriers to Solar Energy Use in Santa Barbara, County.* (Available at www.fossilfreeby33.org.)

Santa Barbara County Million Solar Roofs Partnership

Allen Associates
Bermant Development Company
Campanelli Construction
City of Buellton
City of Goleta
City of Santa Barbara
City of Santa Maria
County of Santa Barbara
DesignARC
Deventec
Dexter's Solar Radiant Energy Services
D.L. George Construction Company
Fronius USA
James Johnson, former City of Santa Barbara Planning Commissioner
JDK/AIA, Architect
La Casa de Maria
Lawrence Thompson, Architects, Inc
Mac's Solar
Midland School
Midstate Bank
Montecito Bank & Trust
Nuclear Age Peace Foundation
Penfield & Smith
Poirier & David Architects
R&M Technologies
REC Solar
RWE Schott Solar
Santa Barbara Bank and Trust
Santa Barbara Contractor's Association
Santa Barbara County Action Network
Santa Barbara County Air Pollution Control District
Santa Barbara County Federal Credit Union
Santa Barbara Museum of Natural History
Santa Barbara School Districts
Shell Solar Industries
Southern California Edison
Sunrise Energy Solutions
The Solar Energy Company
The Sustainability Project
UCSB Housing & Residential Services
UCSB Physical Facilities
URS Corporation
U.S. Department of Energy

Why solar?

In addition to the general reasons, discussed above, for supporting renewable energy, there are many reasons to support solar power as a technology, such as:

- **It increases our nation's energy independence and energy security.** California's energy crisis, during 2000-2001, was just the latest in a long cycle of price fluctuations. Ultimately, the best way for local governments to reduce their vulnerability to unstable energy markets is to produce more of their own electricity with substantial investments in solar and other renewable sources, whose fuels cost little or nothing, locking in the price of electricity for the lifetime of the project.

- **It creates jobs.**
  According to an industry study, every $100 million in solar photovoltaic sales creates 3,800 high paying, skilled jobs in diverse areas such as glass and steel manufacturing, electrical and plumbing contracting, and architecture and system design[6]. The same study found that, compared with conventional power plants that use fossil fuels, solar thermal power plants create two and a half times as many jobs for the communities in which they operate[7].

- **It reduces global warming pollution.**
  For every megawatt of solar installed, more than 870,000 pounds of global warming pollution (CO2) are eliminated each year[8].

- **It allows electricity to be produced in the place where it is consumed.** Solar power systems can be placed on existing houses, businesses and schools. The practice of allowing individual users to generate their own power, quietly and safely, is known as distributed generation (DG). DG saves significant costs over conventional central station generation because it eliminates the need for new transmission lines to transport power from where it is created to where it is needed.

- **The infrastructure needed to support solar power already exists.** Adding solar to homes and businesses does not require re-wiring or massive infrastructure changes. In fact, we estimate the potential for more than 80 megawatts of electrical energy to be generated if solar photovoltaic systems were installed on existing, appropriately oriented residential units in Santa Barbara County[9]. If installed, this amount of solar power would supply about five percent of annual electricity demand in Santa Barbara County. Solar hot

water has similar potential, and concentrating solar power (CSP) has a much larger potential with utility-scale projects like the 350 megawatt array currently operating near Barstow -- enough to power about 350,000 homes at peak production. If only 3,000 acres were developed with concentrating solar power dishes (one of a few types of technology available today), more than 1.6 billion kilowatt hours could be produced each year. This amount, requiring less than 0.2 percent of the county's land area, could generate about half of the county's current electricity demand[10].

- **Rooftop power can be included in new developments.**
  By incorporating solar electric systems into the design of new homes and businesses, our community's power generation can stay in step with growing needs without having to overbuild generation capacity, as is often the case with conventional large scale power systems.

- **The industry's costs are expected to continue to drop.**
  The cost of solar energy has dropped 71 percent since 1980 and will continue to drop as demand increases and more production capability comes on line. Prices have increased slightly over the last year – primarily because of rapidly increased demand in Germany and constrained silica supplies. However, these trends should be short-term as the solar PV industry finds new sources of silica and ramps up production to meet growing demand. The solar industry is currently a $7 billion industry internationally[11]. Analysts estimate that the industry will grow to $30 billion within the next five to seven years, even with existing barriers[12].

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[6] California Solar Industry Association website: Solar: Jobs for Today and Tomorrow ; www.solardev.com/SEIA-solarjobs.php.

[7] *Ibid*.

[8] California Air Resources Board.

[9] Preliminary results of a study commissioned by the Community Environmental Council for the Million Solar Roofs program, modeled after a similar program completed by Marin County.

[10] At 250 kW per acre, per a National Renewable Energy Laboratory study on CSP. Community Environmental Council figures for electricity demand are from the California Energy Commission. This document does not, however, focus on CSP, as that technology is beyond the scope of the Million Solar Roofs Partnership. The CEC will work to promote CSP through its broader Fossil Free By '33 program and we will be producing a solar energy blueprint, including a discussion of CSP technologies, sometime in 2006.

