# GOVERNMENT PROCUREMENT TO EXPAND PV MARKETS

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# GOVERNMENT PROCUREMENT OF PHOTOVOLTAICS

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## I. INTRODUCTION

Achieving even the modest environmental goals of the 1997 Kyoto Protocol will require the "sustained and orderly" commercial development of viable renewable energy options. And in the near-term, significantly increasing the U.S. market for renewable energy will require federal, state, and local governments to substantially increase their purchasing of PV and other forms of renewable energy.

Currently, government procurement practices in the United States tend to be biased toward the purchase of energy from fossil fuels, which costs less than energy produced by PV or other renewable technologies. The reason is that government purchasers do not differentiate between cost and value. The environmental, economic, and security benefits of renewable energy are recognized via government tax credits and research programs, but these societal benefits have not been taken into account in government procurement policies.

If support of renewable energy R&D is an appropriate use of public funds, then why is purchasing the fruits of this research considered by many to be inappropriate? We believe that it is not enough for government to focus on the development of new technologies—government must also support the technologies' commercial application. Drawing upon another paper in this report, "Government Buydowns for the Residential Market" by Thomas Starrs and Vincent Schwent, we believe there are two important rationales for an effective and concerted government purchasing program to support markets for PV and other renewable energy technologies:

There are at least two important rationales for an effective and concerted effort to modify government procurement policies to increase purchases of PV and other forms of renewable energy:

- First, significant government purchases of renewable energy can help resolve the "chicken and egg" dilemma that arises in the case of a new technology's commercialization: Increased production volumes are needed to capture economies of scale in manufacturing the technology, but increased production volumes are precluded by the initially high cost of the technology. The rationale for government purchasing is that large government purchases will lower the net cost of the technology early on; this will lead to increased private market demand, which in turn will encourage the technology's manufacturers to increase production levels and capture new economies of scale.

- Second, government purchases of renewable energy technologies in the early adoption stage can help overcome institutional barriers to commercialization, encourage the development of appropriate infrastructure, and generally pave the way for the commercialization of

technologies such as PV whose commercialization depends on integration within complex technical or regulatory systems.

The commercialization of new technologies—for example, distributed PV—that are radically different from status quo technologies (e.g., central station fossil fuel plants) requires overcoming formidable technical, economic, and cultural hurdles; these hurdles are as large as the technical hurdles faced in developing new technologies. Furthermore, the commercialization of PV and other renewable energy will provide health, ecological, and even infrastructural benefits (e.g., averted transmission line construction and line losses) to the United States that have the qualities of a public good. We believe that government has an obligation to American citizens to provide products and services that the private market seems unwilling to produce at a reasonable price but that are required to ensure the citizens' health, welfare, safety, and long-term economic stability. Renewable energy technologies meet these criteria.

A successful government procurement program for PV and other renewables would help domestic developers overcome institutional barriers to the commercialization of renewable energy technology and encourage the development of an appropriate industrial infrastructure. In addition, if effective, it should challenge the PV and other renewable energy industries to develop a mature commercial infrastructure, produce reliable and effective products; educate prospective customers; price their products competitively; and produce high-quality systems in sufficient volume to meet growing demands.

The discussion below expands on the near-term importance of expanding government demand for renewable energy. It also examines the three primary barriers to government procurement of renewable energy: 1) the higher initial cost of renewable energy technologies; 2) indifference to the cost of environmental externalities; and 3) lack of familiarity with the technology. To make government into significant purchasers of these technologies requires a series of integrated steps to help overcome these barriers.

The Energy Foundation and the Renewable Energy Policy Project (REPP) asked us to address the following question: How can government contribute to an expanded market for PV? In the context of government procurement, the barriers encountered by PV are also encountered by energy efficiency and all renewable energy technologies. Thus, our discussion in much of this paper, rather than focusing on PV alone, addresses the generic problems encountered by renewable energy technologies in the realm of government procurement. The action recommendations presented in the concluding section of our paper, however, focus more specifically on actions that can be taken to expand government purchases of PV.

## II. THE IMPORTANCE OF EXPANDING GOVERNMENT DEMAND FOR RENEWABLE ENERGY TECHNOLOGIES

Concerted action in the realm of government procurement could greatly improve the prospects for the near-term creation of a U.S. domestic market large enough to capture the environmental, economic and national security benefits of renewable energy technologies.

- In 1996, government—federal, state, and local—was the United States' largest consumer of energy and electricity. In 1996, the Energy Information Administration (EIA) reports, the federal government alone consumed approximately 386.7 trillion British thermal units of energy from non-petroleum sources (i.e., from electricity, coal, natural gas, and purchased steam). Of that amount, 184.3 trillion Btus, or 53.9 billion kilowatt-hours (kWh), was consumed by the federal government as electricity—an amount more than 60% higher than the combined generation of utility-owned solar, wind, and geothermal facilities in 1997.[1]

- In 1995, the federal government's total energy bill was $8 billion, or 0.6% of total federal expenditures for that year. Its electricity bill was approximately $3.5 billion, or 0.44% of total federal expenditures for that year.

- If the federal government decided to make a commitment to supply a small percentage of its energy needs using PV, it would have a dramatic impact on the PV industry. In 1997, the U.S. PV industry shipped 53 megawatts (MW) of PV, a 36% jump from the previous year.[2] If the federal government installed additional distributed PV to generate just *1%* of its annual electricity needs, it would require *334 MW* of PV, or over six times total U.S. shipments and over two-and-a half times 1997 world shipments.[3]

- If the federal government purchased distributed PV over 10 years to supply *1%* of its annual electricity needs at the end of that period, it would pay *$111 million per year* above its current electricity costs over the 10-year period.

- If government decided to make a commitment to supply a small percentage of its energy needs using renewable energy, there would be a dramatic impact on the environment. By relying on *renewables* to supply *one-half of 1%* of its power needs by 2000, the federal government alone would avert *51,000 metric tons of carbon emissions*, in addition to averted emissions of Clean Air Act criteria air pollutants and mercury. A *15%* commitment by 2020 would avert *1.3 million metric tons of carbon*.[4]

- The government represents a diverse range of energy needs, including office buildings, laboratories, military housing, public housing, remote ranger stations, highway call boxes,

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[1]Federal government electricity consumption from Energy Information Administration (EIA), *Annual Energy Review 1996* (Washington, DC: 1997), p. 29. EIA assumes 3,412 Btu per kWh. Renewables generation data from "Latest EIA Projections Expect Continued Decline in Renewables-Based Generation," *The Solar Letter*, July 3, 1998, Vol. 8, No. 14, p. 252. In 1997, solar, geothermal, and wind facilities generated 114 trillion Btu of electricity, or 33.4 billion kWh. This is expected to decline to 93 trillion Btu, or 27.2 billion kWh, in 1999.

