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Scoping Paper

Financing Solar Energy in the U.S.

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This document is a "scoping paper" on the subject of financing the end-use applications (the "markets") for solar energy in the U.S.[2] The purpose of a scoping paper, somewhat like "terms of reference," is to describe the subject, characterize the current situation, and identify and assess the key issues. The next step, based on the scoping paper, will be a published policy paper entitled "Financing Solar Energy in the U.S."

1. Summary

The financing of solar energy, representing one of the final phases of the process of commercializing solar energy technologies, needs to be addressed as carefully as the previous stages of research, development, demonstration, and commercial utilization. The degree to which solar energy is financeable represents a key measure of its commercialization. Ultimately, the "financeability" of solar energy will determine the solar market in the U.S.

Policy development for solar energy has been underway for nearly 30 years, since the National Science Foundation and NASA published "Solar Energy as a National Energy Resource" in 1972. Today, leadership for solar market development is coming from the federal government's Million Solar Roofs initiative (MSR), the Utility Photovoltaic Group (UPVG), and several state and local governments. In total, over 200 government programs address or influence the financing of solar energy. Yet, in spite of this attention, solar energy continues to face a financeability problem.

Because as much as 95% of all solar energy installations will require some form of financing upon purchase, public and corporate policy makers can usefully view the commercialization challenge from *the perspective of the lender*. In considering whether to lend money for solar technology, financial institutions will assess the likelihood of being repaid, first from the borrower's cash flow and good character (the so-called

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"ability and willingness" to pay), second, from the solar system's collateral value, and finally, from third-party guarantees. Policies and programs must address those factors to have an impact on market-based lending decisions.

Another urgent issue faces public policy makers. Confusion over technical quality, utility interconnection, safety, economic viability, and insurability actually precludes lenders from making financial determinations. In addition to their impact on potential individual users and solar businesses, these factors harm the broader public interest. The nation's return on its billion-dollar investment in solar panel technology has been delayed by twenty-five years of deliberations over, among other issues, the development and adoption of standards by which users can connect solar systems to the U.S. utility grid.

The solar industries, associations, technical societies, and agencies have undertaken considerable work to address these issues. Based on the review conducted for this paper, it appears that *all institutional barriers* are resolvable within *the next 12 months* if there is an across-the-board call for their resolution. This will require joint leadership and commitment. Key issues include: utility interconnection standards; net metering and other regulatory matters; solar system technical, quality, and installation standards; economic and tax incentives on a more permanent basis to encourage appropriate long-term financing of solar energy systems; evaluation criteria for energy-efficient buildings that explicitly accommodate solar electric and solar thermal options; evaluation criteria for lending that incorporate the benefits of solar energy; and consumer guidelines for solar system sizing and performance.

Developing a viable U.S. market for solar energy is a unique challenge. Pro-solar public policy programs in Europe and Japan are valuable benchmarks, but may not be directly applicable in the U.S. American policy must aim to bring the value and cost of the systems to parity; ensure the practicality of the use of the systems through the implementation of standards and guidelines; and support actual financing through government and private sector mechanisms.

The next phase of public policy implementation is charting how the government will become more involved, and then withdraw over time from active intervention in the solar and renewable energy marketplace. The goal is to create a fabric of laws, regulations, rules, practices, procedures, tax treatments, economic incentives, and supporting technology programs that together define a public policy foundation on which the solar energy marketplace can flourish and grow.

This scoping paper, the front-end research for a full policy paper provisionally scheduled for publication in November 1999, includes an introduction, history of solar energy markets in the U.S., assessment of the situation today, description of the role of financing in sustainable markets, catalogue of key issues constraining financing, and a new context (the lender) for development of policy solutions. An appendix includes a valuable and extensive inventory of financing-related programs.

2. Introduction

2.1. Solar Energy is defined for the purposes of this paper as solar photovoltaics (PV) and solar heating. Most of the paper will deal with the financing of solar PV, with sidebar treatments of solar heating. Other renewable energy options, such as wind power, hydro power, geothermal energy, biomass-derived energy, and solar thermal-electric (STE) power generation, are not included in this paper because they are generally financed in the normal course of utility or non-utility project and corporate finance as wholesale power generators. Passive solar design and energy efficiency are also not included in this paper.

2.2. **Solar PV**:

2.2.1. Solar PV is used in grid-connected applications such as residential rooftop PV systems and building-integrated (BIPV) systems. In such grid-connected applications, energy from the solar systems offset the end-users' purchase of electricity from their local utilities. Installations are generally financed using private end-user financing plus any applicable subsidies (i.e., California), cost-sharing funds (i.e., the UPVG Team-Up Initiative), and tax benefits available in various states.

2.2.2. Solar PV is also being used for remote-site, off-grid applications. In developed countries such as the U.S., these applications include telecommunications towers, offshore oil rigs, remote lighting and signaling, remote homes, water pumping, and many other applications. The systems are paid for, or financed, by the end-users in the normal course of their personal or business affairs. In developing countries like India, South Africa, and Argentina (to name a few), solar PV is being used for rural electrification programs that encompass solar home systems, agriculture, health clinics, schools, and community centers. Financing is typically based on donations from international aid agencies, government programs, and, increasingly, from multi-lateral financial institutions. There is also some early bank-type financing emerging in India, the Philippines, and elsewhere.

2.2.3. The wide applicability of solar PV is suggestive of its ultimate potential in a society increasingly concerned about sustainable development. Solar PV is, in certain ways, one of the most extraordinary of technologies. Consider that humanity has, in PV, invented a method of converting sand into a semiconductor material that can take in sunlight,

> absorb the energy and put it to work mobilizing a flow of electricity – the highest form of useful energy – and do it without motion, pollution, or making a sound. We will never run out of it. Its efficiency will only go up. Its cost will only go down. It is safe. Some people would ask, in terms of our energy future: why are we working on anything else?

2.3. Solar heating systems include solar water heaters and solar space (air) heaters for residential, commercial, and industrial applications. Solar water heaters can utilize a range of technology, from low-tech black mat collectors for pool heaters, to relatively sophisticated sealed collector units for domestic water heating, to parabolic trough concentrators for industrial process water heating. Solar space heaters utilize active and passive designs, typically integrated with extensive energy conservation measures.

2.4. The outlook for solar energy in the U.S. would not be favorable if the scope of consideration is limited to near-term energy economics. The worldwide liberalization of energy markets and utility deregulation is leading to lower costs of fuels and electricity, such that technologies like solar PV and solar heating are chasing a declining cost target. Optimism about solar energy's future comes from the broadening realization that the energy-economic structure of the U.S. "is neither sustainable over the long-term future, nor replicable by other countries around the world, if the global environment is to sustain life as we know it" [speech to the American Solar Energy Society by Denis Hayes, June 15, 1999]. The belief that society is faced with an imperative to manage a changeover from fossil fuels to the efficient use of renewable and clean energy sources is gaining currency as we approach the new century, coined by Dr. Jeremy Leggett as "The Solar Century."

2.5. The purpose of this paper is to assist policymakers and program management in their efforts to chart an effective course for society's successful use of solar energy, here focusing on the financeability of the end-use of the systems by ordinary people and businesses – ultimately, the sustainable market for solar energy.

3. Historical Perspective: Solar Energy Markets in the U.S.

3.1. The U.S. market for solar energy systems peaked initially in the early 1980s in response to federal and state programs and incentives such as income tax credits, property tax exemptions, sales tax exemptions, cost-sharing grants, government purchasing programs, and government-funded demonstrations:

3.1.1. Demand for solar PV systems rose initially in the 1982-1984 period due principally to purchases by the federal government. The PV market remained in the range of 5-10 megawatts (MW) per year for the next 10 years, and has only seen an upturn in recent years, as shown in Figure 1 (p.28). The U.S. solar PV market is experiencing growth in the past 12 to 24 months as a result of: government purchases by the departments of Defense, Interior, Energy, and others; government-funded cost-sharing programs such as the Utility Photovoltaic Group (UPVG); State-level incentives programs related to utility restructuring such as California's $3/watt subsidy; local government initiatives in cities such as Sacramento, Los Angeles, Austin, and Tucson; and private sector installations for home and computer security in relation to the Y2K issue.

3.1.2. Demand for STE systems has never materialized in a broad way in the U.S., but there have been two major STE programs. The first was the Solar Power Tower, using a field of reflectors beaming light on a central steam-generation tower. The Solar Power Tower was financed as a demonstration by grants from DOE, EPRI, utility companies, and the participating equipment vendors. The second was the Solar Electric Generating Station (SEGS) projects developed by Luz, an Israeli company, using parabolic trough reflectors. SEGS was financed on a project-finance basis using a limited partnership structure that flowed the benefits of solar investment tax credits to the investing partners. Current efforts in STE focus on a DOE/EPRI/utility upgrade to the Power Tower, and attempts by several private companies to establish non-utility power generation businesses using the dish-sterling engine technology. Because STE systems require direct solar insolation, the market opportunities for STE exist in desert-like conditions as are found in Mexico, Spain, Egypt, India, the Southwestern U.S., and other areas. The international character of the market is attracting financing interest from the World Bank, the International Finance Corporation, and similar agencies. The dish-sterling companies are financed by corporate partners and venture

capital, but have not yet arranged any project financings.

3.1.3. Demand for solar heating systems peaked in the 1980-1985 period, at an annual level of 16-19 million square feet of collector area per year, as shown in Figure 2 (p.28). The rate of sales and installations has declined since then, to an average level of 6-8 million square feet of collector area per year, of which about 90% is for swimming pool heaters. The markets for residential domestic water heaters, residential space heaters, and industrial process water heaters have declined to a negligible level in the U.S. during the 1990s.

3.2. There is a decidedly mixed picture of the solar business because of two positive indicators in what is otherwise a very disappointing situation:

3.2.1. First, while market acceptance (PV installations) has been low, the *manufacturing* of PV cells and modules in the U.S. has increased steadily over the years to over 46 MW in 1997, as shown in Figure 3 (p.29). This trend gets reported in the general press, creating an impression that the U.S. *market* for solar energy is growing, when most of the growth is in manufacturing for the export market, not installations in the U.S.

3.2.2. Second, the worldwide market for PV has grown steadily over the past 20 years, reaching some 125 MW in 1997 [ref.: Maycock, 1999]. Figure 4 (p.29) compares the rate of worldwide installations to U.S. installations, showing that the global market has grown while the U.S. has lagged behind.

3.3. The conclusion is that, while worldwide markets for solar energy have been growing somewhat over the past 20 years, the U.S. markets have been generally flat in the case of solar PV, zero in the case of STE, and declining in the case of solar heating. This has presented an unattractive business environment for U.S. investors and lenders, who have reacted generally by deciding not to participate at all. The situation appears to be changing rapidly, however, as described in the following section.

4. The Situation Today

4.1. The situation is becoming potentially more positive for solar energy in the U.S.

4.2. The technology is commercially available. The components, such as PV panels, inverters, battery charge controllers, and general electrical equipment, are generally of excellent quality.

4.3. Worldwide activity in PV and, to a lesser, degree, solar heating, is accelerating, helping to create greater interest in the U.S.:

4.3.1. *Europe*: PV programs have expanded tremendously since 1995, supporting the installation of residential rooftop PV systems, highway noise barrier PV systems, and BIPV systems. Germany and Switzerland are the leaders in PV programs, while Greece, Italy, and Spain are the leaders in solar thermal applications. There is a wide array of financial incentives and subsidies available in Europe, including direct subsidies, zero-interest loans, and very high purchase prices for PV-based electricity. European solar energy companies are bringing their innovations to the U.S. market.

4.3.2. *Japan*: The Japanese government launched their 70,000 PV Roofs program in 1996, based on a substantial subsidy plus managed competition among the Japanese PV companies. Over 10,000 systems are being installed each year. The Japanese PV industry is competing under a MITI mandate, with the domestic winners to be permitted to re-enter the international PV markets in the year 2000. Japanese PV companies can be expected to arrive in the U.S. market soon. Kyocera is in the process of acquiring Golden Genesis, the largest U.S.-based PV systems integrators. Sanyo, Sharp, and others should be entering the U.S. market in 2000, bringing innovations in residential rooftop solar systems.

4.3.3. *Developing countries*: Major programs are underway in India, Indonesia, Mexico, Argentina, Morocco, South Africa, and many other countries. These programs are supported primarily by funding and financing from bilateral agencies such as USAID, Denmark's DANIDA, Japan's OECF, and others; and from multilateral agencies such as the World

Bank, the IFC, the UN, and regional development banks. There is also a substantial flow of private corporate capital going into developing country markets.

4.3.4. International market conditions are affecting the U.S. in several ways:

4.3.4.1. First, the major manufacturers of solar equipment are now European and Japanese, although many of them have acquired manufacturing companies in the U.S. Their success in developing products, systems, and services for international markets is also brought to the U.S. market. This is especially apparent in BIPV coming from Europe. Next year, the U.S. is likely to see residential roof-integrated PV systems coming from Japanese suppliers.

4.3.4.2. Second, the public relations efforts of major international companies such as BP, Shell, Siemens, Kyocera, ASE, and others, is seen in the U.S. as well, and this is changing previously closed minds about the business and political future for solar energy.

4.4. Public Policy in the U.S. is beginning to turn favorably towards PV and other renewable energy options because of climate change (global warming) and other environmental priorities. A groundswell of programs are taking shape at state and local levels throughout the U.S., encouraged in part by President Clinton's call for a "Million Solar Roofs" initiative, and a widespread, grassroots recognition that environmental stewardship is essential. This activity is less prevalent at the federal level where legislators are having greater difficulty resolving regional differences into national legislation.