[11] "World Sales of Solar Cells Jump 32 Percent," by Viviana Jimenez, Earth Policy Institute

[12] Daniel Pellegrini, Cooperative Community Energy, from Solar Expo 2004 conference.

Local financial barriers

When talking with people about "going solar," the barrier mentioned most frequently is the high initial cost to purchase a system. Many of the issues related to this can only be addressed through market supply and demand actions at the national or international level, or by establishing consistent rebate or performance-based incentives at the state or federal level. However, there are some steps that can be taken on the local level, including creating affordable loan packages through local financial institutions.

The primary financial barriers to solar are:

1. The high up-front cost of solar power systems

One way to make solar more affordable to a greater number of people is to reduce the financial impact of the initial cost of the system. This can be accomplished through a number of means, including:

- Establishing low interest loan programs where the monthly payments are lower than the consumer's energy bill;
- Eliminating the up-front cost of solar installations by having a third party purchase the system and charging the end user a monthly fee; and
- Forming a cooperative to share the cost of a system and achieving some economies of scale.

There are currently no working models of the latter two mechanisms for residential applications. A number of companies, however, are offering a no up-front cost option for larger facilities, such as URS Corporation, with offices in Goleta, and SunEdison, based in Maryland. A number of local entities are in conversations with these and other companies about solar power facilities.

For homeowners, the most attractive options currently available are low interest home equity loans or lines of credit, where the interest on the loan can be tax deductible.

One shining example of a local lending institution helping to promote solar is the Santa Barbara County Federal Credit Union (SBCFCU). Recently, the credit union installed a 38 kilowatt solar system on its headquarters in Santa Barbara, and in doing so, became the first credit union in California to have a solar electric system installed on its building. Beyond that, SBCFCU has unveiled a new solar loan program that encourages its members to do the same. The loan program provides members with 15-year loans at interest rates of three to four percent, with no appraisal required.

If other institutions followed the credit union's example, we could see the benefits of low-interest financing spread much further than is possible with the credit union's program, which is available only to its members.

2. The misperception that solar systems do not add resale value to a home or business

This hurdle is partially due to real estate appraisers not placing value on solar systems as assets. However, this perception may be changing as new home buyers appear to be seeing the value of solar. This has been documented in a recent study by Shea Homes, a large home builder based in California, which saw that the homes with solar power in a new large subdivision in San Diego sold faster and at a higher price than homes in the same subdivision without solar.

3. Misperceptions regarding the payback period for solar installations

Many potential solar buyers are confused about the appropriate payback period (the amount of time it takes to recoup the cost of the capital investment) for solar installations. The length of this payback period depends on the cost of the installation, the amount of energy the system generates, the availability of rebates and tax credits, and the cost of energy paid to the local utility. Thermal water heating systems have the lowest payback period – between two to three years. Commercial solar installations currently enjoy more financial incentives than residential installations, including accelerated depreciation and federal tax credits (which will also be available for residential installations on January 1, 2006). This can reduce the payback period on some commercial installations down to as short as three to five years.

If consumers are able to secure low interest financing for their installations — where the cost to repay the loan is less than their monthly utility bill — there may be an immediate positive cash flow regardless of the time that it costs to recoup the full cost of the installation. If a resident plans to stay in the home for a decade or more, a positive cash flow will be the most important concern, and the actual "payback period" of lesser importance.

4. A misperception that solar installations increase property taxes

Some local solar installers say that property owners believe they could see an increase in their property taxes after installing a solar energy system. There is good news: it's not true. According to the Santa Barbara County Assessor's Office, "active solar energy systems" are excluded from the legislative definition of "new construction" and

therefore are not assessable. In other words, you are not taxed additionally if you install an "active solar energy system" on your home. However, this exemption does not apply to solar swimming pool heaters, hot tub heaters, passive energy systems or wind energy systems.

Action steps to reduce financial barriers

The high initial cost of installing any solar system is surely the greatest barrier blocking the widespread use of this type of power in Santa Barbara County and elsewhere. Accordingly, we propose the following solutions:

1. **Work with local financial institutions to provide affordable funding for solar installations**

The financial barriers subcommittee of Santa Barbara's Million Solar Roofs Partnership will continue to work with local lending institutions to develop low-interest solar loan programs. As mentioned earlier, the Santa Barbara County Federal Credit Union already offers a program of this type for its members, funding residential installations at a lower-than-market interest rate, depending on credit history. This loan also has a quick approval time of one week. There are many existing local lending institutions in the Santa Barbara area, and the financial barriers committee has initiated discussions with these entities regarding creating solar loan programs similar to the credit union's – keeping in mind that commercial banks exist in a different business environment than credit unions because of different tax advantages, making it more difficult for commercial banks to offer below-market loan products without financial incentives of their own.