[2]Paul Maycock (ed.), *PV News*, Vol. 17, No. 2 (February 1998), p. 1.

[3]Potential volume of PV purchased by the federal government assumes that a PV system has an average capacity factor of 18.5% (the median capacity factor value inferred from Wenger et al., *Niche Markets for Grid-Connected Photovoltaics*, IEEE Photovoltaic Specialists Conference, Washington, D.C., May 13-17, 1996), it would produce 12,965 kilowatt hours of electricity annually. PV estimate also assumes that 1996 energy consumption stays constant in 1997.

[4]Renewable Energy Working Group, "An Integrated Strategy for Renewable Energy in the Federal Sector," second draft, Washington, DC, June 1998.

vehicle maintenance complexes, communications, and others. Thus, expanded government demand can improve the competitiveness of PV technology throughout the marketplace.

# III. BARRIERS TO GOVERNMENT PROCUREMENT OF RENEWABLE ENERGY TECHNOLOGY

In terms of purchasing PV or other renewables, the track record of accomplishment at the federal, state, and local level is not inconsequential. Four federal agencies, for example, have installed at least 4,000 PV systems,[5] and cities such as Albuquerque, N.M., and Portland, Ore., have also found ways to incorporate PV technology into their energy purchases. Despite such efforts, however, total government purchases to date have not resulted in the creation of a PV market large enough to realize significant environmental, economic and security benefits.

There are three principal barriers to government purchases of renewable energy: 1) the higher initial cost of renewable energy technologies in comparison to the cost of conventional energy technologies for most energy applications; 2) government purchasers' indifference to the cost of environmental externalities; and 3) government officials' uncertainties about renewable energy technologies.

## A. The Higher Initial Cost of Renewables

PV and other renewable energy technologies use little or no fuel and have lower operating and maintenance costs than fossil or nuclear fuels, but often they are initially more costly than conventional fossil fuel technologies. The higher initial cost of many renewable energy technologies is due in part to the fact that renewable technologies are still in an early stage of development and in part to the fact that subsidies are often provided to conventional energy sources.

The higher initial cost of renewables is not simply a matter of economics for government procurement officers; for many government procurement officers, the "lowest up-front cost standard" is also a matter of regulation, culture, and practice. The National Performance Review led by Vice President Al Gore found, for example, that complexities in the Federal Acquisition Regulations (FAR) encouraged "many procurement officials [to] feel more comfortable awarding contracts based on lowest cost rather than best value."[6] Lowest up-front cost represents the common denominator of government purchasing decisions. Selecting products solely on lowest up-front costs, is shortsighted. As indicated by surveys of government procurement officials, this practice is especially damaging for renewable energy when competing with fossil fuels.[7]

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[5]The agencies are the U.S. Department of Defense, the National Park Service, the Bureau of Land Management, and the U.S. Forest Service. From Government Procurement Project Web site: http://prince.essential.org/orgs/GPP/ energy_ideas/EI.0296/ EI.0296.04.html. Accessed July 13, 1998.

[6]National Performance Review, *Reinventing Federal Procurement, PROC15: Encourage Best Value Procurement*, National Performance Review Web site: http://www.npr.gov/library/nprrpt/annrpt/sysrpt93/reinven.html. Accessed July 10, 1998.

[7]According to a study by Sandia National Laboratories of PV system use in three federal agencies, the largest perceived barrier for two agencies, and the second largest barrier for the third, was the initial cost of PV systems. U.S. Department of Energy, *Federal Technology Alert*, DOE/GO-10098-484 (Washington, D.C., April 1998), p. 15.

It is important to note that many cost-effective applications of PV do exist. For example, PV is often cost-effective for applications in communications, warning systems, rural water pumping, street lighting, rural water pumping, and other off-grid applications and applications that require reliable energy supply.[8] Our discussions with government procurement officials, however, suggest that such applications are often overlooked and even dismissed; the predominance of higher-cost applications of PV creates misperceptions that all PV applications are more costly than other options. We would expect, therefore, that educating government procurement officials about the cost-effective applications of PV is another key activity to encourage greater adoption of PV.

## B. Government Purchasers' Indifference to Environmental Externalities

The flip side of the high initial cost of renewable energy is the inordinately low price of fossil fuels. Like other customers, the government frequently selects fossil fuels as the basis for both its electricity supply and for distributed applications such as diesel generators. The reasons are simple: Fossil fuels are cheap**,** and the fossil fuel supply infrastructure is in place and mature; thus, government procurement officers incur little administrative risk and lower budget costs by choosing fossil fuels. Like other energy purchasers, government purchasers do not have to pay directly for the adverse environmental impacts of their energy choice—including climate change, local air pollution, and land and air degradation due to fossil fuel extraction.

Taxpayers, however, do bear the cost for the externalities associated with fossil fuel use in many ways—including defense, health care, and environmental. The most efficient economic decision is *lower overall cost*, not lower initial cost. To achieve this level of economic efficiency, externalities must be considered and factored into government procurement decisions.

It is appropriate for government to recognize and act upon the "external" social costs of its energy choices. Traditionally, government has implicitly recognized the social benefits of renewables through R&D programs, tax policies, building codes, and limited commercialization efforts. We believe that it is not enough for government to focus on the development of new technologies—government must also support their commercial application. Governments must lead by example. Incorporating renewable energy into government purchasing decisions is an appropriate use of public funds because increased use of renewables will confer environmental and infrastructural benefits.

## C. Government Officials' Uncertainties about Renewable Energy Technologies

Many government officials, ranging from elected legislators and executives to government facility managers, believe that PV and other renewable energy technologies are uneconomic and unreliable.[9]

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[8]Note that the U.S. Department of Defense Tri-Service Photovoltaic Review Committee identified 3,900 cost-effective applications for PV, amounting to 423 MW of power.

[9]For example, Sandia Lab's survey of PV system use in three federal agencies found the largest perceived barrier for one agency, and the second largest for the remaining two, was lack of familiarity with PV, and "related to this is uncertainty with PV's performance record." U.S. Department of Energy, *Federal Technology Alert*, DOE/GO-10098-484 (Washington, D.C.: April 1998), p. 15.