4.5. The emergence of PV is intersecting with another policy initiative: the restructuring of the U.S. electric utility industry. This is opening up possibilities for PV in several ways: self-generation via net metering, green power sales, and utility-sponsored projects under cost-sharing from UPVG. Again, this appears to be occurring on a state-by-state basis, facing some difficulty at the federal level.

4.6. Still, the actual rate of installations in the U.S. is lagging the rates of activity in Europe, Japan, and the developing world. Solar energy equipment suppliers are finding it difficult to break-even financially, leading to the need for continuing investment to cover operating losses

and fund growth in a profitless market. This has contributed to the abandonment, for all intents and purposes, of the solar energy industry by U.S. investors, leading to the sales of Arco Solar to Siemens, Mobil Solar to ASE, Solec to Sanyo and Sumitomo, and Solarex to BP/Amoco. Indeed, the top manufacturers of solar PV cells and modules are all European- and Japanese-based companies.

4.7. In sum, there is reason for encouragement about the prospects for solar energy, but also reason for concern about creating a successful market in the U.S. The following sections look at the role of financing in creating market demand, the inventory of programs that are poised to participate in this market, and the issues that need to be addressed and resolved to permit financing to flow to the solar energy markets.

5. The Role of Financing

5.1. The term "financing" is used, for the purposes of this paper, somewhat like the term "marketing". The term "marketing" means much more than making the sales transaction – it includes product planning to meet customer needs, product packaging, pricing, and promotion. Marketing is generally well understood to be the all-inclusive task of matching up what a supplier offers with what the customers need or want. Similarly, "financing" is defined as including all of the factors necessary for third-party capital (investment, loans, leases, etc.) to be made available for solar energy systems. It includes economic viability and attractiveness, system quality and reliability, guarantees and warranties, technical standards, system lifetime and residual value, insurance, and tax matters. Financing is all about arranging a financially attractive opportunity, bringing the parties together, and closing a financial transaction that meets all of the terms and conditions of each party.

5.2. There is a growing consensus that the availability of low-cost end-user financing is a key to opening up and accelerating the market adoption of solar energy systems in the U.S. and elsewhere. The key financing issue in developing countries tends to be the availability of capital to rural end-users, while the key issues in the U.S. and other developed countries involve the cost of money, the ease of obtaining low-cost funds, and institutional complexities that hinder financing and market growth.

5.3. A key question is how important is financing to the market growth of solar energy? In other words, what percentage of end-users will require third-party financing to purchase a solar energy system?

5.3.1. Information from around the world suggests that 2% to 5% of PV purchasers buy for cash, while the other 95% to 98% require some form of third-party financing.

5.3.2. The economic nature of solar energy systems is the installation of capital-intensive equipment to harvest the Sun's energy, as an alternative to burning fossil fuels or purchasing energy from the local utility. Financing converts the high up-front cost of a solar system into monthly payments, making it affordable and comparable to the monthly payments for utility service.

5.4. Financing can have more immediate impact on the markets for solar energy than technology research or manufacturing cost reductions. For example, Figure 5 (p.30) illustrates the monthly payments for a 3-kilowatt (kW) grid-connected, residential rooftop PV system in the U.S. The system is assumed to cost $10/watt ($30,000 total cost), with a total system efficiency of 10%. In the base case, financing is assumed to be a 7-year 18% loan, resulting in a monthly payment of $656. Then three improvements are evaluated:

5.4.1. *Research Programs to Improve Efficiency*: By improving the efficiency of the system, its size can be reduced while still generating the same output, thus reducing the cost. For a 50% increase in efficiency, the monthly payment is reduced to $437 per month. It may take ten years or more, however, before technology research can be achieve these results in commercial products.

5.4.2. *Cost Reduction Through Manufacturing Scale-Up*: By scaling up manufacturing, automating factories, and generally reducing the production cost per unit, total system costs can be reduced. Assuming a 50% reduction in system cost, the monthly payment of the sample system can be reduced to $328 per month. Achieving this result might take five years or more, as new factories are planned, built, and put into operation.

5.4.3. *Better Financing*: A third way of reducing monthly payments is to apply lower-cost, longer-term financing. Here, the 7-year, 18% loan is replaced with a 20-year, 5% loan. The monthly payments due

to the change in financing alone come down to $255 per month, and this can be done immediately.

5.4.4. *All Three Initiatives*: Of course the best policy is to accomplish all three cost reductions, but the immediate impact of lower-cost, longer-term financing is apparent. The provision of lower-cost, longer-term financing can have a greater and more immediate impact on the affordability of solar PV systems than research and manufacturing programs. Financing deserves at least an equal seat at the policy table, working in concert with traditional research, development, and demonstration programs.

5.5. How much capital is needed to finance the emergence of solar energy? A preliminary analysis by Solar International Management, Inc. indicates that between 1998 and 2010, the global market for PV will require $3.7 billion invested in PV manufacturing facilities, $3.8 billion invested in the distribution channels (financing inventory and receivables), and $38 billion in end-user financing. Clearly, the major challenge, by a factor of 10:1, is end-user financing. Translating these figures to the U.S. market, assuming that the U.S. remains at approximately 10% of the world market, the capital requirement is nearly $400 million for factories, $400 million for working capital in the distribution channels, and $4 billion for end-user capital. An alternative calculation, based on the installation of solar PV on one million rooftops, at an average cost of $20,000, yields a $2 billion requirement for end-user financing (order of magnitude). By any calculation, the capital challenge is on end-user financing.

6. Inventory of Financing Programs Related to Solar Energy in the U.S.

6.1. There are approximately 200 programs in the U.S. related in some way to the financing of solar energy. Governments, utilities, lenders, and other types of organizations sponsor these programs, which are listed in Appendix A (p.32). Any consideration of potential policy solutions requires an analysis of the numerous solar programs that are currently in place in the U.S.

6.2. **Federal Government**: Federal programs related to solar finance can be sub-divided into four categories: tax incentives, economic incentives, loan/grant programs, and financial research/outreach initiatives:

6.2.1. The Energy Policy Act of 1992 established some solar-related tax incentives for the commercial sector. However, only one federal tax incentive currently applies to ordinary citizens who use solar energy. Two solar-related tax incentives have been proposed and currently await congressional approval.

6.2.2. The Renewable Energy Production Incentive (REPI) is the only federal economic incentive in place to promote the use of renewable energy technologies. Subject to appropriations by Congress, state-owned electric generation facilities, municipal utilities, and non-profit electric co-ops may be eligible for incentive payments from DOE, equal to 1.5¢ for each kilowatt-hour (kWh) of electricity produced from solar, wind, biomass, or geothermal energy.

6.2.3. DOE has the lead for developing and commercializing solar energy technologies. Major DOE programs include the presidential initiative called Million Solar Roofs (MSR), the UPVG, and a buildings-related program (PV-Bonus). While DOE has a broad base of cost-sharing type programs, none except for MSR have explicitly addressed financing.

6.2.4. Over 25 other loan/grant programs related to solar energy are now in place in federal agencies such as EPA, HUD, VA, and others. However, none of these programs have been successful in deploying substantial funds to the solar energy markets. It would benefit the solar industry if government agencies more fully integrated solar energy into their existing energy efficiency programs.

6.3. **State Governments**: Forty-one states currently offer at least one program to promote residential or commercial applications of solar energy technologies. Arizona, California, and Massachusetts have been among the most active states, each offering their own package of financial incentives.

6.3.1 *Arizona*: As a major participant in the MSR program, Arizona maintains solar partnerships at both the state and community level. The state also offers a variety of tax incentives that apply to solar energy, including a personal income tax credit and a sales tax exemption for the residential sector.

6.3.2 *California*: As an element of utility restructuring in 1997, the State of California allocated $540 million to the support of renewable energy. This includes a $3/watt subsidy for PV.

6.3.3 *Massachusetts*: Among other significant solar related tax incentives, Massachusetts provides a 15% credit against the state income tax for the cost of a renewable energy system (including installation), and exempts solar equipment from both local property tax and sales tax.

6.4. **Local Governments**: Efforts at the state level are further bolstered by local programs, administered by city governments or municipally owned electric utilities. Austin TX, Fort Collins CO, Los Angeles CA, Palo Alto CA, Sacramento CA, and Tucson AZ all stand out for their efforts to encourage the use of solar energy. Many of these programs include an element of financing.

6.5. **Utility Programs**: This section can be divided into two sub-categories: utility programs (green pricing initiatives, buydowns, etc.) and utility-based PV businesses:

6.5.1. The Sacramento Municipal Utility District (SMUD) and the Los Angeles Department of Water and Power (LADWP) offer the largest and most widely recognized utility programs. They have become the industry models, leading to the creation of similar programs in states like Illinois and Colorado.

6.5.2. In the second category, utility-based PV businesses include GPU Solar, a subsidiary of the utility holding company GPU International, Applied Power Corporation, a subsidiary of Idaho Power, and Global Solar Energy, a subsidiary of Tucson Electric Power. All utility-related solar programs include an element of financing in their strategies.

6.6. **Institutional Programs**: This section can also be divided into two sub-categories: cooperative finance institutions and the secondary mortgage market:

6.6.1. Rural electric co-ops have the potential to be major players in U.S. solar markets. However, CoBank and CFC, the primary cooperative lenders in the U.S., have been slow to act. CoBank works exclusively with telecom and gas powered utilities

and has been particularly reluctant to get involved in solar finance. CFC has shown interest, but has not acted to date.

6.6.2. Fannie Mae and Freddie Mac are the nation's leading secondary mortgage lenders. Although neither of these organizations offers a specific solar financing program, a variety of their products relate to energy efficiency and can be used to finance solar thermal and PV systems. Fannie Mae is emerging as the leader.

6.7. **Private Sector Programs**: Although numerous private sector finance institutions may be willing to consider financing solar energy projects and equipment, few offer programs that are specifically designed for that purpose. GMAC Mortgage Corporation, Volt VIEWtech, and First Financial Funding have attempted to position themselves as early leaders in solar finance by developing programs in collaboration with the Solar Energy Industries Association (SEIA). As recommended for government agencies, private sector finance institutions could greatly benefit the solar industry if solar finance initiatives were more fully integrated into their existing energy efficiency programs.

6.8. **Solar Industry Programs**: Few finance programs are offered by the U.S. solar energy industry. Initiatives such as the Solar Finance program established by SEIA and Volt VIEWtech, now carried by First Financial Funding, have experienced low volume. Solarex (now BP Solarex) and PowerLight Corporation currently offer two smaller financing programs in the residential and commercial sectors, respectively. BP Solarex has been able to provide some financial incentives to its customers in the mid-Atlantic region through a cost-sharing award from UPVG and additional support from the Virginia Alliance for Solar Energy (VASE). PowerLight has initiated a small-scale leasing program for PV systems on commercial buildings in collaboration with GE Capital.

6.9. **Nonprofit Programs and Foundation Grants**: A number of nonprofit organizations and foundations are actively involved in promoting renewable energy. However, most of these programs are focused on international markets. The nonprofits and foundations working specifically on renewable energy in the U.S. tend to focus their resources on policy development, technical research, and public education/communication. A notable exception (and by no means the only one) is the Renewable Energy Development Institute (REDI), which provides assistance and information on off-grid mortgages and solar loans.

6.10. Overall, the landscape is crowded with financing programs, but very little financing is actually being done. Why? This question is explored in the following section.

7. Issues Affecting the Further Financing of Solar Energy

7.1. Solar energy becomes financeable when the end-use is economically attractive and all related issues have been resolved. This section summarizes the issues that diminish or constrain the financeability of solar energy in the U.S. today.

7.2. **Ownership**: A critical issue affecting the financing of solar PV is the question of ownership. Solar PV on the customers' side of the electric meter changes the fundamental divide between utility responsibilities and customer responsibilities – clearly separated at the point of the meter under traditional utility service. Today's applications include utility-owned PV systems on customers' property (residential rooftops), and customer-owned PV systems generating energy into the grid (traditionally, a practice tightly controlled by utilities). The lack of clarity on ownership issues tends to make lenders take a wait-and-see attitude. In this way, bureaucratic foot-dragging is directly preventing solar energy markets from growing. These issues are further discussed below, in order of perceived importance.

7.3. **Utility Interconnection**: For user-owned PV systems, the interconnection of the system to the electric utility grid is perhaps the single most important technical aspect of grid-tied PV systems. The National Electrical Code, the Uniform Building Code and the various electric utility companies, working together with standards bodies such as the Electric Power Research Institute, IEEE, DOE, and the UPVG, have worked to develop an acceptable standard for interconnection of grid-tied PV/Inverter systems, but this has gone on for many years. The key standard has not yet been adopted by the utility industry. The issue of grid interconnection is complex, but there will be no substantial grid-connected market in the U.S. until the utilities have adopted such a standard.