Another opportunity for solar lending in the Santa Barbara region may come from one, or all, of three new banks moving to the area. CEC staff and the financial barriers subcommittee plan to meet with these incoming banks to promote the idea of embracing solar and renewable energy financing as a specialized program for our area. A solar financing program may be a vehicle for the bank to gain community recognition and help the bank develop a strong community bond, while helping to expand the use of solar in our community.

<u>Further action steps for the Partnership:</u>

- Continue to meet with existing lending institutions to discuss the possibilities of a solar financing program.

- Continue to work with existing and new financial institutions and MSR partners to develop a "Funding for Solar" document that outlines financing options for residential solar installations, and develop low-interest loans for solar power.

2. Work with MSR partners to develop a solar utility plan

Tax-exempt entities that do not have a tax burden, such as non-profit and local government organizations, are unable to take advantage of the tax rebates that make solar installations more affordable for other entities. The Million Solar Roofs Partnership has been working to determine the feasibility of creating a solar utility that would eliminate the up-front cost of a solar installation, focusing primarily on hard-to-reach sectors such as affordable housing projects, non-profits, and local governments. The goal in creating a solar utility would be to expand the current solar market in such a way that it will not take away business from local solar installers. Rather than taking a piece of the pie, a solar utility would grow the pie by finding untapped (and perhaps through traditional financing mechanisms) markets.

The primary features of a solar utility would include:

- Tax-exempt organizations and low-income residents would be eligible to utilize the solar utility.
- Solar panels would be installed with no up-front cost to the end user.
- The property owner would pay the solar utility for energy consumed.
- After a fixed amount of time, the ownership of the system may transfer from the solar utility to the property owner.

The advantages of businesses and residents buying energy from a solar utility would include:

- No up-front cost to install a solar system.
- Energy may be purchased at a fixed rate. When standard utility prices increase, solar utility energy may remain constant, depending on the contract terms.
- The end user may eventually own the system once the investment is paid for through electricity rates.
- The business or individual can take pride in using a renewable energy source with minimal financial burden.

Further action steps for the Partnership:

- Work with MSR partners to identify the market for a solar utility.
- Continue to develop a solar utility business plan.
- Identify funders/partners.

3. Develop a "Sunny Day" fund to reduce the cost of renewables for residents and businesses.

California state rebates are substantial, but prices for solar PV remain high for many residents, non-profits and local governments. For this reason, we are developing, in parallel with the solar utility concept, a fund for a regional loan buy-down program or for local rebates in addition to state rebates. If local governments and others are serious about supporting solar power, we may hope to obtain contributions for such a fund from these entities. We are also examining the potential of individual contributions to this fund and CEC has completed a beta version of a website allowing individuals to contribute to this fund based on the "true" cost of gas, according to a study that attempts to internalize the externalized costs of gasoline. This website is available for viewing at www.fossilfreeby33.org and may be developed into a more detailed site.

We may also seek to emulate Colorado's Renewable Energy Mitigation Fund — a program launched in 2000 by Aspen and Pitkin Counties in Colorado that charges new homeowners a fee if their home exceeds 5,000 square feet and another fee up to $100,000 if they exceed the "energy budget" allotted to their property by the local building code. As of Fall 2005, this program had raised more than $3.5 million for energy efficiency and renewable energy projects for the region.[13] If enacted locally, a similar program would have many benefits, not the least of which would be to slightly inhibit the construction of very large homes while creating long-term financing for local renewable energy and energy efficiency projects.

Further action steps for the Partnership:

- Work with local governmental and private sector institutions to secure seed monies.
- Leverage seed monies to create a larger fund.
- Develop the potential for a return on investment for donors, rather than simply rely on charitable contributions.
- Work with local governments to enact a program similar to Colorado's, possibly as part of our solar ordinance outreach process.

[13] Conversation with Gary Goodson, December 7, 2005, Community Office for Resource Efficiency, www.aspencore.org

Local institutional barriers

Conversations with representatives from local solar companies and government agencies make clear that permitting issues have been a significant hurdle to moving solar power forward in our community. For example, every jurisdiction has a different process for permitting solar electric systems, some of which require review by an architectural review board for potential aesthetic conflicts, while others do not. Some forms of solar installations (e.g. ground mounted) require land use permits, while others (e.g. roof mounted) do not. Permit fees can add thousands of dollars to the cost of installing a solar system on a home or business.

Another institutional barrier is that some local government agencies have not set the use of solar or other renewable technologies as a priority, either for their own operations or for the community as a whole. As a result, few agencies incorporate solar power into their energy portfolio. Still another barrier is that renters, who make up approximately 40 percent of our housing market, are unable to take advantage of solar because they do not own the building they live in. While they typically pay their own utility bills separate from their rent, they have little control over the source of their energy since the landlord owns the building.