Interviews with federal, state, and local officials yield a common concern—that stories about the technological failures of renewable energy technologies have clouded the technologies' reputation among government officials at all levels. Technologies such as solar water heaters have experienced sales booms fed by tax breaks and other incentives, and then failed to perform owing to an unresponsive and financially ailing industry.

Technological failure is a costly mistake for any industry. One former federal official even asserted that "bad news travels 10 times faster than good news" in the federal procurement community.[10] It appears that skepticism about renewables is even higher within municipal governments that lack an internal office devoted to renewable energy. Because of their reservations about renewable energy, some facility managers do not include renewables in an analysis of energy options, despite legislative or executive mandates to do so.[11]

[10]Doug DeNio, formerly of National Park Service, Lakewood, Colo., personal communication, May 22, 1998.

[11]One Florida state official believes that state legislation that "encourages the use of solar technologies in state buildings when lifecycle costs indicate they are economically feasible" has done little to promote renewables; the reason, this official suggests, is that facility managers believe that renewables are overly expensive and unreliable and should not be included in a cost analysis in the first place.

# IV. PRINCIPLES OF AN EFFECTIVE GOVERNMENT PROCUREMENT PROGRAM FOR RENEWABLE ENERGY

If a government procurement program is to succeed in creating a competitive renewable energy industry and provide reliable electricity supply to the government, then the higher initial cost and technological uncertainty about renewable energy must be reduced. A successful government program for renewables must go further, however, and challenge the domestic renewable energy industry to create the products and infrastructure it needs to compete in the much larger private marketplace. An effective government procurement program for renewables must do the following: 1) deal with the higher cost of renewables; 2) resolve legal and regulatory conflicts; 3) consider the needs of the private market; 4) link PV with other renewables; 5) establish solid political leadership; 6) assure government procurement officers that renewable energy is reliable, effective, and safe; 7) educate government officials and the public about renewables; 8) provide innovative financing options or government purchases of renewables; 9) recognize the environmental benefits of sustainable energy; 10) aggregate energy purchases of federal, state, and local governments; 11) and build on energy efficiency.

## A. Deal with the Higher Initial Cost of Renewables

What is principally needed by the government procurement system is a way of directly dealing with the higher initial cost of renewable energy. As simply a source of energy, PV technology is not likely to be price competitive for some time to come, except within certain niches like remote site applications. Moreover, there are additional factors at work in the marketplace—for example, restructuring of the electric utility sector, the ready supply of petroleum, and the continued government subsidization of coal mining and combustion—that conspire to keep domestic energy prices at levels that make it more difficult for renewable energy technologies to compete solely on the basis of consumer price.[12]

Although changes in laws and regulations are necessary, what is principally needed by government purchasing agents is the confidence that political leaders are willing to accept the higher cost of renewable energy purchases. Until the public weighs into the debate more heavily, political leaders will be reluctant to take the initiative. As long as renewable energy is considered only energy and not a matter of national priority with multiple benefits, it will continue to lose the comparative price battle to conventional but more polluting energy sources.

[12]Cost-effective niches do exist; their numbers can be multiplied with appropriate policy measures.

## B. Resolve Legal and Regulatory Conflicts

Much of what prevents government facilities managers and purchasing agents from choosing renewable energy options more often are inconsistencies and conflicts within the regulatory structure. A prime example of such a conflict are short payback provisions of government purchasing rules.

The federal government and many state governments require purchases to "pay for themselves" within a specific period of time. For the federal government, 42 U.S.C. 8254 (National Energy Conservation Policy Act) and 10 CFR 436 define "cost-effective" purchases as those with a payback period of less than 10 years. In the state of Arizona, a 1997 Arizona Senate Bill 1399 requires the state to use solar energy "if the simple payback in energy savings is 8 years or less."[13] The existence of these provisions defeat even the President's will to change federal energy practices. Executive Order 12902 requires federal agencies to purchase renewable energy measures but repeats the 10-year payback provision of 10 CFR 436.

PV, like most emerging renewable energy technologies, is simply unable to meet the federal government's 10-year payback requirement under current energy market conditions and accounting procedures for the majority of potential applications. The problem with the 10-year payback provision is that it requires recouping the initial investment [for hardware] over a period of time shorter than the effective life of the system. By forcing a 20-year investment to pay for itself in 10 years radically increases its annual cost.

Short payback provisions make it impossible to implement lifecycle accounting procedures and to take into account the cost of externalities. To be effective, any effort to expand government demand for renewable energy must include the means for identifying and resolving legal and regulatory conflicts such as these.

## C. Consider the Needs of the Private Market

A good government procurement program for renewables should take into account the needs of the private market. The creation of a government market for renewables that bears no relationship to the private market eliminates the indirect, but potentially enormous economic development and environmental benefits of commercializing renewables in the private market. Too often policy efforts to create a *government market* have resulted in submarkets reflective of governments' unique needs and procedures. For many PV firms, devoting substantial staff time to government contracts may detract significantly from efforts oriented to the larger private market.[14]

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[13]Database of State Incentives for Renewable Energy (DSIRE), *State Programs and Regulatory Policies Summary,* at Web site: http://www.ncsc.ncsu.edu/dsire.htm. Accessed May 18, 1998.

[14]According to the National Performance Review, a study by the Center for Strategic and International Studies found that "it costs five times more to bid on a government contract than on a commercial job. Once a contractor has obtained a government contract, it costs that contractor three times its usual administrative expenses to comply with government controls." National Performance Review, *PROC 12: Allow for Expanded Choice and Cooperation in the Use of Supply Schedules,* National Performance Review Web site: http://www.npr.gov/library/nprrpt/annrpt/sysrpt93/ reinven.html. Accessed July 10, 1998.

Emerging industries like PV cannot afford to maintain separate sales and maintenance staffs. Orienting these staffs to an insulated government purchasing program will hinder important marketing efforts in the private market. Making product developers choose to operate in either the public or the private market also defers the benefits which are known to accompany higher production levels. Large-scale production is needed to decrease the price and increase the quality of PV and other renewable energy alternatives. As Starrs and Schwent wrote:

> Simply put, PV equipment manufacturers cannot justify expanding production volumes because the early market won't support higher volumes at current costs. The way out of this dilemma...is to stimulate PV market demand at a high enough volume and for a long enough time that manufacturers can justify increasing production in response.[15]

Although individual public and private markets will at some point grow large enough to prompt efficiencies of scale, increasing government demand in a manner compatible with the operation of the private marketplace significantly shortens the needed time. In other words, the earlier the market is able to achieve the necessary manufacturing and operations scale, the more competitive PV and other renewable energy technologies become.