7.4. **Regulatory Policy**: The second most important issue for the financing of solar energy is regulatory policy. These issues define the feasibility of grid-connected PV in a society in which electricity is highly regulated at federal, state, and local levels. Several regulatory issues stand out as especially important for financing:

7.4.1. *Net Metering*: Net metering allows PV generated electricity to be valued at the utility's full retail rate

(i.e., 5¢/kWh to 15¢/kWh) instead of the utility's wholesale "avoided cost" rate (i.e., 2¢/kWh to 5¢/kWh). Net metering is to the economic attractiveness of PV what the interconnect standard is to the feasibility of PV – it is essential. Laws regarding the use of net metering are currently in place in 27 states and will most likely be incorporated at some point into a national electric utility restructuring program. Current regulations in each state vary as to how they treat electrical sizing, output, and credits for energy produced, but all are of great value to PV system owners. In California, for example, a customer can produce as much energy during a full year as is consumed and have an energy bill of zero. A uniform application of net metering is an important step in creating a consistent, nationwide market for renewable electricity.

7.4.2. *Utility Restructuring*: A second area of regulatory policy that affects the financeability of solar energy is utility restructuring. This is a double-edged sword – opening up the markets to competition and new technologies, but also creating a period of uncertainty, which causes potential end-users (and lenders) to take a wait-and-see approach.

7.4.3. *Portfolio Standards*: Several states have adopted rules by which utility distributors and/or generators must include a minimum level of clean and/or renewable sources of power. The viability of these "portfolio standards" has not been established one way or the other.

7.5. **Solar Energy Equipment and Application Standards**: The uniform, standardized quality of solar energy systems is still not what it needs to be to attract a mass market supported by financing. Five areas need to be addressed urgently:

7.5.1. *Technical Standards*: Long-term acceptability of solar energy equipment and systems will depend upon the implementation of national and international standards. One of the core property standards in the housing industry is the Housing and Urban Development (HUD) "Minimum Property Standards". This standard is not only utilized by

HUD but also by FHA and VA in their lending and housing programs. A standard exists for solar water heating systems used for domestic hot water and space heating. The process for approval took several years to complete. A standard for building-integrated PV has been proposed in the Federal Register. This standard addresses issues relating to PV modules, but needs to address mounting structures, system controls, energy storage, and system performance. HUD working together with the solar industry and relevant agencies should seek to develop uniform guidelines for complete solar electric systems. This is a prerequisite to financing.

7.5.2. *Energy Efficiency Standards*: The "Energy Efficient Mortgage" is a widely available mortgage loan incentive program that encourages energy conservation measures in residential structures. The "incentive" is both a higher Loan-to-Value ratio, due to the increasing value of energy improvements over time, and greater income by the amount of the monthly savings resulting from those energy improvements. This program is used mostly as a "time of purchase" incentive and requires a Home Energy Rating System (HERS) "certified audit" using approved software. Solar water heating systems have been included in most versions of the HERS software, but there is no provision in the software for building-based electric systems like PV. The National Home Energy Rating Association, working together with the Energy Efficient Mortgage Association, DOE, and State Energy Offices, needs to incorporate PV in the software.

7.5.3. *Solar System Performance Standards*: Lenders must have a high degree of assurance that the systems are sized correctly and will work. Today, they do not have such assurance. The industry still lacks basic system quality standards and performance measurement standards. Performance standards for solar water heating systems have been developed (ASHRAE / Solar Rating Certification Corporation (SRCC). Although much is known about individual components of a PV system, there is little data on integrated systems and overall system performance. Such standards must be widely applied to give lenders the confidence in solar energy systems.

7.5.4. *Installation & Maintenance Standards*: Similarly, financiers need comfort that the systems will be installed to a high level of quality and standardization. Proper operation of a solar energy system is dependent upon the quality of the initial installation as well as the long-term operation and maintenance of the system. The fire alarm and security alarm industries have UL listings on both their products and the installation and maintenance of the systems. This includes certification of training programs, installation techniques, and maintenance to improve the reliability of system performance. Training and certification programs for installers and service personnel should be further developed within the existing contractor base.

7.5.5. *Training of Inspectors:* Building inspectors also need training in the unique aspects of solar energy systems. Generic tools could be developed to provide assistance with issues such as roof mounting details, interconnection, and other site specific requirements like permits, engineering, inspections, etc.

7.6. **Economic Incentives**: As restructuring legislation is passed in various states, new incentives programs are being created to assist with the inclusion of renewable energy systems in the "mix" of energy options for each utility service territory. In California, for example, investor-owned utilities have paid into a fund to provide a "buydown" for new photovoltaic systems at a level of $3.00 per watt, up to half of the total system cost. Other utility districts are offering even greater incentives, and some have completely different methods such as "shopping credits." The wide variation in incentive methods and amounts allows for the local promotion of solar energy. However, nationwide financing programs would be more feasible if incentives were adopted nationally.

7.7. **Lender Guidelines**: The lending industry uses standardized guidelines to make loan decisions. Economic and appraisal guidelines must be modified to accommodate solar systems. These include the following:

7.7.1. *Evaluation / Qualification Criteria*: Both solar water heating and PV systems have a relatively long-term payback period – typically more than 10 years. The existing EPA Energy Star mortgage program limits energy improvements to only those with less than a 10 year payback. The analysis includes assumptions

about the price of future energy, which is typically assumed to be the same as today's energy (i.e., a "simple payback" with no energy escalation). While this may make some economic sense in the short-term the main purpose behind the EPA's Energy Star program is to reduce emissions through energy efficiency. In this regard solar systems provide pollution-free energy and should not be subject to a strict "payback-time." One way to deal with this problem is to "bundle" energy measures such as insulation and lighting efficiency with solar to achieve a shorter payback. Another method would be to finance up to 10 years of savings from a solar device regardless of overall payback estimates.

7.7.2. *Off-Grid lending / Rural Property Guidelines*: With restructuring of the electric utility industry there are new opportunities and regulatory forces at work which will make "stand-alone" electrical power systems more common. Although lenders would agree that Fannie Mae would finance homes with private water systems, private septic systems, and private road systems, most lenders would not agree that Fannie Mae would support a loan for a home with a private electrical power system. However, Fannie Mae does have a written policy that includes homes with private power systems as long as they meet the same "market criteria" as any other residential property as determined by an approved appraisal. Rural Property Guidelines exist to address some of the more common problems in rural real estate such as a longer time-to-market, or a greater distance range, or comparing a grid-connected home to a non-grid-connected home. Information regarding these appraisal guidelines and their use in appraising rural properties should be incorporated into appraiser and lender training. In addition, existing databases such as the Multiple Listing Service and TRW's DataQuick network need to contain information about the source of electricity for easier access to off-grid comparable sales. This would involve the real estate industry and local government employees in compiling and maintaining this information. While such "back-room" issues might seem too detailed for policy work, it is this kind of issue that ultimately keeps the

big picture policies from being realized in the market.

7.7.3. *Loan-to-value (LTV):* The cost of a residential solar electric and hot water system ranges from $20,000 to $50,000 and higher. Residential mortgage financing is a cost-effective method to finance such long-term investments. A conforming "loan-to-value" ratio of 75% is typical for a "cash-out" refinance and Fannie Mae has a pilot program for energy equipment which allows up to 90% LTV. However, the cost of a solar energy system is not reflected in the market approach used by most appraisers. There is an addendum form, FNMA 1004a / FMAC 70a, which is designed to be used by appraisers to determine both the "net present value" and the monthly savings of energy equipment such as PV and solar thermal systems. At present, this form is seldom, if ever, used. Training appraisers to include the additional income and assets related to the solar system would allow greater investments in renewable energy equipment.

7.8. **Insurance**: Lenders require adequate insurance coverage because the borrower's insurance policy protects the value of the collateral over the years ahead.

7.8.1. *Replacement*: Full replacement value insurance policies cover the cost of replacing a residence should all be lost to disaster. However, unless specifically addressed in the policy, the replacement cost of a solar energy system may not be included in the standard homeowner's insurance policy. Addition insurance to cover the cost of replacement of the energy system should be a part of the operating cost of a solar system.

7.8.2. *Safety / Leaks & Fire*: In many local fire districts there are regulations preventing the "downgrading" of an existing roof by the addition of components such as PV or solar water heaters. A "Class A" roof needs "Class A" fire-rated materials for any addition, including solar equipment. PV and solar water heater modules need to have a fire rating as determined by the testing labs and the industry. Roof attachments and the potential for leaks are the main factor in many building permit reviews. There

is a need for standardized attachment methods with engineering calculations regarding loading and method of attachment. These could be utilized nationwide by local building departments to ease the permitting and financing processes.

7.9. **Information Dissemination**: Lenders and investors need easy access to reliable information upon which to make decisions. There are many Internet sites, toll-free telephone services, and free publications available throughout the U.S., from government, educational, industry, and non-profit organizations. While many sites provide links to other organizations, there is a need for a centralized clearinghouse for solar energy information. While efforts are in place to provide more linkages to these various financial services there is still a need for broader access to financing information by the public, the industry, and financing companies

8. Outlook: The Context for Resolution of the Key Issues

8.1. This section of the paper applies two "structures" around which the final policy paper will be organized:

- Economic Attractiveness: Moving PV to Cost/Value Parity
- Financial Attractiveness: Addressing the Criteria for Lending

8.2. **Economic Attractiveness: Moving PV to Cost/Value Parity**: The economics of solar energy have to be attractive before there can be any consideration of third-party financing. It is said that PV-based electricity now costs anywhere from 15¢/kWh to 50¢/kWh, whereas conventional power generation, using today's best gas-fired combined cycle technology, costs just 2.5¢/kWh to 3.5¢/kWh. Clearly, if PV electricity costs 30¢, and conventional power costs just 3¢, then PV appears to be off by a factor of ten, and there can be no truly viable market. However, from a recognition that energy economics are created in part by regulatory, tax, and other government structures, one can see the potential for policy "strategies" that make PV competitive in today's world. As illustrated in Figure 6 (p.30), there are two halves of the policy equation:

8.2.1. *Value*: Government policies need to be coordinated into strategies that together enhance the value of solar energy. The value of PV-based electricity can be raised to the level of retail rates through net metering, a state-level regulatory change that has

been adopted by at least 27 states. The next phase of the movement to net metering will include "time of use" net metering, which accurately reflects the value of on-peak, daytime kilowatt-hours from PV systems. This can be further enhanced by income tax credits, environmental rebates, and other "value" gains. The EPA is working on a new environmental rebate called the Clean Air Non-Depletion Allowance (CANDA).

8.2.2. *Cost*: The cost of PV systems can be reduced over time through technology research for efficiency improvements, developmental work for reducing manufacturing costs per unit, design improvements that cause PV to displace conventional building materials [sidebar: paybacks on PV versus granite], and training programs for minimizing installation costs. Immediate cost reductions can be achieved through subsidies, cost-sharing programs, abatement of sales taxes and property taxes, provision of low-cost financing, and other programs. Again, policies can be integrated into strategies that achieve the desired results.

8.2.3. *Cost/Value Parity*: A target of approximately 15¢/kWh can be set as the point at which the value of PV electricity, and the cost of PV electricity can be brought together in the immediate future. To the extent that value and cost are at parity or better, solar energy becomes financeable.

8.3. **Financial Attractiveness: Addressing the Criteria for Lending**: The second framework for developing policy strategy is the structure by which lenders think about making loans, and actually evaluate loan candidates. For the making of a standard loan, lenders look to be repaid from three possible sources: (1) from the borrower's cash flow and character (often stated as the borrower's "ability and willingness" to repay); (2) from recovery and resale of the asset being financed (collateral value of the solar system); and (3) from third-party guarantees. This "lender's mentality" can provide a useful structure for planning and evaluating policy:

8.3.1. *Improving borrower's ability and willingness to repay*: Such policy initiatives include:

8.3.1.1. Reducing the cost of solar systems:

- Component R&D;

- Component manufacturing;
- Building-integrated design;
- System installation;
- System maintenance;
- Subsidies;
- Tax abatements;
- Other cost-reducing mechanisms.

8.3.1.2. Raising the perceived value of solar systems at the time of purchase:

- Net metering;
- Tax credits;
- Economic incentives;
- Environmental rebates;
- Other value-enhancing mechanisms.

8.3.1.3. Assuring that perceived value is actually realized over time:

- System performance standards;
- Warranties;
- Payback guarantees;
- Energy cost guarantees;
- Other value-assurance programs.

8.3.1.4. Supporting the Making of Sound Decisions:

- Energy efficiency standards;
- Appraisal methodologies;
- Loan-to-Value criteria;
- Loan evaluation criteria;
- Information dissemination.

8.3.2. *Improving the collateral value of solar systems*: The second source of repayment, in the event that a borrower fails to repay as agreed, is from the recovery and resale of the solar system (i.e., its "collateral value"). The system must be physically recoverable, and there must be a secondary market for the used equipment. It is the lack of collateral value that causes lenders to avoid asset-based financing for solar energy. They perceive little or no value to the collateral, hence making loans solely on the borrower's credit, and not on the value of the system. Policy options to create collateral value for

solar systems, and hence increase their financeability, include:

- Component and system standards;
- Warranties;
- Insurance;
- Creation of a secondary market;
- Other collateral-enhancing mechanisms.

8.3.3. *Third-Party Guarantees*: Lenders will look for a third source of repayment in the form of third-party guarantees of repayment in the event the borrower fails to repay and the collateral is not worth the principal remaining on the loan. This is, for example, the reason for the VA mortgage program, where the VA provides lenders with a guarantee of repayment. Policies that enhance the "guarantee" mechanism for solar energy include the extension of existing loan guarantee programs to now encompass solar energy explicitly, i.e.: VA, HUD/FHA, and DOE (new programs?).