More specifically, the barriers we've identified are:

1. Permit review staff do not have adequate training in current solar technologies

Local permit agencies, including planning and building departments, have historically not understand current solar technologies. This can lengthen the complexity and time required to process a permit request. In reality, the majority of solar installations are standard systems containing consistent components approved by Underwriters Lab or the California Energy Commission, requiring only simple electrical and structural review prior to installation. This holds true for both photovoltaic and solar water heating applications, whether roof or ground mounted. However, because this fact is often not recognized by permitting agencies, unnecessary conditions may be placed on projects, adding to the complexity and cost of the installation.

This barrier is being eliminated or significantly reduced in some local jurisdictions, such as the City and County of Santa Barbara, with adoption of new permitting guidelines that eliminate architectural review for smaller systems and reduce fees.[14]

[14] These permitting changes have yet to be finalized, at the time of this report, but should be sometime early in 2006.

2. Permit processes are inconsistent between jurisdictions

Every jurisdiction has its own requirements for processing solar permits. This makes obtaining permits very confusing and frustrating for local solar contractors who provide systems for clients in multiple jurisdictions throughout the county. It also increases the complexity and the amount of time required for processing permits. We applaud the County of Santa Barbara in being the first local jurisdiction to come into compliance with the state Solar Rights Act, by significantly reducing permitting barriers to solar power.

3. Permit fees can add to the expense of already costly systems

Solar electric systems may require review by planning agencies, architectural review boards, and building departments. In some cases, when the building or property on which the solar system is to be installed lies within the Coastal Zone, additional review may be required. Each of these steps comes with not only its own review process, but its own fee structure. These fees can add significant additional costs to the installation of a solar system.

4. The panelized design of solar electric systems is not considered compatible with existing community aesthetic standards and architectural requirements

The tension between promoting solar power and maintaining aesthetic standards is particularly noticeable in the city of Santa Barbara, with its Mediterranean style and design requirements for red tile roofs and stucco walls. This tension is exacerbated by the fact that few new homes are being constructed in Santa Barbara, pursuant to long-standing slow-growth development policies. It is generally easier to design solar systems in new construction rather than incorporating them after the fact in an existing structure, where they may look foreign. As a result, slow -growth policies contribute to a slower solar power adoption rate than may be seen in other regions with faster growth rates.

This conflict is not dissimilar to how other common architectural features may have been viewed in the past. For example, only in the last 50 years have attached garages become the norm rather than the exception. These features have become standard residential and commercial architectural features, as should solar installations. We hope the question asked will one day be "why don't you have solar panels?"

5. Some planning agencies and design review boards have the misperception that glare is a significant issue associated with solar panels

The issue of glare impact on surrounding properties has been a basis for opposition to, or even denial of, solar installations in the Santa Barbara area. While there may be some situations where glare needs to be addressed, this is rare. For example, the Federal Aviation Administration (FAA) conducted a comprehensive aeronautical study for a proposed 100 KW installation on a 27,000 sq. ft. United Parcel Service building adjacent to the Palm Springs Airport. The FAA found that solar panels absorb over 90 percent of incoming solar radiation and, consequently, did not pose a significant hazard to the nearby airport.

6. The majority of local government agencies have not set the installation of solar or other renewable technologies as a priority

While the California energy crisis of 2000-2001 inspired some concern about energy availability, reliability, and cost, few local government agencies have taken a serious long-term look at future energy scenarios and the impacts on their operations. The Santa Barbara region is not much different, and the majority of agencies are not incorporating solar into their existing or future energy portfolios. With recent increases in the cost of natural gas and oil (which may not be purely a temporary phenomenon in light of growing "peak oil" concerns) investing in solar now will most likely pay off in the future. The potential impacts on our local economy from increasing and unstable energy rates are significant, as was exemplified during the energy deregulation debacle in California only a few years ago.

As mentioned above, some local jurisdictions, such as the City and County of Santa Barbara, are placing a renewed emphasis on solar energy and energy efficiency. We applaud them for these efforts and urge them to do more.

7. Tenants, who often pay their own utility bills, are not able to benefit from the use of solar

Landlords have few incentives to install solar on their rental properties. Since owners of rental properties typically do not live in their own buildings, they do not benefit from the energy savings gained by the installation of a solar system. The tenants — who are usually responsible for paying all or a majority of their utility bills — would financially benefit from solar systems but typically cannot install solar on their rented home or office building or are not interested in making this level of leaseholder improvement. With rental properties making up 40 percent of the total properties in Santa Barbara, a significant number of buildings probably will not "go solar" without additional financial assistance.

Action steps to reduce institutional barriers

The institutional barriers subcommittee of Santa Barbara's Million Solar Roofs Partnership recommends the following action steps for reducing or eliminating the institutional barriers identified in this report. We have been pursuing many of these over the last year, primarily by working with the City and County of Santa Barbara to update and streamline their separate permitting procedures for solar PV systems, in line with the California Solar Rights Act. We should soon see these changes finalized with the City of Santa Barbara and, as mentioned earlier, the County of Santa Barbara has completed their revisions, streamlining the permitting process for solar PV.