## D. Link PV with Other Renewables

The fate of PV in the government marketplace is tied to the fate of renewable energy technologies in general. Government markets for PV technology are limited for virtually the same reasons that government markets are restricted for wind, solar thermal, and other renewable technologies. Efficiency of effort suggests that removing these common barriers should be integrated effort undertaken by the entire sustainable energy community.

Arguing for PV in this larger context not only does not weaken the argument for PV; it strengthens it. Focusing exclusively on government procurement of PV may only increase PV's share of a very small pie. Uniting the renewable energy community around the common issue of encouraging government procurement of a variety of sustainable technologies, however, is likely to increase the size of the overall market pie. We believe that the most effective strategy for PV advocates seeking to expand PV markets through government procurement is a strategy that increases the size of the overall pie as well as the size of PV's piece of the pie.

Proposing that governments consider purchasing only one of several available renewable energy technologies places political leaders in the position of having to choose between technologies. Because of past failures, today's government leaders prefer to avoid such decisions. Political leaders are more confident when they are asked to support and not to drive the decisions of the marketplace. Further, a market open to renewable energy technologies that can meet reasonable price and reliability requirements is more oriented to the operation of the private market.

Another advantage for addressing renewables as a group appears from data suggesting that consumer education campaigns in support of PV or other specific renewable energy options are premature and consequently less effective than those which present a simpler message. Until consumers are aware

[15]Thomas Starrs and Vincent Schwent, "Government Buydowns for the Residential Market," *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998).

of the general benefits of sustainable energy choices, they are likely to have difficulty understanding why they should be listening to the advantages of PV. A more generic approach offers the entire renewable energy sector an opportunity to have their messages heard and understood.

## E. Establish Solid Political Leadership

The primacy of "least-cost" in the procurement culture is detrimental to PV and other renewable energy alternatives. Overcoming this barrier will require concerted leadership that clearly communicates to government purchasing agents that political leaders are willing to accept the higher price of renewable energy purchases. Overall, effective political leadership requires an explicit commitment to purchase renewable energy, as well as a comprehensive revision of the existing government procurement system to remove imbedded barriers (e.g., payback periods shorter than effective system life). Past experience with federal executive orders suggests that procedural barriers can prevail over the "bully pulpit" due to their longevity and routinization within the procurement system.[16]

## F. Assure Government Procurement Officers that Renewable Energy is Reliable, Effective, and Safe

Government purchasers, like private consumers, must be confident that PV is reliable, effective and safe. Therefore, all PV products sold to government must be able to meet or exceed reasonable operating standards. These standards should be the same as those standards recognized in the private market, so that government specifications for PV do not create a separate government market, but encourages PV commercialization.

Two organizations are the primary creators of performance and reliability standards for PV modules:

- The International Electrotechnical Commission (IEC) has established IEC standards 61215 and 61646, creating environmental "torture tests" for crystalline and thin film PV, respectively.

- The Institute of Electrical and Electronics Engineers (IEEE) has created IEEE standard 1262, which establishes environmental testing and safety testing for PV modules.

IEC and IEEE are both in the process of creating performance standards for PV modules in power and energy supply, based on actual environmental conditions and specific, uniform dates for all tests.[17]

[16]A negative example of a clear commitment and subsequent implementation is Executive Order 12902. Issued by President Clinton in 1993, the executive order directed procurement officers to purchase more renewable energy, but did not require such purchases. The White House failed to follow the order with essential reforms of Federal Acquisition Regulations (FAR) and Office of Management and Budget directives that discriminated against renewables. The result was that the existing procurement system held precedence over the executive order, and the federal government did not become a significant consumer of renewables

[17]Jerry Anderson, Siemens, and Secretary of International Electrotechnical Commission (IEC) Technical Committee 82, Camarillo, Calif., personal communication, July 9, 1998.

A third organization, Underwriters Laboratories (UL), has assigned UL code 1703 to PV modules to demonstrate their safety. UL symbols are powerful conveyors of safety, since they are a familiar sign to U.S. consumers and carry the weight of the insurance community.

Unfortunately, existing PV standards only apply to PV modules; standards for the "balance of system" (BOS) are virtually nonexistent. Those BOS standards that do exist are based only on laboratory performance. The importance of standards to increase consumer confidence makes it imperative that standard-setting bodies place a high priority on creating BOS standards based upon a system's operation under field conditions.

Although IEC and IEEE are the logical organizations to develop PV standards, time is of the essence in this matter, and both IEC and IEEE are burdened by rather ponderous standard-setting procedures:

- IEC is an international organization that relies on committees for finalizing standards. IEC committees are composed of representatives from industry, utilities, and government. The average IEC standard takes 60 months to be finalized.[18]

- IEEE is a national organization and requires 100% consensus for standards from IEEE's voting members, which include utilities, PV firms, consultants, the National Renewable Energy Laboratory (NREL), and the U.S. Department of Energy (DOE). IEEE's standard-setting process typically takes longer than the 60 months it takes IEC to set standards.

To expedite standard setting for PV and other renewables, standard-setting must accelerate to build consumer-confidence within the government. We recommend that federal and state governments consider asking for assistance from national and state energy laboratories (e.g., NREL, Sandia National Laboratory) and universities, and testing institutes (e.g., the National Institute of Standards and UL).

In addition to raising the confidence level of public and private consumers, the establishment of performance standards for PV and other renewables may confer additional benefits. Performance standards that push the industry to create better products can also make it easier for governments to accommodate technological innovation in their purchasing decisions.

## G. Educate Government Officials and the Public about Renewables

Most government officials know very little about renewables. Unfortunately, those that are familiar with the technology have impressions formed by past technology and program failures. Such impressions are particularly strong in the many state and local governments that do not posses adequate in-house expertise in renewables.

To create demand and increase confidence, a long-term educational effort should be undertaken. As discussed below the program should have two primary tracks: 1) an internal education program for

[18]Jerry Anderson, Siemens, and Secretary of International Electrotechnical Commission (IEC) Technical Committee 82, Camarillo, Calif., personal communication, July 9, 1998; Richard DeBlasio, National Renewable Energy Laboratory (NREL), Golden, Colo., personal communication, July 27, 1998.

government officials (e.g., government policy-makers, facilities managers, procurement officials); and 2) an external education program for energy and buildings professionals and the American public. The purpose of the external education program would be to create a strong constituency capable of pushing federal, state, and local governments to adopt renewables procurement programs.