8.3.4. *Improving the profitability of solar energy loans*: The ultimate policy approach to bringing lenders into solar energy is to go directly to the question at hand, creating incentives for lenders, encouraging them to make loans for solar energy. The basis for this approach is that the lenders are the ones taking much of the financial risk on solar energy systems, more so than the end-users. Candidate policies include:

- Loan guarantees;
- Interest rate subsidies;
- Secondary markets for solar loans;
- Other risk-reduction programs for lenders.

9. Plan for Development of the Policy Paper

9.1. The next step is the preparation of a full policy paper entitled "Financing Solar Energy in the U.S."

9.2. **Objectives**: The purpose of the full paper will be to convey an accurate assessment of the situation, describe the policy options that are available to government, and recommend an action plan for their implementation. The full paper will build on this scoping paper,

adding conclusions and recommendations on policy. As previously stated, emphasis will be placed on the implementation of existing policy ideas.

9.3. **Workplan**: The schedule of tasks to prepare and publish the full paper is illustrated in figure 7 (p.31), and summarized as follows

9.3.1. *Concept*: Completed in May 1999.

9.3.2. *Scoping Paper*: Completed in June 1999.

9.3.3. *Review*: The review of the scoping paper will be done in two phases: (a) review by selected experts in early July, and (b) open review by the public via access to REPP's web site in July and August.

9.3.4. *Funding*: Preparation of the paper should be funded by multiple parties to ensure broad "ownership." Candidates include REPP, DOE, UPVG, foundations, and others.

9.3.5. *Draft Paper*: Drafting the full paper will require approximately one month. This short schedule is made possible by organizing a team of expert authors.

9.3.6. *Editorial*: REPP staff will edit the paper and bring it up to a high level of professional quality.

9.3.7. *Expert Review*: The draft paper should receive broad-based peer review.

9.3.8. *Final Paper*: Comments from the experts will be accommodated in the final paper. The key date for the entire schedule is September 15, 1999, on which day the paper is to be presented to the DOE PV program managers and the agencies involved in the Million Solar Roof's Initiative, as input to planning FY 2000 programs.

9.3.9. *Publishing*: The paper will be published in the form of a REPP Issue Brief.

9.3.10. *Distribution*: The REPP Issue Brief will be printed and distributed.

9.4. **Team**: A team of experts is being assembled as contributing authors for the final paper. Experts are being recruited for the following subject areas:

9.4.1. Solar energy market outlook;

9.4.2. Economics, state by state;

9.4.3. Regulatory issues;

9.4.4. Technical and interconnect standards;

9.4.5. Program examples:

- National: Fannie Mae;
- State: California;
- Local: Tucson or LA;

9.4.6. Financial examples;

- Residential loans;
- Commercial financing;

9.4.7. PV Industry role in financing;

9.4.8. Government role in financing;

9.4.9. Sidebar: Solar hot water;

9.4.10. Sidebar: Solar thermal-electric;

9.4.11. Sidebar: Information sources;

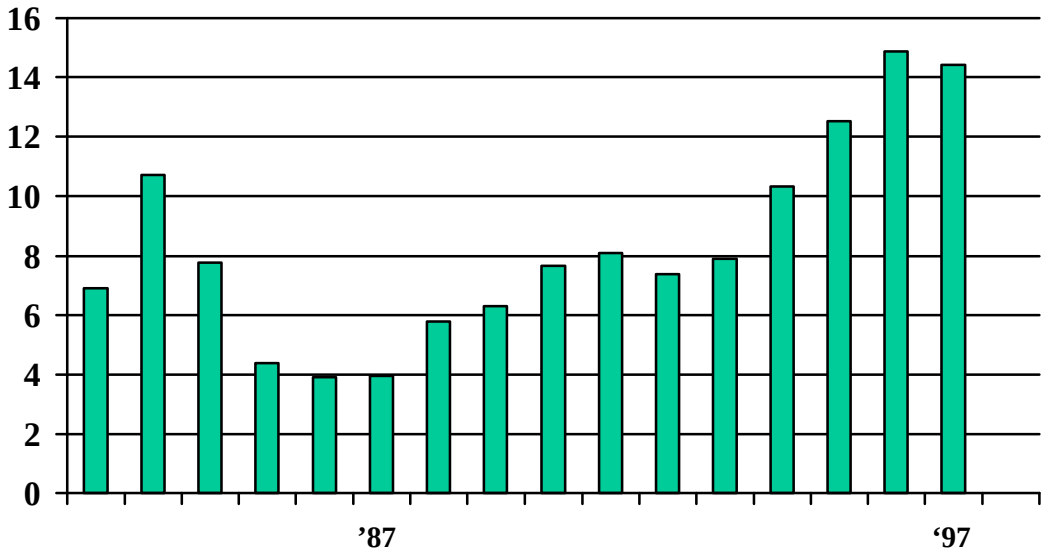
10. Presentation of Results

10.1. The principal output of the work will be a REPP Issues Brief. In addition, the material will be organized into a slide presentation and talking points for executive-level presentations (the initial presentation is scheduled for the UPEX conference, October 4-6, 1999).

* * * * * * *

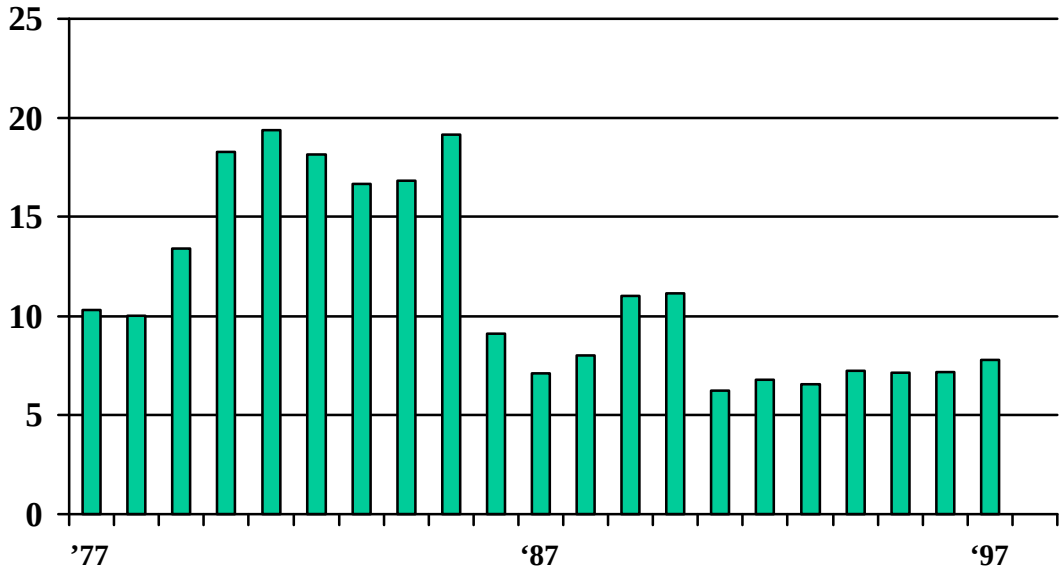
This document has presented a "scoping" of the situation and issues related to the financing of solar energy in the U.S. It has included an assessment of market conditions, existing financing programs, key issues constraining further market development, and a framework for assessing government policy options. The next step is to expand this work to the recommendation of future policy.

Figure 1: Solar PV Installations in the U.S., 1982 - 1997
(Megawatts / Year)



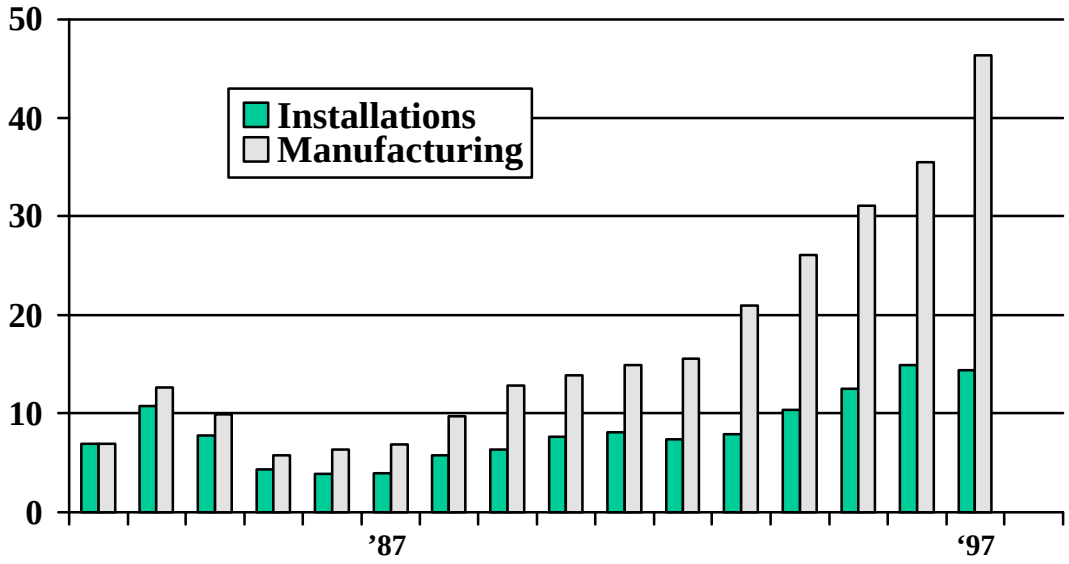
Source: Renewable Energy Annual, EIA, 1998

Figure 2: U.S. Solar Thermal Collector Installations, 1977 - 1997
(Million Sq. Ft. / Year)



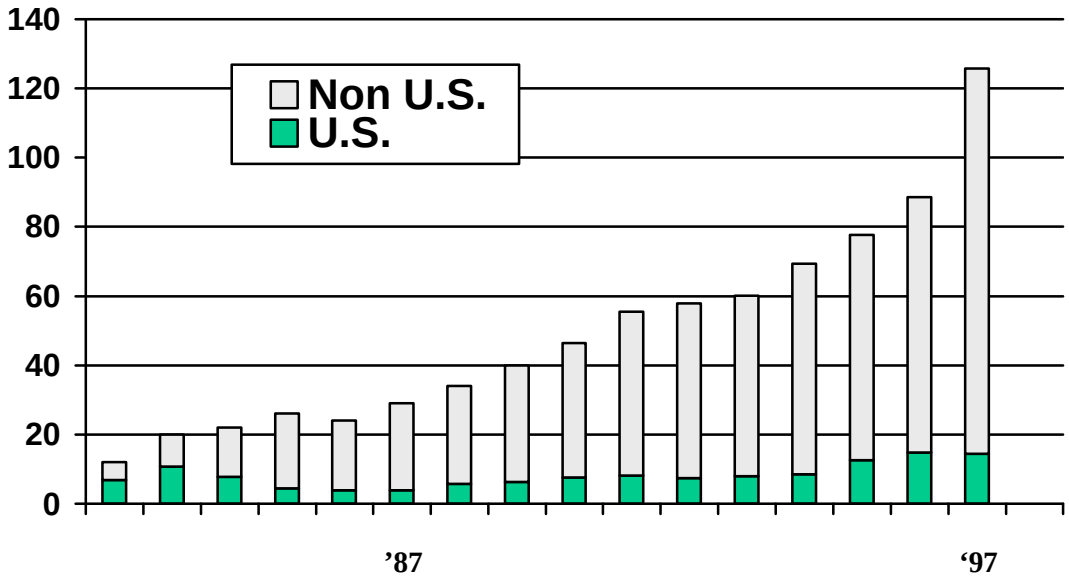
Source: Renewable Energy Annual, EIA, 1998

Figure 3: Solar PV Installations and Manufacturing in the U.S., 1982 - 1997
(Megawatts / Year)



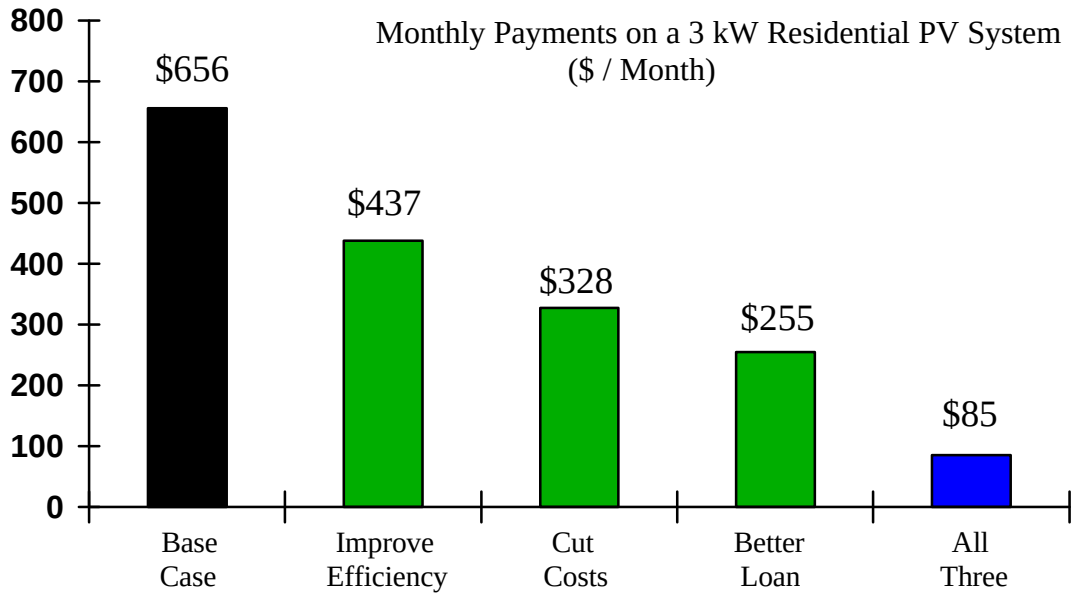
Source: Renewable Energy Annual, EIA, 1998