1. Examine efforts in other counties and states to identify successful solar-promoting programs

A number of other jurisdictions have programs that promote solar power that are worth exploring. For example, some communities now require that new government buildings meet the U.S. Green Building Council's standards for Leadership in Energy and Environmental Design (LEED). LEED standards promote a number of energy efficiency improvements, such as double-pane windows, improved insulation, passive solar design, as well as solar power. Specifically:

- The State of California requires new state-funded buildings to reach the LEED Silver level. The City of San Diego requires the same of City projects, and Alameda County requires new buildings to be certified LEED Silver or higher. San Mateo County requires that buildings 5,000 sq. ft. or lager be LEED certified to the highest "practical" level.
- The City of Santa Monica offers grant money for new private sector buildings built using LEED standards.

In addition, several communities have programs that specifically promote renewable energy and conservation:

- In 2001, the City and County of San Francisco passed a $100 million revenue bond to be spent on solar panels, wind turbines and energy efficiency measures for public facilities.
- That same year, Marin County put in place a BEST program with the Community Development Agency to "enhance energy efficiency and conservation in residential, commercial, and community facilities."

- In Pitkin County, Colorado, new buildings must meet energy requirements. Those that consume more than the limit can install renewable energy systems or pay a renewable energy mitigation fee.

Further action steps for the Partnership:

- Finalize the permit streamlining process with the City and County of Santa Barbara and extend this model to all local governments in our region.
- Evaluate the success of existing government solar promotion programs.
- Evaluate the feasability of applying elements of successful programs to Santa Barbara County.
- Compile a list of the most successful and most feasible programs for Santa Barbara County.

2. Draft a model solar energy ordinance for Santa Barbara County

Components of successful renewable energy programs from other regions are being modified and incorporated into a model solar energy ordinance for Santa Barbara County and city governments who wish to promote solar power more vigorously. CEC has drafted a version of this ordinance and will work with interested local governments to tailor it to their needs. The draft ordinance suggests streamlined permitting procedures, identifies financial and non-financial incentives for solar power, and proposes possible requirements for new construction, such as LEED certification.

Further action steps for the Partnership:

- Contact local governments with an interest in promoting solar power and tailor our draft ordinance for their needs.

3. Reduce local institutional barriers to solar by working with homeowners' associations (HOAs) to encourage solar power

Homeowners' associations (HOAs) often have additional permitting requirements that pose an institutional barrier to solar power. In order to eliminate or at least reduce their resistance to solar power (or even make them cheerleaders for solar power), we will work with local HOAs to educate them about the Solar Rights Act, which restricts their ability to impose additional requirements on solar facilities. We also will educate HOAs about the benefits of solar power both to homeowners and to our region. We

may even be able to encourage some to support solar power in their common areas for pool heating and other uses.

Further action steps for the Partnership:

- Develop a presentation for HOAs, informing them of restrictions under the Solar Rights Act and suggesting means by which HOAs can ensure that their community concerns are met in new solar installations.
- Identify HOAs with which to work.

Local educational barriers

Even though solar technologies have existed for decades, many people still do not consider solar to be a viable option for their own homes or businesses, primarily because they do not have the information necessary to make an educated decision. Education is the key element required to fully integrate solar power into not only the energy portfolio of the community, but also the hearts and minds of the general public.

Currently, few education efforts in the realm of solar power are being undertaken in the Santa Barbara area. Neither utility companies nor local government agencies have made solar a true priority and, as a result, are not a source of general, reliable information about the technology or its social and environmental benefits. Moreover, with the exception of a few dedicated teachers who are incorporating it into their own curriculum, schools are not educating their students about solar. It appears that the only educational materials used in the community are those that come directly from the local solar installers, the Internet, and non-profit entities.

This lack of robust education impacts not only potential buyers, but also architects, permit planners, and building officials.

Unfortunately, these key groups do not have the knowledge to make solar mainstream at this time. If architects were better educated, they could incorporate passive solar energy into their initial designs and facilitate simple additions for solar electric. Permit planners and building officials could fast-track solar projects that follow specific guidelines and be more receptive to the needs of the solar industry. Other benefits will undoubtedly also arise.

The present state has resulted in many educational barriers that prevent full utilization of solar power by the general public. Following are some of the most prevalent educational obstacles:

1. Today's perception of solar power is based on outdated information

Although solar technology has developed greatly in the past 30 years, the general impression of solar power has not for many people. The public generally does not understand the progress that has occurred in design, efficiency, and cost, resulting in the belief that solar is still too expensive and unrealistic for most people.

2. Consumers do not have information about the full menu of solar technologiesthat are available

Most people do not understand the details and differences between solar technologies. Confusion arises most frequently when comparing solar thermal and solar electric technologies. In addition, a full menu of these possibilities is not shared efficiently. Most of the emphasis is placed upon solar electric, while passive design, daylighting, and solar hot water are commonly overlooked. As mentioned earlier, financial incentives for solar thermal have recently been revived, so we may expect its popularity to increase again.