### *1. Education for Government Officials*

Educating the government about the benefits of renewables is not a new concept. A number of organizations already provide educational materials and services to governments. For example, the Urban Consortium Energy Task Force and the City of Albuquerque, N.M., produced a PV purchasing guidebook directed at local and state governments.[19] Sandia National Laboratory has run the Photovoltaic Design Assistance Center to assist governments in finding cost-effective PV applications. The Utility Photovoltaic Group (UPVG), a group of more than 90 utilities, has reached out to many local governments to establish community-based PV systems through its TEAM-UP program. The Federal Energy Management Program has created and distributed numerous publications on the technical and economic benefits of PV, addressing the interests of federal, state, and local governments. The Interstate Renewable Energy Council (IREC) has held conferences with procurement officials, educating them about PV and encouraging procurement by providing contact information on PV firms.[20]

The PV industry itself should play a much greater role in the educational process. Most government officials interviewed for this report, for example, had never been visited by a representative of the industry or individual companies. Contact between the industry and the government promotes purchases. At least two PV purchases, one by the General Services Administration (GSA) and one by the municipal utility for Austin, Tex., were partially the result of direct industry outreach to officials.[21] Unfortunately, proactive marketing appears to be the exception. In fairness to the industry, it must be said that proactive marketing is a labor-intensive activity not often justified by the number of sales which result; however, a more open market justifies expanding educational and marketing activities.

Industry educational activities should include site visits for government officials, training for government service staffs, presentation of performance data and testing results, etc. Presentations to government officials should also address a top interest of state and local governments—the local economic development potential of PV. Industries must explain to governments that procurement and greater tax revenues can go hand-in-hand. The most robust model is the Sacramento Municipal Utility District (SMUD), which began a "Solar Pioneers" program to encourage PV purchases. Because of the success of the program, SMUD has arranged for local manufacturing of PV.[22] In another

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[19]Glen Koontz, *Photovoltaic Purchasing Guidebook for Local and State Governments*, a project of the Urban Consortium Energy Task Force of Public Technology, Inc. and the City of Albuquerque, N.M.

[20]Jack Werner, Climate Institute and Interstate Renewable Energy Council (IREC), Washington, D.C., personal communication, July 15, 1998.

[21]George Post, General Services Administation (GSA) Public Buildings Service, Tampa, Fla., Field Office, personal communication, July 14, 1998; and Leslie Libby, City of Austin, Tex., personal communication, July 14, 1998.

[22]Don Osborn, Sacramento Municipal Utility District (SMUD), Sacramento, Calif., personal communcation, Feb. 11, 1998. Manufacturing facilities for PV modules and balance-of-supply components are set for operation by the end of 1998, and will help to create predesigned, standardized modules for building

example, the city of Tucson, Ariz. has begun a PV demonstration program for government buildings, and is also declaring itself a "Solar Capital" in an effort to attract industry and create jobs. So far, a thin-film manufacturer is beginning operations in Tucson.

### *2. Education for the General Public*

The failure of government officials' to buy renewable energy is prompted largely by such officials' belief that American voters would not approve the additional budget associated with renewable energy technology. Although technical issues related to such technologies have been raised, these can for the most part be dispensed on the basis of testing. Proving that the American people support the use of renewable energy has been more difficult.

The renewable energy community may have placed too great an emphasis in recent years on convincing government leaders and not enough on educating their constituents. A public education campaign funded by foundations and industry would be a timely response to congressional efforts to reduce federal funding for professional and consumer education related to renewable energy. The federal government has been a significant source of capital for such educational efforts, and its diminished role in this realm will greatly handicap efforts to keep the issue of renewable energy before the public.

An effective external education program targeting energy service professionals and the public can create positive peer pressure on governments and even specific government facilities. The external educational effort should have two results: 1) general support for renewable energy to cultivate a "passive pressure" by citizens on the government, and 2) "active pressure" (e.g., public campaigns, lobbying) on government officials to purchase renewables.

- ***Passive pressure.*** The educational effort should create general support for renewable energy, so that is becomes a part of the public's conventional wisdom and does not face "default skepticism" from many government officials. For government procurement, the most important precedent is recycled paper. Extensive educational efforts by environmental groups, which targeted children and adult consumers alike, made government use of virgin paper a questionable practice that starkly contrasted with public opinion supporting paper recycling. Overall, a public education campaign funded by nongovernment and industry organizations would permit a much harder-hitting approach than has been possible in the past. A national public education campaign would also serve to support action at the state and local level giving added impetus to net metering and restructuring initiatives in support of PV and other renewable energy technologies.

- ***Active pressure.*** There should be direct pressure on the government to purchase renewables. Advocates of renewable energy should have information on the government procurement process, where their local government facilities are, and who are the government contacts to lobby. Advocates should know that public institutions are responsible for heeding public demands for environmental quality, and that barriers to government procurement can be overcome. Although many procurement rules seem to have been around since governments first began, they are not etched in stone and can be changed.

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integration, thereby benefitting the PV incentive program as well as providing local economic development opportunities.

# H. Provide Innovative Financing Options for Government Purchases of Renewables

## *1. Opportunities to Pursue in Financing Government Purchases*

Even with political will, governments must have a way to pay the higher cost of green power and green power technology.[23] Financing options for government purchases of renewables include 1) direct government appropriations; 2) savings from contract negotiations; 3) the awarding of energy savings performance contracts (ESPCs); and 4) project financing using tax-exempt bonding authorities. These options are described in Box A below.

### Box A: Financing Options for Government Purchases of Renewables

Options for financing government purchases of renewables include the following: 1) direct government appropriations; 2) government cost savings generated via large-volume energy purchases; 3) the awarding of energy savings performance contracts (ESPCs); and 4) project financing using tax-exempt bonding authorities. Each of these options is discussed below.

***Direct Government Appropriations***

Direct appropriations are the simplest and most cost-effective method for paying for green power and green power technologies.[a] This form of financing would fund projects all at once, thereby avoiding the interest charges associated with third-party financing. However, direct appropriations carry a high-degree of political risk. Thus, agencies frequently look for off-budget ways (e.g., ESPCs) to expand their spending authority and are willing to incur the higher cost of financing to do so. With more prominent support from political leaders, however, agency officials would be more willing to subject their funding requests to the congressional appropriations process.