Figure 4: World and U.S. PV Markets, 1982 - 1997
(Installations -- MW / Year)



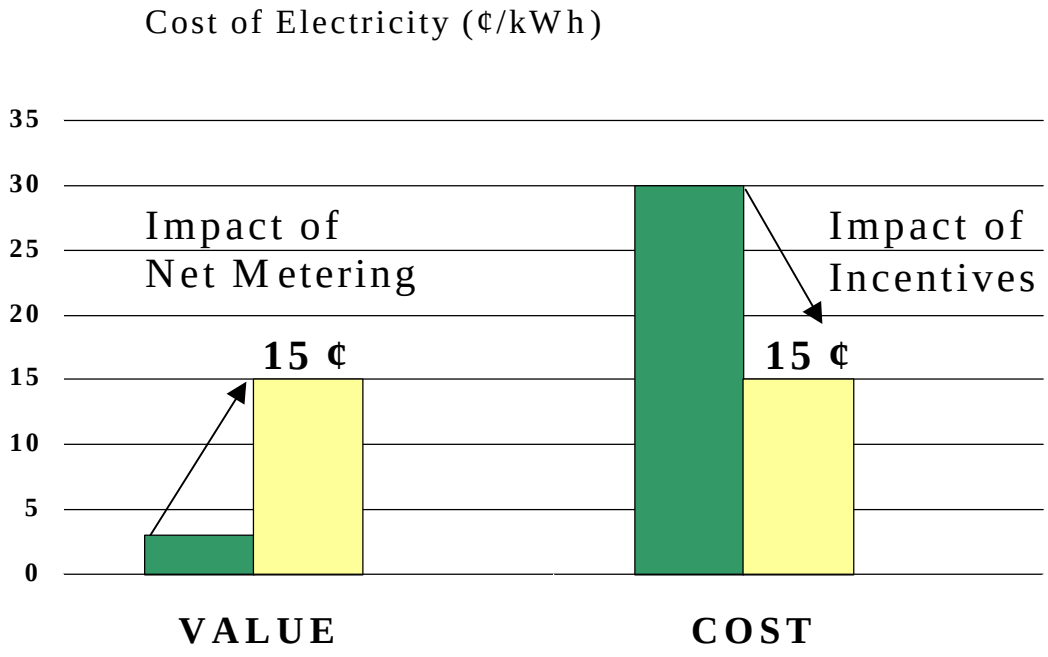
Sources: Renewable Energy Annual, EIA, 1998;
Photovoltaic News, Maycock, 2/99

Figure 5: Impact of Financing vs. Other Policy Options



Source: SolarBank Project, 1999

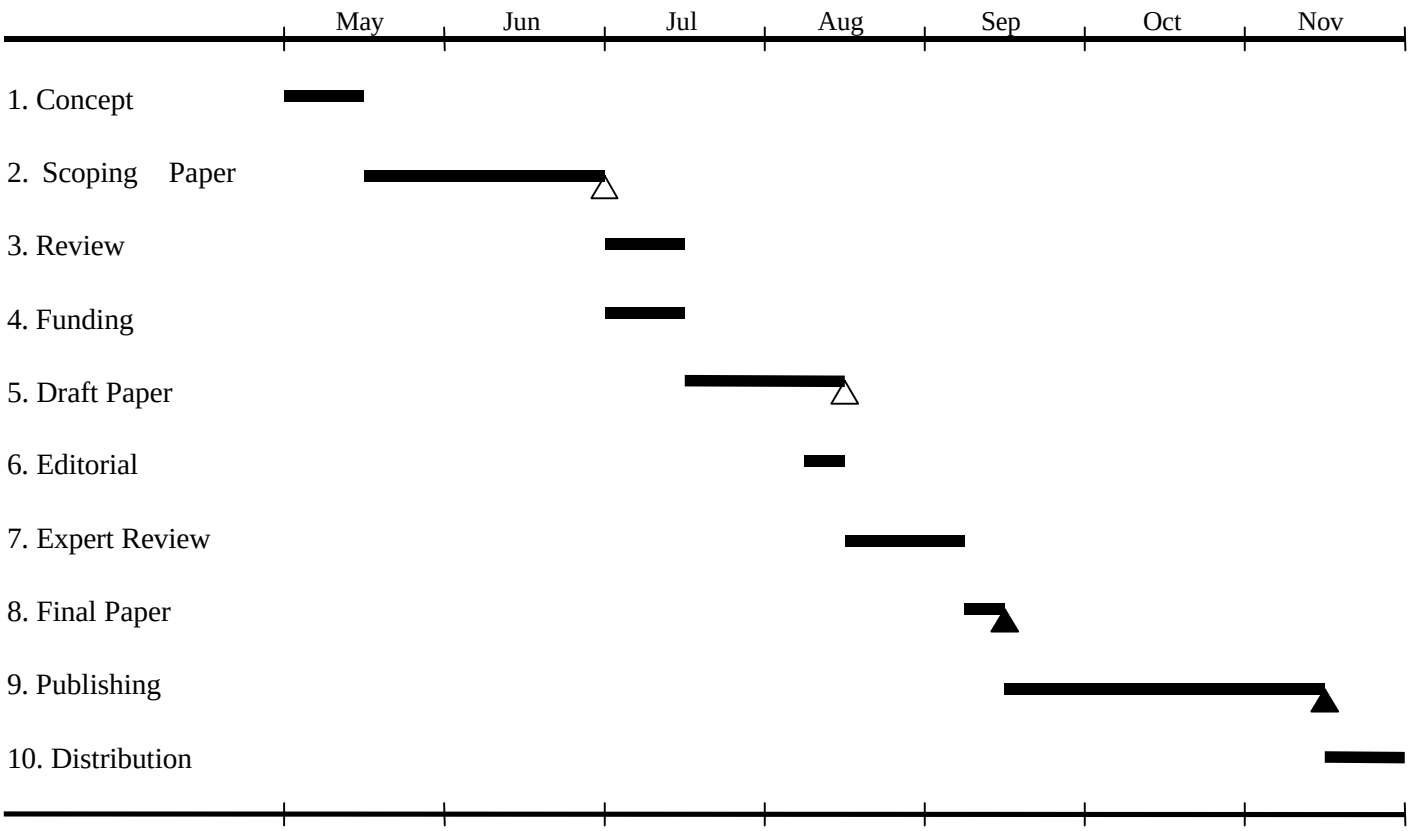
Figure 6: Moving PV to Cost / Value Parity



Source: SolarBank Project, 1999

Figure 7: Schedule

Preparation and Publishing of “Financing Solar Energy in the U.S.”



Appendix A: Financing Programs Related to Solar Energy

- **FEDERAL TAX INCENTIVES**

Business Energy Tax Credit (26 USC Sec. 48)
Type: tax credit for solar energy property
Terms: Up to 10% of the purchase/installation (or investment) amount of qualified solar energy property can be claimed when filing annual tax returns. This credit was permanently extended as part of the Energy Policy Act of 1992.
Available To: commercial
Eligible Technology: photovoltaics, solar thermal
Additional Information: http://www.seia.org/taxcredi.htm, and instructions for IRS Forms 3468 and 3800

Business Rebate Tax Exemption (Energy Policy Act of 1992)
Type: tax abatement
Terms: As of 1996, only 35% of the total value of utility rebates for solar systems and energy efficient appliances is taxable.
Available To: commercial, industrial
Eligible Technology: photovoltaics, solar thermal
Additional Information: http://www.eren.doe.gov/consumerinfo/refbriefs/la7.html

Modified Accelerated Cost Recovery System (26 USC Sec. 168)
Type: 5-year accelerated depreciation for solar equipment
Terms: A 5-year depreciation schedule, using a 200 percent declining balance method. Without this legal provision, depreciation for solar equipment would be done over the standard 20-year period.
Available To: commercial
Eligible Technology: photovoltaics, solar thermal
Additional Information: http://www.seia.org/legdepre.htm

Residential Rebate Tax Exemption (Energy Policy Act of 1992)
Type: tax abatement
Terms: Establishes that utility rebates for residential solar systems and energy efficient appliances are not taxable.
Available To: residential
Eligible Technology: photovoltaics, solar thermal
Additional Information: http://www.eren.doe.gov/consumerinfo/refbriefs/la8.html, and http://www.irs.ustreas.gov/prod/forms_pubs/pubs/p171302.htm

PROPOSED Solar Tax Credit (by Vice President Gore)*
Type: tax credit
Terms: Credit equal to 15% of the cost of a rooftop solar system -- up to $1,000 for solar water heating systems, and up to $2,000 for PV panels. Applies to systems put in place between 1999 and 2003 (for solar water heating systems) and 2005 (for PV panels).
Available To: residential, commercial
Eligible Technology: photovoltaics, solar thermal
Additional Information: http://www.eren.doe.gov/millionroofs/gore.html
* This credit was proposed in January 1998 and has not yet been approved.

PROPOSED Energy Efficiency Tax Credit (by Rep. William Thomas)*
"The Energy Efficient Affordable Home Act of 1999" (H.R. 1358)
Type: tax credit
Terms: A homeowner who improves the energy efficiency of his/her home by 30% would qualify for a tax credit of 20% of the cost of the improvements ($2,000 limit). A homebuilder who constructs a new home that exceeds the 1999 IECC by 30% or more would be eligible for a flat tax credit of $2,000.
Available To: residential (for energy improvements), homebuilders (for constructing new energy efficient homes)
Eligible Technology: photovoltaics, solar thermal
Additional Information: http:www.ase.org/takeaction/
* This credit was proposed in March 1999 and has not yet been approved.

• FEDERAL ECONOMIC INCENTIVES

Renewable Energy Production Incentive (REPI) (Energy Policy Act of 1992, Sec. 1212; 10 CFR 451)
Type: annual incentive payments
Terms: 1.5 cent/kWh (adjusted for inflation) incentive payments to qualifying renewable energy generation facilities that started operations between October 1, 1993 and September 30, 2003. Facilities are eligible for annual payments for the first ten-year period of their operation, subject to the availability of annual appropriations in each fiscal year.
Available To: State-owned electric production facilities, municipal utilities, nonprofit electric co-ops
Eligible Technology: photovoltaics, solar thermal, wind, geothermal, or closed-loop biomass
Additional Information: http://www.eren.doe.gov/utilities/repi.html, or contact Robert.Brewer@hq.doe.gov (202) 596-2206

• FEDERAL LOAN & GRANT PROGRAMS

Department of Agriculture (USDA): Rural Business-Cooperative Services (RBS)
Type: loans and grants
Terms: RBS offers various loans and grants to promote rural economic development and job creation. Funding is available through the following programs: Business and Industry Guaranteed and Direct Loans, Intermediary Relending Program Loans, Rural Business Enterprise Grants, Rural Economic Development Loans and Grants, and Rural Technology and Cooperative Development Grants.
Available To: rural utility services, public agencies, cooperatives, corporations, municipalities, nonprofits, Indian tribes
Eligible Technology: potentially photovoltaics, solar thermal
Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.seia.org/mrfedloan.htm, and http://www.rurdev.usda.gov/rbs/busp/rbeg.htm

Department of Agriculture (USDA): Rural Housing Service (RHS)
Type: loans and grants
Terms: RHS works with Farmer Mac to provide loan and grant programs for purchase, construction, repair, and improvements of homes and community facilities. Among others programs, RHS offers Community Facilities Loans, Home Improvement and Repair Loans and Grants, Home Ownership Loans, and Resource Conservation and Development Loans.
Available To: rural residential, municipalities, nonprofits, Indian tribes
Eligible Technology: potentially photovoltaics, solar thermal
Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.rurdev.usda.gov/agency/rhs/rhsprog.html, and http://www.rurdev.usda.gov/rbs/busp/redg.htm

Department of Agriculture (USDA): Rural Utility Services (RUS)

Type: loans and grants

Terms: RUS has two loan programs that are related to PV: the Generation and Transmission loan Program and the Direct Loans Program. The Generation and Transmission loan Program, which has $300 million in available funds, is a 100% loan guaranty program with an interest rate based on the Treasury Yield Curve (20-30 years). The Direct Loan Program is based on appropriations from Congress. The interest rate is based on the municipal bond rate. RUS borrowers are also eligible for the Rural Economic Development Loan Program and Rural Economic Development Grant Program, which are administered by RBS.

Available To: rural generation and transmission (G&T) companies, cooperatives, the Navajo Tribal Utilities Authority, others

Eligible Technology: photovoltaics

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.seia.org/mrfedloan.htm

Department of Energy (DOE): Federal Energy Management Program (FEMP)

Type: Federal ESPCs

Terms: The President has directed Federal agencies to reduce their energy use by 30% from 1985 levels by the year 2005. As a result, FEMP has intensified its efforts to deploy solar energy systems in Federal facilities. Congress has explicitly authorized agencies to use Energy Savings Performance Contracts (ESPCs) to fund these investments. In a federal ESPC, an energy service company (ESCO) pays the up-front cost of implementing energy conservation measures in a facility. The government then repays the ESCO a share of the related savings over the life of the contract, which can be up to 25 years. FEMP is also promoting regional and technology-specific Super ESPCs, which streamline the process of an agency acquiring solar equipment with a simple delivery order.