3. The societal and environmental benefits of solar are not sufficiently acknowledged

Solar power should not be considered just another energy resource; rather, communities should see it as the way of the future due to its environmental benefits and virtually unlimited supply. A simple cost analysis is not sufficient for solar power due to its long-term advantages on a local and global level, and the externalities that arise from use of fossil fuels and nuclear power, which, when adequately incorporated into decision-making processes, should favor renewable technologies.

4. Aesthetic and environmental trade-offs are not clearly defined

The aesthetics of solar power installations remain a very important issue for many considering solar power, often becoming an obstacle. To overcome this, the trade-off between aesthetics and environmental benefits must be made explicit, while ensuring that the highest aesthetic standards are achieved in new installations. In other words, we must acknowledge that solar power has a visual impact, which is not pleasing to everyone's sense of aesthetics. However, as a community, we need to consider values other than pure aesthetics – such as environmental and national security concerns.

5. The public doesn't believe that solar power will become commonplace

Most people find it easier to accept the current structure of energy resources and usage. Often, little effort is put into learning about new developments and technologies. However, solar power, along with other renewable energy alternatives, will inevitably become more prevalent due to their diverse advantages.

6. A full audience is not being addressed with solar education

The focus of solar education is not broad enough to make drastic improvements in the industry. Education programs must be tailored for specific groups such as consumers, youth, regulatory professionals, industry professionals, and manufacturers.

7. Architectural review boards and code inspectors often are not fully educated about solar

Inspectors are often an overlooked component of the industry in terms of education. Many assume that inspectors are already experts, but this is not often the case. Inspectors often do not know specifics about the variety of solar technologies. In such a rapidly changing field, updated information is vital to making appropriate decisions.

8. Most financial institutions are not knowledgeable about the financial benefits of solar

The solar field often lacks the support from financial institutions that could significantly improve the industry. Banks and appraisers need to be a major focus of teaching endeavors in order to communicate the financial benefits of solar power. Many still see it as a poor investment, when in actuality, the system can become a revenue source for the purchaser as a result of the electricity cost savings over the life of the system, depreciation, and the benefit of increased certainty of future electricity costs because of the zero cost of solar "fuel."

9. K-12 schools offer very little curricula on solar power

The next generation must be knowledgeable about solar in order for it to become an integral aspect of society, and yet curricula for solar power are not available in most local schools. Overcoming this barrier could result in a great number of future decision-makers who are more receptive to solar technologies.

10. Information is too decentralized, inaccessible, and untrustworthy

Even when members of the public have the desire to learn more, they have no simple route to do so. If a specific group or agency was defined as the best source of information, people could be more confident about the reliability of information.

Action steps to reduce educational barriers

The principle action necessary to overcome educational barriers blocking the widespread use of solar power is outreach: general, targeted, and in the classroom.

1. General Outreach

Lectures and workshops

In spring of 2005, the Community Environmental Council (CEC) sponsored a 7-part lecture series focusing on renewable resource technologies. Each week a different technology was highlighted, including solar energy, wind energy, ocean energy and alternative transportation fuels. The dialogue and momentum generated through these lectures will be further focused through specific workshops for parties interested in installing solar or small wind. The solar workshop for residents may include information about solar options (PV, water heating, etc.), permitting procedures, financing options, and contact information for local installers. A similar workshop may be held for businesses.

Further action steps for the Partnership:

- Work with MSR partners to hold workshops focusing on the "hands on" aspects of residential and business solar systems.
- Follow up with workshop attendees to document their progress and pitfalls.
- Modify workshops based on feedback.
- Schedule additional workshops as needed.

Informational flyers

With guidance from the Santa Barbara Million Solar Roofs Partners, CEC has developed flyers that provide information about planning a solar installation on California's central coast and frequently asked questions about solar. More flyers will be developed as topic areas are identified. These flyers are handed out at public events and are available at www.communityenvironmentalcouncil.org.

Further action steps for the Partnership:

- Develop informational flyers to address specific issues as they are identified.
- Distribute flyers at public events and post on website.

Newspaper articles and media appearances

CEC has regular media contact in relation to its involvement in the Million Solar Roofs Partnership and its broader Fossil Free By '33 program. We received favorable press coverage numerous times over the past year, with two local TV stations running significant spots on our most recent general partnership meeting.

Further action steps for the Partnership:

- Continue to keep a strong media presence through interviews, articles, op-eds and press releases.

Visibility at festivals and educational events

CEC presents information at many festivals and events throughout the year, providing an opportunity to reach a diverse array of community members and talk one-on-one about local environmental issues. CEC is currently creating a solar energy interactive display, which will include a small solar array, lighting source, and a load such as a fan. Participants will be able to turn the light source on and off, as well as change the orientation of the photovoltaic cells to observe the effect on the load.