***Government Cost Savings Generated via Large-Volume Energy Purchases***

By combining the purchasing power of government agencies into a single purchasing agreement, the government can create substantial cost savings which can fund renewable energy purchases. In a competitive power purchase solicitation in New England, for example, the federal General Services Administration (GSA) recently included a 4% renewable energy requirement. The purchase agreement initially covers federal agencies in Massachusetts, Rhode Island, and New Hampshire. The solicitation notes that some agencies will require a green power option. It was established that 4% of the total power provided would be from renewable energy resources. By combining the renewable energy portion of the solicitation with 96% conventional electricity, GSA is able to generate substantial overall savings from existing contracts. The precedent of bundling green power with conventional power established in this pilot could prove very important to a future expansion of the government market for PV and other green power resources.

***Energy Savings Performance Contracts (ESPCs)***

ESPCs overcome government financial constraints by making an energy service company responsible for initial project capitalization. Thus, ESPCs are in essence a performance-based loan from an energy service company to the government, which the government is able to pay off using the difference between what the agency's costs were before the improvements and what they are after. Although more costly than outright purchase, ESPCs do offer governments the opportunity to fund projects off budget.

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[23] Green power is defined as 100% renewable from solar, wind, biomass, small-scale hydro or fuel cells and as firm and uninterruptible.

[a]For example, even a low finance rate can add considerable additional cost to a particular transaction. At an annual interest rate of 5%, a $10,000 investment over 10 years requires costs $15,000.

## Box A: Financing Options for Government Purchases of Renewables (cont.)

ESPCs have been used successfully to finance efficiency improvements. At the federal level, ESPC contract terms can be up to 25 years, a period that provides greater flexibility than the shorter 10-year maximum for power purchases. To expand the use of ESPCs to encourage the procurement of PV systems, the U.S. Department of Energy (DOE) has established what are known as "Super ESPCs." Super ESPCs allow the government to use the savings from efficiency improvements for the purchase of renewable energy systems. A Super ESPC for PV has recently been awarded to two energy service companies (ESCOs), who have teamed up with a total of four PV suppliers. But it is too early to know how widely the Super ESPC will be used. From the standpoint of the government, there are two primary problems with the application of PV in ESPCs: 1) the lack of a cash stream for financing; and 2) the unwillingness of ESCOs to assume the higher risks and lower profits of PV and other renewable energy measures. Because PV systems do not generate energy more cheaply than utilities do, there is no source of repayment capital other than capital equipment budgets or future appropriations. The absence of a revenue stream and the desire to keep profit margins as high as possible prompts energy service companies to shy away from bundling efficiency measures with PV or other renewable energy measures.[b]

***Project Financing Using Tax-Exempt Bonding Authorities***

Recent changes in federal law have complicated the use of tax-exempt bond financing; nonetheless, this option remains promising. Tax-exempt bonds have been used successfully to finance, among other things, infrastructure projects such as publicly owned waste treatment facilities, airports, and new generating facilities for municipal utilities.

A change in federal law occurred in 1996: A provision of Public Law 104-108 (Section 1608: Termination of Future Tax-Exempt Bond Financing for Local Furnishers of Electricity and Gas) went into effect and eliminated the use of tax-exempt bonds to finance new facilities for local gas or electric services and restricted the availability of tax exempt securities that were already issued for these purposes. This provision was intended to restrict municipal utilities from using tax-exempt financing to build facilities to compete in a restructured utility marketplace. Although the provision does restrict the use of tax-exempt financing mechanisms, however, it does not prevent their use.

Tax exempt bonds in support of industrial development, research, and other public purposes are still available. The following example illustrates the use of tax-exempt bonds:

The XYZ Foundation, a large philanthropic organization with an interest in sustainable development, wishes to demonstrate the value of PV technology to society. Because of the relative newness of solar technologies, the XYZ Foundation can classify the PV project as a research demonstration project, thus avoiding the limitations imposed by Public Law 104-108. The anticipated project would involve the local utility and various government and nongovernment commercial buildings in the city's downtown. The project would provide low-interest capital for the purchase of PV systems to be installed on the roofs of government buildings for the use of those buildings and for sale to participants in a green pricing program. Working through a state conduit ( i.e., an industrial or small business authority) any 501(c)(3) tax-exempt organization is able to use its status to issue a tax-exempt bond for the proposed demonstration. The bond is approved on the basis of the creditworthiness of the XYZ Foundation and the strength of the consumer and utility agreements as the basis for repayment. Once issued, the tax-exempt bonds are sold in the market. The capital derived from the sale of the bonds provides the necessary up-front capital and the monthly payments of the utility. The building owners provide the funds to retire the debt.

Although current law makes tax-exempt financing more difficult than in the past, it is an avenue that remains open. Additional work is warranted in this area.

[b]It has been suggested by one U.S. Department of Energy (DOE) executive that energy service companies would be more willing to bundle efficiency and renewable measures if the cost of capital could be kept low. It would be possible for example to establish a low-interest revolving loan fund which energy savings companies could draw upon. Capitalization of the fund by the philanthropic or nonprofit sector was proposed.

## 2. Current Barriers to Financing Government Purchases

Two "hidden" barriers within the federal government procurement system are particularly damaging to financing government purchases of renewable energy: 1) prohibitions on the commingling of agency funds from different accounts; and 2) a 10-year time limit on federal utility contracts. For innovative financing policies to work, these hidden barriers must be removed so that the procurement system does not blunt the success of new financing initiatives.

- **Prohibition on the commingling of agency funds from different accounts.** Federal agency appropriations are typically divided among a number of specific functions: operations, capital investments in equipment and buildings, and programs. Agency heads are prohibited in most cases from commingling the funds from one account with another. Monies appropriated for construction purposes, for example, cannot be used to increase program budgets. Although such limitations make sense when the functions are unrelated, they are less reasonable when the functions are related.[24]

- ***The 10-year time limit on federal utility contracts.*** Federal agencies generally face a 10-year time limit on their power purchase agreements.[25] Because of changing conditions in the power industry, long-term (i.e., 20- to 30-year) financing is no longer available. Extending the allowed contract term beyond 10 years would reduce pressures to amortize the investment in an unnecessarily short period of time. The ability of federal agencies to commit to long-term purchases would also improve the willingness of third parties to finance the transactions.