Available To: Federal agencies/facilities

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.seia.org/mrfedloan.htm, and http://www.eren.doe.gov/femp/

Department of Energy (DOE)/Utility Photovoltaic Group (UPVG): Team-Up Initiative

Type: grants

Terms: The Team-Up initiative stands for building Technology Experience to Accelerate Markets for Utility Photovoltaics. It provides grants to help develop sustainable markets and opportunities for PV applications. Industry is currently investing four to five dollars for every dollar invested by the U.S. taxpayer.

Available To: teams made up of utilities, independent power producers, industry, others

Eligible Technology: photovoltaics

Additional Information: http://www.ttcorp.com/upvg/team_mn.htm, or contact UPVG (202) 857-0898

Department of Energy (DOE): Municipal Energy Management Program

Type: grants

Terms: This program provides grants up to $75,000 for applied energy research and demonstration projects, and up to $25,000 for technology transfer projects. Cost-sharing and partnerships between and public and private entities are required.

Available To: local governments, municipalities, cities

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://www.eren.doe.gov/buildings/state_and_community/memp.html, or call Eric Thomas (202) 586-2242

Department of Energy (DOE): Weatherization Assistance Program

Type: grants

Terms: DOE provides grants to states which subgrant to local agencies to install energy conservation equipment in low-income households. Each state must submit a plan to spend the funds. DOE can exercise a limited amount of control over the technologies implemented by "encouraging states to examine specific energy alternatives."

Available To: state agencies through DOE, residential (single/multi-family low-income) parties through the state agencies

Eligible Technology: solar water heating systems

Additional Information: http://www.eren.doe.gov/consumerinfo/refbriefs/la3.html

Department of Housing and Urban Development (HUD): Community Development Block Grant Program

Type: loans, grants, and subsidies

Terms: This is HUD's primary neighborhood support program, distributing more than $4.5 billion/year to local governments. Acquisition, construction, reconstruction, and installation of power generating and distribution facilities are eligible projects. Programs that promote energy efficiency and renewable energy are encouraged.

Available To: nonprofits, local development corporations

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.hud.gov/cpd/cdbgfct.html

Department of Housing and Urban Development (HUD): Energy Efficient Mortgage Program

Type: loans

Terms: The Federal Housing Administration (FHA), which is a part of HUD, insures home mortgages and allows an increase in the base loan amount of up to 5% of the appraised value of the property to include cost-effective energy saving measures ($8,000 limit). This program is eligible for both existing homes and new construction, and requires a Home Energy Rating System (HERS) inspection. In 1978 Congress authorized HUD to exceed by 20% the maximum loan limits for home ownership and property rehabilitation to allow for the installation of passive and active solar water heating systems. This authorization is currently being revised to include PV systems.

Available To: 1-4 unit residential properties

Eligible Technology: solar water heating systems

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.seia.org/mrfedloan.htm, http://www.hud.gov/insured.html, or contact Bob Groberg at HUD (202) 708-0614 (x 4642)

Department of Housing and Urban Development (HUD): HOME Investment Partnership Program

Type: loans

Terms: Through this program, more than $1 billion/year is provided to applicant state and local governments for investment in long-term-affordable housing for low-income families. Funds can be used for housing rehabilitation, including energy conservation measures.

Available To: state and local governments, joint ventures by state and local governments, public utility companies, nonprofits

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.hud.gov/progdesc/home1a.html

Department of Housing and Urban Development (HUD): Hope VI Program

Type: grants

Terms: Hope VI provides funding to public housing authorities for planning, revitalization, and demolition projects that improve public housing buildings. Any new construction must meet the Council of American Building Officials (CABO) Model Energy Code Standards. This program should provide opportunities to demonstrate solar energy systems.

Available To: public housing authorities (except Indian housing authorities).

Eligible Technology: potentially photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://hud.gov/progdesc/hopevia.html

Department of Housing and Urban Development (HUD): Section 184 Indian Home Loan Guaranty Program

Type: loans

Terms: Guaranteed loans for acquisition or rehabilitation of both existing and new homes.

Available To: Native Americans, Indian Housing Authorities

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://aspe.os.dhhs.gov/cfda/p14865.htm, or http://www.seia.org/mrfedloan.htm

Department of Housing and Urban Development (HUD): Title I Property Improvement Mortgage Insurance

Type: loans

Terms: HUD/FHA Title I insurance enables approved lenders to make property improvement loans to creditworthy borrowers with little or no equity in their homes ($25,000 limit for single-family homes). These second mortgages do not require energy efficiency calculations and can help finance solar installations that otherwise might not be eligible under a first mortgage. HUD/FHA insures property improvement loans for up to 20 years.

Available To: residential

Eligible Technology: photovoltaic, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.hud.gov/progdesc/title-i.html

Department of Veterans Affairs (VA): Mortgage Loan Guaranty Program & Energy Efficient Mortgages

Type: loans

Terms: Guarantees mortgage loans for veterans and servicepersons to enable them to obtain loans with favorable terms, usually without a down payment. This program allows veterans to buy, build, or renovate a home, and increase their mortgages for energy-related improvements. The maximum loan amount is $203,000 with the interest rate determined by a negotiated rate structure (currently 7.5% to 8.25% on 30-year fixed rate). A veteran may also refinance an existing VA loan to retrofit a home with energy efficient measures (limits $3,000 to $6,000). In the case of new construction, PV or solar water heating systems can be included in the sale price of the home.

Available To: veterans, servicepersons, certain unremarried surviving spouses

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), and http://www.seia.org/mrfedloan.htm

Environmental Protection Agency (EPA): Energy Star Mortgages

Type: loans

Terms: EPA's Energy Star program offers mortgage financing that enables consumers to purchase a home that is at least 30% more efficient than the 1992 Model Energy Code at a lower total monthly cost than a standard house. Financing for this program is done through a private Energy Star partner.

Available To: residential

Eligible Technology: photovoltaics, solar thermal

Additional Info: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.epa.gov/energystar.html, or call 1-888-STAR-YES (888-782-7937)

Environmental Protection Agency (EPA): Energy Star Loans

Type: loans

Terms: Through this program, consumers can obtain lower interest rate fixed term loans for high efficiency residential heating and space conditioning equipment. Available from Energy Star loan partners.

Available To: residential, contractors

Eligible Technology: solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.epa.gov/energystar.html, or call 1-888-STAR-YES

Environmental Protection Agency (EPA): Environmental Justice Through Pollution Prevention Grant

Type: grants

Terms: Funds up to $250,000 for pollution prevention/source reduction projects that have a direct impact on minority/low-income/tribal communities.

Available To: state and local governments, nonprofits, schools, tribal governments, national/regional organizations

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://www.epa.gov/opptintr/ejp2, or contact Louise Little (703) 841-0483

Environmental Protection Agency (EPA): Environmental Technology Initiative (ETI)

Type: grants

Terms: Funding to promote public health and environmental protection by advancing the development and use of innovative pollution prevention and other environmental technologies.

Available To: public-private partnerships

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://www.epa.gov/oppe/eti, or contact ETI information line (202) 260-2686

Environmental Protection Agency (EPA): Performance Partnership Grant

Type: grants

Terms: Multi-program grant funds that can be used for programs including pollution control and prevention.

Available To: state agencies, Native American tribes

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://www.epa.gov/watrhome/PPG/ppgtoc.htm, http://aspe.os.dhhs.gov/cfda/p66605.htm

Environmental Protection Agency (EPA): Sustainable Development Challenge Grants

Type: grants

Terms: Competitive grants to leverage private and public sector investment in sustainable communities. Demonstrations or development of pollution prevention or environmental protection processes are eligible projects under this grant program.

Available To: state and local governments, Native American tribes, U.S. territories, schools, nonprofits

Eligible Technology: photovoltaics, solar thermal

Additional Information: http://www.epa.gov/regional/statelocal/funding.htm

Federal Emergency Management Act: Disaster Preparedness Assistance

Type: grants

Terms: $50,000/state is available to write disaster preparedness plans and provide disaster training. An opportunity exists for states to incorporate language in their disaster plans to include PV as an emergency power supply system.

Available To: state governments

Eligible Technology: potentially photovoltaics

Additional Information: http://www.seia.org/mrfedloan.htm

Small Business Administration (SBA): 7(a) Standard Small Business Loan

Type: loans

Terms: Through this program, SBA provides financial assistance to start-up and existing small businesses in the form of loan guarantees. SBA will guaranty both short- and long-term loans. Eligibility requirements for this program are as broad as possible so that a wide variety of financing needs can be accommodated. There is no loan maximum dollar amount for a 7(a) loan, but SBA's share may not exceed $750,000 to any business and its affiliates. SBA will guaranty up to 80% of a loan for $100,000 or less, and a maximum of 75% for loans of more than $100,000. Generally the interest rate cannot exceed 2.75% over the prime lending rate, except for loans less than $50,000, where the rates may be slightly higher. This program will permit any small business to purchase a PV or solar thermal system only if the energy savings will positively affect the company's cash flow. The payback period is required to be less than 10 years.

Available To: small businesses

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.seia.org/mrfedloan.htm, http://www.eren.doe.gov/consumerinfo/refbriefs/1113.html, and http://www.sba.gov/financing/7aloan.html

Small Business Administration (SBA): 7(a)(12) Energy & Conservation Loan

Type: loans

Terms: This program is designed to help finance the production of energy or the implementation of energy efficient measures. Loans are available for designing, engineering, manufacturing, distributing, marketing, installing, or servicing energy devices or techniques that conserve U.S. energy resources. Note that this program is not available to the end-user (the business that wants to acquire and use the energy measure itself). End-users can finance energy measures by obtaining a basic 7(a) loan. Terms for working capital are 7 years, equipment 10 years, and building 25 years. The interest rate and maximum loan amount are the same as they are for the 7(a) program.

Available To: small businesses

Eligible Technology: photovoltaics, solar thermal

Additional Information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.seia.org/mrfedloan.htm, http://www.eren.doe.gov/consumerinfo/refbriefs/1113.html, and http://www.sba.gov/financing/7aloan.html

Small Business Administration (SBA): Pollution Control Loan

Type: loans

Terms: This program, which is a subsection of the 7(a) loan, assists businesses that are planning, designing, or installing a pollution control facility. The facility must prevent, reduce, abate, or control any form of pollution. End-users can use this program to help finance most real or personal property that will reduce pollution. SBA can guaranty up to $1 million under this program, less any outstanding balance due on other SBA loans.

Available To: small businesses

Eligible Technology: potentially photovoltaics, solar thermal

Additional Information: http://www.sba.gov/financing/frpollute.html

Small Business Administration (SBA): New LowDoc Loan Program

Type: loans

Terms: This new program streamlines the process of making loans of $150,000 or less with a one-page application and electronic loan processing. SBA will respond to loan requests within 36 hours. Maturity generally is 5 to 10 years, but can be up to 25 years for fixed-asset loans. The interest rate is negotiable (fixed or variable) but is tied to the prime rate.

Available To: small businesses

Eligible Technology: potentially photovoltaics, solar thermal

Additional Information: http://www.sba.gov/financing/frlowdoc.html

Small Business Administration (SBA): The SBA Express

Type: loans

Terms: Lenders who qualify to become SBA Express Lenders can take most servicing actions without prior approval from SBA. For example, SBA Express Lenders can use their own forms and processes to approve loans of $150,000 or less, while providing minimal paperwork to SBA to obtain a 50% guaranty on the loan. This program makes it easy for lenders to provide smaller revolving loans. With SBA Express, lenders can approve unsecured lines of credit up to $25,000. SBA will respond to loan requests within 36 hours.

Available To: small businesses

Eligible Technology: potentially photovoltaics, solar thermal

Additional Information: http://www.sba.gov/financing/frfastrak.html

Small Business Administration (SBA): Certified Development Company (504) Loan Program

Type: loans

Terms: A Certified Development Company (CDC) is a nonprofit corporation that contributes to the economic development of its community or region. There are about 290 CDCs nationwide. CDCs work with SBA and private sector lenders to provide financing to small businesses. Typically at least 10% of the loan proceeds are provided by the borrower, at least 50% from an unguaranteed bank loan, and the remainder by a SBA-guaranteed debenture. The maximum SBA debenture is $1 million. Funds can be used for a variety of purposes, including the purchase of long-term equipment, construction of new facilities, modernization of existing facilities, and implementation of utility projects.

Available To: small businesses through CDCs

Eligible Technology: potentially photovoltaics, solar thermal

Additional Information: http://www.sba.gov/financing/frcdc504.html

• FEDERAL FINANCIAL RESEARCH & OUTREACH INITIATIVES

DSIRE -- National Database of State Incentives for Renewable Energy

The Interstate Renewable Energy Council (IREC) initiated this database with funding from DOE's Office of Utility Technologies. DSIRE surveys, organizes, and disseminates information on financial and regulatory incentives that are designed to promote the application of renewable energy technologies in each state. Every incentive is cataloged by type, state, end-use sector, and technology. The North Carolina Solar Center is the principal subcontractor to IREC for collecting and preparing this information.

Additional information: http://www-solar.mck.ncsu.edu

Energy Efficiency and Renewable Energy Network (EREN)

EREN is the DOE's primary information source on energy efficiency and renewable energy. As part of its web presence, EREN provides useful information on the progress of renewable energy in each of the 50 state, as well as links to other DOE websites. EREN also maintains a site called *Financing Solutions*, which provides useful links to energy efficient and renewable energy financing resources. *Financing Solutions* is divided into the following 7 categories to address specific end-users: homeowners, small businesses, industry, utilities, state/local programs, federal buildings, and international.