A few of the festivals and events where CEC will present solar information during 2005 are:

- CARE Fair at the University of California at Santa Barbara
- Helping Hands Day at Santa Barbara Community College
- University of California at Santa Barbara's Campus Sustainability Day
- Science Night at La Patera School
- Santa Barbara Harbor and Seafood Festival
- Gold Coast Science Network
- South Coast Earth Day Festival
- Goleta Earth Day Festival
- Lemon Festival

Further action steps for the Partnership:

- Develop a solar demonstration piece for use at festivals and events.
- At each festival and educational event, provide a specific sign-up sheet for parties interested in solar power.
- Keep a database of parties interested in installing solar, and use the database to notify interested parties of upcoming workshops, permitting and incentive changes, and new informational materials.

Establish CEC as a one-stop-shop for information about solar and other renewable energy sources

To help fill the information gap on solar, CEC will be developing an information clearinghouse through our website www.communityenvironmentalcouncil.org.

Further action steps for the Partnership:

- Expand the CEC website to include easily accessible and comprehensive solar information.
- Develop a comprehensive "solar checklist" that outlines the steps involved in installing a residential solar system.
- Tailor and post at CEC's website the Clean Power Estimator calculator to allow the end user to calculate the length of time to recoup their investment and other details of buying solar power.
- Compile testimonials from current solar users.

2. Targeted Outreach

General outreach efforts are aimed at a broad audience with the intention of educating everyone who will listen about the benefits of solar power. This method, however, is not sufficient to address the specific educational barriers that are blocking the widespread use of solar power. This requires a targeted outreach campaign that delivers specialized information to groups who are in a position to further the use of solar power. Targeted groups include: architects and builders, small business owners, homeowner's associations, non-profits, and local governments. The MSR partnership has identified key motivators for these target audiences.

Architects and builders

Architects and builders are often open to the idea of using solar, but do not have the time to explore the possibilities. Solar usage may be increased through presentations that address the following topics:

- Incorporating solar electricity and solar thermal into building design.
- Making solar power a standard offer like marble counters.
- Making it company policy to describe the benefits of solar power to customers.
- Wiring buildings to be solar-ready even if solar power is not installed immediately.
- Ensuring that solar installations are aesthetically pleasing and safe.

Further action steps for the Partnership:

- Generate a list of representatives from the architectural and building firms interested in hearing a presentation on solar power.
- Develop a presentation that addresses local architects and other building-related professionals.
- Follow up with the audience to gauge the usefulness of the presentation, and incorporate any necessary changes into future presentations.

Small business owners

Santa Barbara County supports a large number of small local businesses. Their owners may not have the equity of a large corporation, but they do have the power to make decisions about the company's investments. With current tax incentives, business owners are in a particularly good position to invest in solar panels for their electrical needs; currently the payback period for an investment in solar power is the most favorable that it has been for businesses. Developing a program for working with local business owners to lay out a step-by-step guide to installing solar would help remove the confusion and address the lack of information that can prevent solar from being installed.

Further action steps for the Partnership:

- Send a direct mail piece to the top 100 businesses in Santa Barbara whose roofs have been identified as having the most solar potential.
- Generate a list of small business owners interested in hearing a private or group presentation on solar power.
- Develop a presentation that clearly outlines the process of installing solar systems and addresses the latest financial incentives.
- Follow up with the audience to gauge the usefulness of the presentation, and incorporate any necessary changes into future presentations.

Homeowners associations

Many homeowners associations (HOAs) require strict aesthetic requirements on the homes within their purview. However, under the California Solar Rights Act, HOAs may not unreasonably restrict the installation of solar systems through any covenant, restriction, or condition contained in any deed or other contract. Most HOAs are not familiar with this law.

Santa Barbara's Million Solar Roofs Partners recognize the importance of working with these associations to educate them about the Solar Rights Act in a way that is non-threatening. The partnership believes that there are strategies for working with HOAs that will lead them to encourage the use of solar power in their communities instead of discouraging it based on an overly narrow aesthetic vision or simply outdated information. Strategies for encouraging solar through HOAs are:

- Familiarize HOAs with the Solar Rights Act and what it does or does not permit in relation to solar power.
- Educate HOAs about solar installations that are aesthetically pleasing – panels that look like shingles, panels placed out of view of street traffic or behind parapets, etc.
- Encourage HOAs to embrace solar installations as a point of pride in their community.

Further action steps for the Partnership:

- Develop a presentation that will educate about the Solar Rights Act, present panel styles that minimize visual impacts, and encourage community pride.
- Generate a list of HOAs interested in hearing a presentation on solar power.
- Follow up with the audience to gauge the usefulness of the presentation, and incorporate any necessary changes into future presentations.