  Long-term contracts are vital to renewable energy project funding because they guarantee renewable energy firms the revenue stream required to repay debt and provide the required return on equity under project financing. Shorter contract horizons has led to a shift away from project financing (based on revenue streams) for renewable energy projects towards conventional corporate financing (based upon the financial condition of the developer, with the assets of the corporation used for collateral). This trend is unfortunate for emerging PV companies, many of whom do not have the balance sheets to support conventional corporate financing. The growth of an expanded domestic market for PV would help renewable energy companies secure the financing they need.

[24] A simple illustration of this is found in the following scenario. A utility offers to partially subsidize the cost of PV systems for its customers. The General Services Administration (GSA) has recently been given the authority and the budget to build a new office building in the utility's service region; the agency did not know of the utility's offer at the time of its budget request, however, and the approved budget request did not include funds for a PV system. Now that GSA has learned of the offer, it believes that it has enough money in its utility budget to cover the cost of a PV system as well as to pay its electric bill. Because of the prohibition of commingling funds, however, the agency cannot use its excess of utility funds to participate in the program.

[25] A significant exception to the 10-year limitation is the U.S. Department of Defense (DoD), which can contract for up to 30 years under certain waiver conditions. It is not certain how often DoD facilities have used the waiver.

## I. Recognize the Environmental Benefits of Sustainable Energy

Although the environmental benefits of renewable energy technologies may be intuitively understood, these benefits are rarely taken into account in government purchasing decisions. Nonetheless, there are some precedents for taking these benefits into account in government purchasing decisions. In 1994, for example, the National Park Service's (NPS) Denver Service Center issued a directive that estimates the costs of air pollution to include facility lifecycle cost estimates.[26] Beyond using lifecycle costing procedures, government officials could credit renewable energy systems for their contribution to the environment. This is not a new concept. For example, the federal government purchases recycled materials due to their environmental benefits, partly due to an Executive Order issued by President Clinton in 1993 that called for the purchase of "environmentally-preferable products."[27]

## J. Aggregate Energy Purchases of Federal, State, and Local Governments

Aggregating the energy purchases of federal, state, and local governments could offer several distinct benefits: 1) the creation of a large market for renewables in a single metropolitan area; 2) the transfer of knowledge from governments with experience in a particular renewable energy product to governments with less experience; 3) low negotiated prices for renewable products and services; and 4) the provision of a large customer for the renewable energy industry without imposing high transaction costs on single vendors.

- ***The creation of a large market for renewables in a single metropolitan area.*** Aggregating government energy purchases could create a substantial market for renewables in a single metropolitan area. By encouraging manufacturing and servicing firms to locate near their customers, such a market could help spur regional economic development, a top concern for local and state government officials.

- ***The transfer of knowledge from governments with experience in a particular renewable energy product to governments with less experience***. Aggregating government energy purchases could facilitate the transfer the knowledge of governments experienced in a particular renewable product to less experienced governments. For example, the federal General Services Administration (GSA) operates a Federal Supply Schedule (FSS), in which vendors are listed once they have entered into a "indefinite supply, indefinite quantity" contract with GSA. This enables procurement officers from federal facilities to merely review the FSS, select a product to purchase, and order the product. The officer does not have to complete a lengthy "design-build" process which requires evaluating bids for cost and appropriateness. The officer is confident that the FSS will only list capable vendors. The FSS reduces the significant transaction costs of individual purchases. Many state governments already have put this concept into use. For example, New York State's Office of General

[26]The National Park Service estimated a cost of $8 per ton of carbon dioxide and $3.40 per pound of nitrogen oxide. From Government Procurement Project, Web site, http://prince.essential.org/orgs/GPP/energy_ideas/EI.0296/ EI.0296.04.html. Accessed July 13, 1998.

[27]Executive Order 12873 required federal agencies to purchase recycled products. However, the Order contained several loopholes based on "unreasonable" cost, unreasonable availability, and poor performance. Recently, Executive Order 13101 closed these loopholes. See Government Purchasing Project, *Analysis of Executive Order 13101,* September 14, 1998 (Washington, D.C.).

Services has created supply schedules which local governments and nonprofits can use to purchase supplies.[28]

- ***Low negotiated prices for products and services.*** Aggregating the energy purchases of several government purchasers can lead to low negotiated prices for renewable energy products and services. The National Performance Review supports aggregation for purchases of emerging technology, asserting that "contract consolidation will be particularly beneficial to government in new areas of technology…Government at all levels would have a greater impact on the marketplace and could acquire products and services at lower cost."[29]

- ***The provision to the renewable energy industry of a large customer without imposing high transaction costs on single vendors.*** Several industry representatives have worried that aggregation would reduce margins on the sales of individual PV systems; however, the same representatives complained about the onerous process of securing individual contracts. Aggregation allows PV firms, many of whom are unable to muster the substantial resources needed to master the government procurement maze, to devote minimal resources to contract management and more resources to manufacturing and service. Economies of scale realized within the government sector result in lower prices, higher quality and larger production capacities, thereby increasing the competitiveness of renewable energy technologies in the private marketplace.[30]

## K. Build on Energy Efficiency

Government efforts to include low-energy design principles in construction and renovation support renewables by lowering the load requirements for government facilities. Lower load levels have been shown to reduce the incremental costs of PV systems. Buildings that integrate energy efficiency into their initial design are less costly to retrofit in the future and provide more immediate savings in the form of lower operating costs and reductions in harmful emissions.

In addition to "setting the stage" for renewables, energy efficiency can directly finance renewable energy purchases through cost savings. The federal government has already realized significant energy and cost savings from increased efficiency. Between fiscal years 1985 and 1994, energy consumption (Btu) in federal buildings declined by 11.2%.[31] Improvements in efficiency resulted in the savings of millions of dollars; dollars that can be used to pay the higher "up-front" price of renewable energy sources. These savings serve as the basis for the Super ESPCs discussed earlier.

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[28]Tom Berrone, New York State Energy Research and Development Agency (NYSERDA), Albany, N.Y., personal communication, July 14, 1998.

[29] National Performance Review, *Reinventing Federal Procurement, PROC 12: Allow for Expanded Choice and Cooperation in the Use of Supply Schedules,* Web site: http://www.npr.gov/library/nprrpt/annrpt/sysrpt93/reinven.html. Accessed July 10, 1998.