Additional information: http://www.eren.doe.gov/financing

Energy Information Administration (EIA)

EIA, DOE's statistical agency, provides policy-independent data, forecasts, and analyses to promote sound policy making, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA's website contains a comprehensive profile of the solar energy industry in the U.S., as well as financial data and analysis for each specific energy type.
Additional information: http://www.eia.doe.gov

• MILLION SOLAR ROOFS (MSR)

Current State and Community Partnerships

American Samoa
Arizona: State of Arizona
Arizona: Salt River Project Area
Arizona: City of Tucson
California: State of California, California Building Industry Association
California: City of California, Los Angeles Department of Water and Power
California: City of Sacramento, Sacramento Municipal Utility District
California: San Diego Area
California: San Francisco and Monterey Bay Area, Bay Area Solar Consortium
Colorado: State of Colorado
Colorado: City of Boulder
Florida: State of Florida
Georgia: City of Atlanta, Southface Energy Institute
Hawaii: County of Hawaii, Island of Hawaii
Hawaii: City and County of Honolulu, Island of Oahu
Hawaii: Island of Kauai
Hawaii: County of Maui, Islands of Maui, Molokai, and Lanai
Idaho: State of Idaho
Illinois: City of Chicago
Maine: State of Maine
Maryland: State of Maryland
Massachusetts/New England: New England Electric Service Companies Area
Montana: State of Montana
Nevada: State of Nevada
New Jersey: State of New Jersey
New Mexico: State of New Mexico
New Mexico: City of Albuquerque
North Carolina: State of North Carolina
Ohio: Solarize Ohio (State of Ohio)
Oregon: State of Oregon
Pennsylvania: State of Pennsylvania
Pennsylvania: City of Philadelphia
Republic of Palau
Vermont: State of Vermont
Virgin Islands
Washington State: Washington State University Extension Energy Program
Wisconsin: State of Wisconsin

- **STATE PROGRAMS (INCENTIVES, LOANS, & GRANTS)**

Alaska
Power Project Revolving Loan Fund (loan program)

Arizona
Qualified Environmental Technology Facilities Credit (personal income tax credit)
Solar and Wind Energy Systems Credit (personal income tax credit)
Revolving Energy Loans for Arizona (RELA) Program (loan program)
Qualified Environmental Technology Facilities Credit (industrial recruitment incentive)
Solar and Wind Energy Equipment Exemption (sales tax incentive)
Line Extension
Net Metering

California
SAFE-BIDCO (loan program)
Energy Technologies Advancement Program -- ETAP (special grant program)
Opportunity Technology Commercialization Program (special grant program)
Small Business Energy Loan Program (loan program)
PV Pioneers II (buydown program)
Non-Bypassable Distribution Charge (system benefits Charges)
Net Metering

Colorado
Solar Rebate Program (sponsors: CO SEIA & CO Office of Energy Conservation)
SolarSource (buydown program)
Line Extension
Net Metering

Connecticut
Local Option for Property Tax (property tax incentive)
Net Metering

Delaware
Net Metering

Florida
Solar Energy Equipment Exemption (sales tax incentive)
Rebates for Suppliers of Utility-Interactive Photovoltaic Systems (sponsored by the Florida Solar Energy Center through a grant from the Florida Energy Office/Florida Department of Community Affairs)

Hawaii
Solar Energy System Credit (corporate income tax credit)
Residential Solar Energy System Credit (personal income tax credit)

Idaho
Solar, Wind, and Geothermal Deduction (personal income tax credit)
Low Interest Loans for Renewable Energy Resource Program (loan program)
Net Metering

Illinois
Illinois Clean Energy Community Trust ($250 million from ComEd.)
Alternative Energy Bond Fund Program (special grant program)
Special Assessment for Renewable Energy Systems (property tax incentive)
Renewable Energy Resource Trust Fund (system benefits charges)

Indiana
Alternative Energy Systems Program Grant (special grant program)
Renewable Energy Systems Exemption (property tax incentive)
Net Metering

Iowa
Alternative Energy Loan Program (loan program)
Grants for Energy Efficiency and Renewable Energy (special grant program)
Energy Bank Program (loan program)
Net Metering

Kansas
Renewable energy Grant Program (special grant program)

Maine
Net Metering

Maryland
Community Energy Loan Assistance Program (loan program)
Local Option Property Tax Exclusion for Renewables (property tax incentive)
Maryland Residential Rooftops, Year 2 (State buydown program to promote the Million Solar Roofs Initiative)
Harvesting the Sun (provides financial assistance to eligible farms that install PV systems)
Municipal Outreach (special grant program -- up to 50% cost-sharing for municipal RE projects)
Net Metering

Massachusetts
Alternative Energy Patent Exemption (corporate income tax credit)
Solar and Wind Energy System Deduction (corporate income tax credit)
Solar and wind Power Systems Excise Tax Exemption (corporate income tax credit)
Renewable Energy Systems Credit (personal income tax credit)
Local Property Tax Exemption for Solar, Wind, and Hydro (property tax incentive)
Renewable Energy Equipment Exemption (sales tax incentive)
Massachusetts Renewable Energy Trust Fund (system benefits charges)
Net Metering

Minnesota
Renewable Energy Equipment Accelerated Depreciation (corporate income tax credit)
Wind and Photovoltaic Systems Exemption (property tax incentive)
Solar and Wind Energy Equipment Exemption (sales tax incentive)
Net Metering

Mississippi
Energy Investment Fund (loan program)

Missouri
Low-Cost Efficiency Loan Funds (loan program)

Montana
Renewable Energy Systems Exemption (property tax incentive)
Montana's Universal System Benefits Program (system benefits charges)
Net Metering

Nebraska
Low Interest Loan Program for Energy Efficiency (loan program)

Nevada
Renewable Energy Systems Exemption (property tax incentive)
Solar Energy Producers Property Tax Exemption (industrial recruitment incentive)
Net Metering

New Hampshire
Local Option Property Tax Exemption for Renewable energy systems (property tax incentive)
Net Metering

New Jersey
Solar and Wind Energy Systems Exemption (sales tax exemption)
Net Metering

New Mexico
Line Extension
Net Metering

New York
Renewables Research and Development Program (special grant program)
Photovoltaic Income Tax Credit and Net Metering (personal income tax credit)
New York State Energy Research and Development Authority (research & outreach programs)
Net Metering

North Carolina
Solar Commercial and Industrial Credit (corporate income tax credit)
Solar Energy Systems on Residential Buildings Credit (corporate income tax credit)
Solar Energy Systems on Residential Buildings Credit (personal income tax credit)
Solar Industrial Process Heat Credit (personal income tax credit)
Active Solar Heating and Cooling Systems Exemption (property tax incentive)
Photovoltaic Systems Manufacturer Incentive (industrial recruitment incentive)

North Dakota
Geothermal, Solar, and Wind Devices Deduction (personal income tax credit)
Renewable Energy Systems Exemption (property tax incentive)
Net Metering

Ohio
Conversion Facilities Tax Exemption (corporate income tax credit, and sales tax credit)

Oklahoma
Net Metering

Oregon
Business Energy Tax Credit -- "Betsy" (corporate income tax credit)
Renewable Energy Production Credit (personal income tax credit)
Residential Energy Tax Credit Program (personal income tax credit)
Small Scale Energy Loan Program – SELP (loan program)
Renewable Energy Systems Exemption (property tax incentive)

Pennsylvania
Net Metering

Rhode Island
System Benefits Charge
Net Metering

South Dakota
Renewable Energy Systems Exemption (property tax incentive)

Tennessee
Small Business Energy Loan Program (loan program)

Texas
Solar Energy Device Franchise Tax Deduction (corporate income tax credit)
Solar and Wind-Powered Energy Systems Exemption (property tax incentive)
Solar Energy System Manufacturer Franchise Tax Exemption (industrial recruitment incentive)
Line Extension and Construction Charge
Net Metering

Utah
Renewable Energy Tax Credit (corporate income tax credit)
Energy Saving System Income Tax Credit (personal income tax credit)

Vermont
The Renewable Energy Resource Center (information and financial assistance service)
Net Metering

Virginia
Low Income Loan Program for Energy Conservation Improvements (loan program)
Local Option Property Tax Exemption for Solar and Recycling Equipment (property tax incentive)
Solar Photovoltaic Manufacturing Incentive Grant Program (industrial recruitment incentive)
Photovoltaic Manufacturing Incentive Grant Program (special grant program)
Net Metering

Washington
High Technology Product Manufacturers Excise Tax Exemption (sales tax incentive)
Net Metering

Wisconsin
Renewable Energy Assistance Program – REAP (special grant program)
Solar and Wind Energy Equipment Exemption (property tax incentive)
Net Metering

• LOCAL GOVERNMENT PROGRAMS

City of Austin
See the following section for a description of programs offered by Austin's municipally-owned electric utility.

City of Fort Collins
Since 1992, The City of Fort Collins has promoted energy conservation measures through the Zero Interest Loans for Conservation Help (ZILCH) program. Solar thermal technologies qualify for this program, however solar PV currently does not. In 1997, Fort Collins enacted a more progressive version of the Model Energy Codes for all new residential and commercial construction. The new codes ask builders to consciously evaluate energy saving alternatives throughout the construction process.
Additional information: call Lucinda Smith (970) 224-6085

City of Los Angeles
See the following section for a description of programs offered by Los Angeles' municipally-owned electric utility.

City of Palo Alto

The City of Palo Alto's Resource Conservation program operates through the city's Utility Department. It offers a variety of programs including technical assistance and the City of Palo Alto Utilities (CPAU) PV Program. The CPAU PV Program began on May 4, 1999. It offers homeowners and businesses in Palo Alto cash rebates of $4/watt off the cost of new rooftop PV systems.
Additional information: http://www.city.palo-alto.ca.us/environmental/rescons.html, or call Lindsay Joye (650) 329-2680

City of Sacramento

See the following section for a description of programs offered by Sacramento's municipally-owned electric utility.

City of Tucson

The City of Tucson has committed to the installation of 25,000 rooftop PV units by 2010, an impressive 2.5% of President Clinton's Million Solar Roofs Initiative. City Authorities made this commitment in response to the widespread, grassroots support of solar energy in Tucson, lead by the Tucson Coalition for Solar. The Coalition receives cost-sharing from DOE/UPVG's Team-Up Initiative. In its efforts to stimulate the PV market in Tucson, the Coalition has established a community task force to address the key barriers to the sustainable commercialization of solar energy. It also recently announced its Community Energy Fund, a campaign to raise funds toward the purchase of solar energy appliances for low- and modest-income families.
Additional information: call Valerie Raulick (520) 326-3195

• UTILITY PROGRAMS

Austin Energy

Austin's municipally-owned electric utility, Austin Energy, has three programs designed to promote the use of solar energy and energy conservation. Funded in part by DOE/UPVG's Team-Up Initiative, the "Solar Explorer" allows a residential or commercial customer to pay a premium of $3.50/month to support the construction of large-scale solar generating facilities in the community. Austin Energy also participates in Energy Savings Performance Contracts (ESPC) with local businesses. As part of this program, the utility conducts free energy audits and recommends cost-effective energy conservation measures including the use of appropriate solar technologies. Finally, in partnership with NationsBank, Austin Energy offers low interest loans for home energy improvements, which can include the purchase and installation of solar water heating and potentially PV systems. Austin Energy buys down the interest rates to make this program possible.
Additional Information: http://www.austinenergy.com/home/finance.html, or call John Luden (512) 505-3678

GPU Solar

GPU Solar is a joint venture company formed by GPU International, a subsidiary of GPU Inc., and AstroPower, Inc. GPU Solar, which received a $250,000 cost-sharing award from DOE/UPVG's Team-Up Initiative, sells pre-engineered residential solar electric systems. These standardized rooftop PV systems range in size from 1 kW to 4 kW. They are designed to be connected to the utility grid and contain all hardware and components including batteries.
Additional information: http://www.gpusolar.com, or call Eva Gardow (973) 263-6783

Idaho Power

Idaho Power, an IDACORP Company, has two subsidiaries that work to advance the solar energy market, Applied Power Corporation (APC) and Idaho Power Resources Corporation (IPRC). In 1998, APC received a $700,000 cost-sharing award from DOE/UPVG's Team-Up Initiative to market solar products and services nationwide. The goal is to provide at least 365 kW of electricity from APC solar systems. ASE America, Inc., Solarex, and Ameren Corp. are assisting APC with marketing and financing services for this program. APC has entered into an agreement with GreenMountain.com to launch Green Mountain

Solar(sm), which is currently marketing rooftop PV systems in California and Pennsylvania. In addition, Idaho Power has run several television commercials to market its solar PV systems to end-users in remote locations.
Additional information: http://www.idahopower.com/enrgyres/solar.html, or call Dennis Lopez (208) 388-2464

Los Angeles Department of Water and Power (LADWP)