Non-profits and local governments

Non-profits and local governments often dismiss the possibility of solar panels because they cannot take advantage of the state and federal tax credits available to residents and other businesses. This has the effect of making the payback period significantly longer than they are for for-profit businesses. However, for non-profits or government agencies who have a degree of stability and who do not plan to sell the building once it has a solar installation, it may be possible to achieve positive cash flow throughout the payback period, even if the payback is relatively long. This can be achieved by financing the system in such a way that the monthly cost of the system is less than the electricity bill would have been without the system, achieving a positive cash flow throughout the payback period.

There are also a number of companies offering no up front cost options for going solar. No companies in Santa Barbara County currently offer this option for small solar systems, but a number of solar installers are developing plans for this option, as discussed above.

Further action steps for the Partnership:

- Generate a list of non-profits interested in hearing a presentation on solar power.
- Develop a presentation that addresses the long- and short-term benefits of installing solar, as well as the financial strategies available for tax-exempt organizations.
- Follow up with the audience to gauge the usefulness of the presentation, and incorporate any necessary changes into future presentations.

3. Classroom outreach

California's teachers are inundated with curriculum guidelines and standardized testing goals, making it difficult to fit in anything "extra" into their lesson plans. In order to bring solar energy education into the classroom, teachers need easy and fun lessons that they can incorporate into existing curricula, and they need to be shown how to teach these lessons. To do this, CEC and other Million Solar Roofs partners will work with the National Energy Education Development (NEED) - a non-profit organization devoted to developing energy education curriculum for K–12 teachers. CEC will also run teacher workshops to help teachers find grant funding to teach energy education. Strategies for helping schools develop solar curricula include:

- Work with teachers and educational programs in the tri-counties to incorporate energy education into their curricula.
- Organize teacher workshops to demonstrate methods for teaching energy concepts such as energy conservation and energy sources including solar.

Further action steps for the Partnership:

- Contact local teachers to gauge the interest in teaching solar education in the classroom.
- Identify barriers to teaching energy education in the classroom.
- Develop teacher workshops with NEED that give teachers the resources for teaching energy education, including solar, in the classroom.
- Follow up with teachers to track implementation of energy lessons in the classroom.
- Work with CEC's education staff to incorporate solar education into existing environmental education programs and summer camps.
- Establish a lending library of energy education tools for Santa Barbara County teachers.

Measuring progress

The goal of our Million Solar Roofs Partnership is to install 750 new solar systems by 2010. According to the California Energy Commission, 129 new grid-tied solar PV systems were installed in Santa Barbara County from January 1 through October 1, 2005.[15]

If we continue to progress at the same rate witnessed during 2005, we will far exceed our solar PV goals by achieving over 850 installations, as depicted in the following chart:

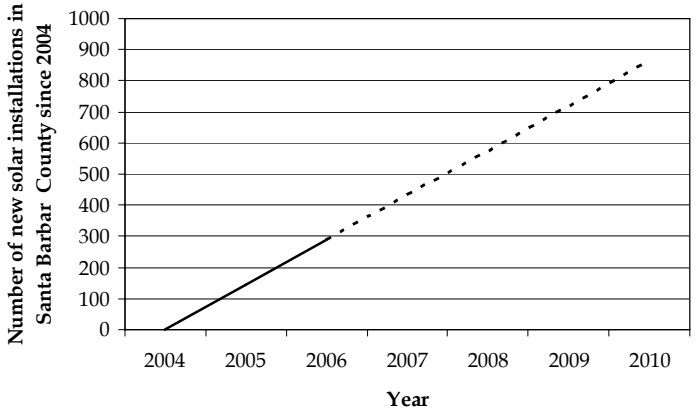

Figure 2. New Solar PV installations in Santa Barbara County (actual until January 2006, projected from February 2006). Source: California Energy Commission.

Next steps for solar

This report has identified a number of barriers that may be restricting the development of strong solar markets in Santa Barbara County. While they may be numerous, they are not insurmountable.

The next step in this process will be for the Million Solar Roofs Partnership to publicize the results of this report and work to implement the report's recommendations. We hope that this implementation plan will be used by local decision makers, the solar industry, non-profit organizations, and financial institutions as a road map for strengthening local solar markets. It may also be a tool for securing additional funding to help implement these action steps.

Through this process, built on a community-wide dialogue, progress will be made to ensure that solar energy will play a more prominent role in the future energy mix we use in Santa Barbara County.

It will be up to every member of the partnership to help ensure that this process moves beyond recommendations and advances into real changes among local governments, businesses, and residents. The ultimate proof of success will be, however, the number and capacity of solar power installations we eventually install discretely and tastefully throughout our communities.

We are truly at a tipping point in the history of our region's and our nation's energy patterns and we hope that this report adds to the positive development of clean and renewable energy generation in our region and elsewhere.

Community Environmental Council
26 W. Anapamu St., Second Floor
Santa Barbara, Calif. 93101
(805) 963-0583 • Fax: (805) 962-9080
www.CommunityEnvironmentalCouncil.org