LADWP, the nation's largest municipal utility, offers a variety of programs to promote the use of solar energy. LADWP's General Manager, David Freeman, has committed the utility to at least 100,000 PV systems to help meet President Clinton's Million Solar Roofs Initiative. Under its Solar Electricity Rooftop Program, LADWP installs and services PV systems on certain residential rooftops at no charge to the homeowner. This service is free because LADWP maintains ownership of each system and all of the electricity it generates. The participating homeowners continue to pay their regular electric bills, but get the satisfaction of contributing to a "greener" Los Angeles. LADWP also offers a green pricing program that allows customers to purchase power from wind and solar facilities. The interesting part is that participating customers receive "green awards" that can be redeemed with purchases of energy efficient appliances to offset the $3 to $5/month premium paid for the program. In addition, LADWP plans to sell residential PV systems that will be competitive under the California Net Metering law.
Additional information: http://www.ladwp.com/whatnew/solaroof/solaroof.htm, or contact (213) 367-3832

New England Electric Systems (NEES)

In addition to transmitting, distributing, and selling electricity in Massachusetts, Rhode Island, and New Hampshire, NEES markets energy commodities and services such as solar programs. New England Power and AllEnergy Marketing Company, which are NEES members, have both recently introduced solar energy programs. AllEnergy is administering the Regen Program (green pricing), and New England Power is piloting a solar system buydown program in Medford MA.
Additional information: http://www.nees.com, or call Elizabeth Hicks at NEES (508) 303-7227, or Mike Tennis at AllEnergy (781) 642-9502

Niagara Mohawk

Working with DOE/UPVG's Team-Up Initiative, Niagara Mohawk has become involved in a number of solar PV projects including a 13 kW system on a state government building in Albany, and an electric distribution system support project using 100 kW of PV panels.
Additional information: http://www.nimo.com/nimotod/environ/perfreport.html

Sacramento Municipal Utility District (SMUD)

SMUD owns several large-scale solar generating facilities including the world's longest operating, large PV plant at the site of the now closed Rancho Seco nuclear station. Believing that the mass production of PV systems is the key to lowering costs and stimulating the market, SMUD has launched a series of solar programs. The PV Pioneers I Program has been available since 1993 to homeowners who are willing to host a PV system on their rooftop. SMUD covers the costs of purchasing, installing, and operating the system for a period of ten years, with all of the electricity generated sold to the homeowner at regular SMUD rates. Participating homeowners are asked to pay a premium of $4/month. However, this fee will be reduced if there are any electrical rate increases and eliminated if rate increases total 15%. At the end of the 10 years, SMUD will sell the system to the homeowner, extend the agreement, or remove the system. SMUD also now administers the PV Pioneer II Program, which enables customers to buy their own PV system through SMUD and own the electricity it generates (they receive credit on their bill). SMUD subsidizes the costs of these systems, enabling customers to purchase them at a substantial discount. Modular PV systems are available for existing homes and building integrated PV systems are available for new homes.
Additional information: http://www.smud.org/home/pv_pioneer/pioneerI.html, http://www.smud.org/home/pv_pioneer/pioneer2.html, or call (916) 732-6835

Tucson Electric Power (TEP) Company

TEP's Energy Services Division conducts Energy Savings Performance Contracting (ESPC). As part of this service, TEP proposes an energy conservation package and guarantees the savings. The energy conservation measures are financed out of a percentage of the savings for a fixed-term, with no downside risk for the property owner. TEP has installed a series of mid-sized PV systems in Tucson and has taken an active role in the development of Civano, Tucson solar village project. Finally, in 1996, TEP formed Global Solar Energy with ITN Energy Systems, Inc., of Denver. Global Solar expects to manufacture up to 1.5 megawatts of thin-film (CIS) solar cell material. The company has claimed that, once in full-scale production, it will be able to manufacture this material at one-half to one-third of the cost of manufacturing other existing solar energy technologies.

Additional information: http://www.tucsonelectric.com/commercial/commeservices.htm, or call Dr. Prabhu Daval (520) 623-7711

• INSTITUTIONAL PROGRAMS

CoBank

CoBank is a $20 billion cooperative bank that is the leading lender to U.S. agriculture and rural America. CoBank specializes in cooperative, agribusiness, rural utility, farm credit association, and agricultural export financing by offering a range of loan programs and financial services. Although rural co-ops have the potential to become big players in U.S. solar market, CoBank's Electric and Water Division works exclusively with gas powered utilities and currently does not provide any financial services to solar related projects.

Additional information: http://www.cobank.com, or call (303) 740-4321

Cooperative Finance Corporation (CFC)

CFC is a large non-government lender that provides financial services to more than 1,000 cooperative utility owners, serving more than 32 million end-users with electricity. CFC administers a family of financial programs called EC Community Solutions for customers of member co-ops. The EC Commercial program offers loans to businesses for equipment purchases and upgrades; the EC Home program provides mortgages; and the EC Home Improvement program makes loans for energy-related home upgrades. First International Bank N.A. (FIBNA) of Hartford is CFC financial partner in EC Community Solutions. FIBNA actually makes and services the loans. According to the Director of the EC Home Improvement program, CFC might be willing to finance solar projects, but has not received any requests to do so from member co-ops.

Additional information: http://www.nrucfc.org, or call Joel Allen (703) 709-6700 x 851

Fannie Mae -- Federal National Mortgage Association

Fannie Mae, formerly known as the Federal National Mortgage Association, is a congressionally chartered, share-holder owned company and the nation's largest source of home mortgage funds. In addition to its conventional first mortgages, Fannie Mae offers four products that can be used to finance solar thermal and/or PV systems. The Consumer Energy Loan is an unsecured loan program that was created about 5 years ago. It is designed so that utility companies can offer their customers low-interest rate loans for energy efficiency improvements. Fannie Mae has issued more than 40,000 loans through this program, ranging in size from $1,000 to $20,000. The second product line, the Energy Efficient Mortgage Program, has just been revised and is in its pilot-stage. The revisions were made because very few loans were issued under the original program. The revisions include: eliminating the requirement for additional money down, thus allowing 100% financing of the energy improvements (up to the LTV limitations); recognizing multiple rating methods and prescriptive programs to determine the energy efficiency of a home; and allowing sample ratings of "like-built" properties for new construction projects, thus reducing the "per house" cost of energy ratings. The third product, which has just been developed, is a second mortgage option called the "Remodeler." This loan, which has a limit of $50,000, allows homeowners to make energy improvements without really changing the financial structure of their mortgage. Finally, Fannie Mae has just announced plans to work with the National Association of Home Builders (NAHB) to promote green building initiatives that emphasize the efficient use of resources such as energy and water.

This program is being piloted in six cities: Atlanta, Columbus, Albuquerque, Denver, Los Angeles, and Seattle.
Additional information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.fanniemae.com, http://www.seia.org/mrfedloan.htm, or http://www.nahb.com/update/story6.html, or call David Kerry (978) 468-9932

Freddie Mac -- Federal Home Loan Mortgage Corporation

Freddie Mac, formerly known as the Federal Home Loan Mortgage Corporation, is a secondary mortgage lender. Freddie Mac purchases mortgages from primary lenders, packages the mortgages as securities, and sells the securities (guaranteed by Freddie Mac) to investors such as insurance companies and pension funds. Like Fannie Mae, Freddie Mac is a congressionally chartered institution that is privately owned by its shareholders. Freddie Mac's programs are also similar to Fannie Mae's. Freddie Mac encourages energy efficiency by providing specific criteria for energy efficient mortgages that the company is willing to buy on the secondary mortgage market. Appraisers are allowed to consider the value of energy improvements in the property value. However, appraisers are often reluctant to do so because of a lack of good comparables.
Additional information: "The Borrower's Guide to Financing Solar Energy Systems" (DOE: September 1998), http://www.freddiemac.com, or http://www.seia.org/mrfedloan.htm, or call John Hemschoot (303) 791-8850

• PRIVATE SECTOR PROGRAMS

First Financial Funding

Created in 1981, First Financial Funding, provides debt consolidation loans, home improvement loans, appraised value loans, and advanced loan automation. It allows customers to apply for loans on-line, and responds to applications within 24 hours. First financial Funding is an approved lender under Fannie Mae's unsecured Consumer Energy Loans Program. It also services loans under SEIA's Solar Finance Program.
Additional information: http://www.firstloan.com/default.html, or call (800) WE-OK-FHA (936-5342)

GE Capital

GE Capital operates a small-scale leasing program with PowerLight Corporation for commercial PV applications. However, the several people at the company's headquarters in Connecticut had never heard of this program.
Additional information: http://www.gecapitalenergy.com

GMAC Mortgage

GMAC Mortgage Corporation has committed to being a major player in the Million Solar Roofs Initiative. As such, it has worked with the Solar Energy Industries Association (SEIA) to develop its Energy Efficient Program, which allows consumers to finance solar installations with their first mortgage or home equity loan. PV systems are not financed alone, but as part of the home mortgage. The program applies to both new construction and retrofits of existing homes.
Additional information: http://www.gmacmortgage.com, http://www.natresnet.org/herseems/gmac.htm, or call Marianne Daily (215) 682-1000

Nations Bank

Nations Bank is involved in a loan program with Austin Energy. Additional research is required on this item.

Residential Energy Service Network (RESNET)

RESNET is a national network of mortgage companies, real estate brokerages, builders, appraisers, utilities, and other housing and energy professionals. Its mission is to improve the energy-efficiency of the nation's housing stock and to qualify more families for home ownership by expanding the national availability of mortgage financing options and home energy ratings. Its main sponsors are GMAC

Mortgage Corporation, and PMI Mortgage Insurance. RESNET provides up-to-date news and information about energy efficient mortgages and Home Energy Rating Systems (HERS).
Additional information: http://www.natresnet.org/Default.htm

SolarBank Program

SolarBank International is being planned as a global capital fund for the financing of the end-use markets for solar energy. When established, it will have affiliated SolarBank funds in each of the countries where there is a substantial market for Solar PV. Sources of capital will be 50% from SolarBank International and 50% from in-country investors, lenders, and institutions.
Additional information: http://www.solarbank.com, or call (202) 429-2030

Volt VIEWtech

Volt VIEWtech was the first Fannie Mae authorized loan provider in the energy efficiency industry. It has served as the primary lender for financing programs sponsored by Southern California Gas, Pacific Gas and Electric, Tampa Electric, and Yankee Financial. Volt VIEWtech also helped create the Edison Electric Institute E-Seal and the Solar Energy Industries Association's Solar Finance Program (described in the following section).
Additional information: http://www.voltviewtech.com

• SOLAR INDUSTRY PROGRAMS

BP Solar

A wholly owned subsidiary of The British Petroleum Company p.l.c., BP Solar employs over 600 staff world-wide. It recently bought Solarex (now BP Solarex) based in Frederick MD. BP Solarex currently administers two buydown programs for the mid-Atlantic region in collaboration with the Virginia Alliance for Solar Energy (VASE) and DOE/UPVG's Team-Up Initiative.
Additional information: http://www.bp.com/bpsolar/index.html, or http://www.solarex.com, or call Mac Moore (707) 428-7900

Golden Genesis Company
Additional information: http://www.goldengenesis.com/index.html, or call Ron Kennedy (602) 951-6330

PowerLight Corporation

PowerLight was formed in 1991 and is based in the San Francisco Bay Area with representative offices in New York and Hawaii. PowerLight provides a variety of project development, management, design, construction, and analysis services for its clients. It has completed numerous PV projects around the world, including the largest roof-integrated PV systems in the U.S. In collaboration with GE Capital, PowerLight administers a small-scale leasing program for PV systems on commercial buildings.
Additional information: http://www.powerlight.com, or call Dan Shugar (510) 540-0550

Siemens Solar
Additional information: http://www.solarpv.com, or call Clay Aldrich (805) 388-6327

Solar Energy Industries Association (SEIA): Solar Finance Loan Program

SEIA initiated a program called Solar Finance in May 1997. This program is available to SEIA's national and state chapter members for a fee of $500/year. SEIA is also working with UPVG so that its members will also be able to participate. Volt VIEWtech and First Financial Funding service the unsecured loans, which offer a one-day approval turn-around. The Solar Finance program provides 100% financing for solar equipment up to $25,000 with terms running between 5 and 15 years at competitive fixed interest rates.
Additional information: http://www.seia.org/solarfin.htm, or call SEIA (703) 248-0702

FOUNDATION GRANTS

Solar/Renewable Energy Grant Programs:
The Energy Foundation
Ford Foundation
W. Alton Jones Foundation
W. K. Kellogg Foundation
MacArthur Foundation
Andrew W. Mellon Foundation
Joyce Mertz-Gilmore Foundation
The Pew Charitable Trusts
Rockefeller Brothers Fund
The Rockefeller Foundation
Turner Foundation Grants
The United Nations Foundation

Other Environmental Grant Programs:
Beldon Fund Grants
Ittleson Foundation Environmental Grants
Max and Anna Levinson Foundation Grants
Charles A. and Anne Morrow Lindbergh Foundation Grants
The William Penn Foundation
Surdna Foundation Grants

• NONPROFIT PROGRAMS

Conservation Law Foundation
CREST/Solstice
Energy Efficiency & Renewable Resources in Electric Industry Restructuring (EERR)
Environmental Defense Fund (EDF)
Environmental Law and Policy Center
Florida Solar Energy Center
Interstate Renewable Energy Council (IREC)
International Institute for Energy Conservation (IIEC)
Land and Water Fund
Natural Resource Defense Council (NRDC)
North Carolina Solar Center
Renewable Energy Development Institute (REDI): REDI provides information on off-grid home mortgages and solar loans. (888) 646-7334. http://www.redi.org/
Renewable Energy Policy Project (REPP)
Resources for the Future (RFF)
Union of Concerned Scientists (UCS)
Virginia Alliance for Solar Energy (VASE)
Worldwatch Institute
World Resources Institute (WRI)

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