[30]See Peter Asmus, *Power to the People: How Local Governments Can Build Green Electricity Markets*, REPP Issue Brief No. 9, Renewable Energy Policy Project (REPP), Washington, D.C., January 1998. One example of public-private aggregation mentioned in the REPP issue brief includes the Windsource program in Colorado. The cities of Denver, Boulder, and Colorado Springs are aggregating demand with nongovernment loads to purchase wind power from the Public Service of Colorado, an investor-owned utility.

[31]Federal Energy Management Program Overview Web site: http://www/eren.doe.gov/femp/overview.html. Accessed April 8, 1998.

In support of efforts to expand government markets for PV and other renewable energy alternatives, it is recommended that the federal government require all federal facilities built after 2010 to be based upon low-energy building design principles. Prior to 2010, the federal government should incrementally expand the number of facilities designed according to these principles. The average life of a building is well over 50 years. What is done today will have a profound and direct effect on the environment for many years to come.

# V. ACTION RECOMMENDATIONS: GOVERNMENT PROCUREMENT OF PV

In this section, we present what we believe is a balanced approach to the development and implementation of a government procurement program in the United States that will effectively expand markets for PV. We believe that four general areas should form the cornerstone of increasing the market for PV via federal, state, and local government procurement policies:

- resolving conflicts in existing federal laws and procurement regulations;
- creating an integrated framework for government procurement of renewable energy;
- building consumer confidence in PV systems; and
- financing federal government purchases of renewable energy.

Our recommendations in each of these areas are presented in Box B and are discussed further below

## Box B: Recommendations in Four Key Areas of Importance to Government Procurement to Expand PV Markets

**Resolving Conflicts in Existing Federal Laws and Procurement Regulations**

1. Eliminate the federal 10-year payback requirements for purchases.
2. Grant federal agencies the authority to choose their energy suppliers.
3. Exempt renewable energy projects from the 10-year contract term limit for federal utility contracts.

**Creating an Overall Framework for Government Procurement of Renewable Energy**

1. Commit to increased federal government purchases of renewable energy.
2. Streamline the existing federal procurement process.
3. Permit government agencies to purchase either renewable energy technology or green power.[a]
4. Aggregate federal and other purchases of renewable energy.
5. Establish a Federal Energy Executive to oversee implementation of government efforts to increase procurement of renewable energy.
6. Set goals/parameters for federal government procurement of renewables.
7. Require periodic reviews of the federal procurement program.

**Building Consumer Confidence in PV Systems**

1. Improve PV warranty protections.
2. Develop standards and performance measures for PV systems.
3. Educate government officials and the general public about PV.
4. Train personnel to maintain PV systems.

**Financing Federal Government Purchases of Renewable Energy**

1. Increase federal agency appropriations to cover the higher initial cost of renewable energy systems.
2. Extend the energy savings performance contracts (ESPC) authority for a minimum of 15 years.
3. Expand federal agencies' authority to use funds from separate accounts for related purposes.
4. Change the federal tax code to permit the issuance of tax-exempt bonds in support of renewable energy projects.
5. Extend the maximum time period for federal utility contracts.
6. Enact a national renewables portfolio standard (RPS) and/or systems benefit charge (SBC).

[a]Green power is defined as 100% renewable from solar, wind, biomass, small-scale hydro or fuel cells and as firm and uninterruptible.

Table 1 presents our recommendations for expanding expand PV markets though government procurement in a somewhat different form. In Table 1, the recommendations are organized by specific actors: the President, the U.S. Congress, national laboratories, the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), nongovernment organizations, industry, the Institute of Electrical and Electronics Engineers (IEEE), local governments, etc.

Many of our action recommendations pertain to the federal government. We are more familiar with the federal government than with state or local governments, and the level of effort that would have been required for us to obtain the detailed information we would need to tailor our recommendations specifically to state and local levels of government was well beyond the scope of this project. Our interviews with state and local procurement officials suggest, however, that governments' procurement systems share common characteristics (e.g., the preeminence of lowest consumer price; a lack of explicit accounting procedures for externalities; a lack of knowledge about PV and other renewables; and the importance of committed leadership). Thus, many of our recommendations for the federal government may be more broadly applicable at the state and local level. In the matters of education, training, and product warranties, we have generally assigned responsibility for action to industry, nongovernment advocacy organizations, and the philanthropic sector.

Two primary opportunities for altering U.S. government procurement policies will arise within the next several months. First, the Office of the President is considering the issuance of an executive order on renewable energy—in support of the 1997 Kyoto agreements, the Clinton Administration has increased its efforts to conform federal energy and equipment purchases to established environmental goals. Second, federal authority to enter into energy savings performance contracts (ESPCs) lapses at the end of 1999; thus, an opportunity for altering procurement policies will arise shortly after the 106th U.S. Congress convenes in January 1999. Efforts are already underway to prepare the legislation necessary for extending the government's use of ESPCs. The occasion of this legislation provides an ideal opportunity for expanding the scope of the proposals to include many of our recommendations.

Changing the U.S. government's energy practices will not be easy. Although much can be accomplished via legislation and executive action within the next year, fully implementing our recommendations below at the federal level will require several years of persistent work. Where possible, we have indicated which of the recommended actions possibly can be accomplished in the near-term and which will require a long-term or continuing effort. In the last analysis, whether the nation's political leaders are able to forge the type of program required to make the federal government a significant consumer of PV and other renewable energy technologies will depend upon public support and an effective advocacy program.

## Table 1: Action Recommendations: Expanding PV Markets Through Government Procurement

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| **President** | The President should issue executive orders to do the following:<br>⇒ Remove 10-year payback requirement and require lifecycle cost evaluation.<br>⇒ Indicate permanent intention to purchase renewables.<br>⇒ Create a Federal Energy Executive and interagency committee on procurement of renewables.<br>⇒ Establish purchasing goals (possibly with bands) for the purchase of renewable energy technologies.<br>⇒ Support aggregating the purchases of renewable energy by federal, state, and local governments.<br>⇒ Require internal and external review of procurement efforts by General Accounting Office, industry, and advocates.<br>⇒ Require minimum performance standards for renewable energy technologies. |
| **U.S. Congress** | The U.S. Congress should pass laws to do the following:<br>⇒ Require that emissions data be considered by federal agencies in making purchasing decisions.<br>⇒ Expand federal government agencies' choice of electricity suppliers.<br>⇒ Provide appropriations to the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) for administrative and analytical roles, and to all agencies for purchases of renewables.<br>⇒ Provide authority to the Federal Energy Executive to oversee implementation of increased federal government procurement of renewable energy.<br>⇒ Amend Federal Acquisition Regulations (FAR) to extend "low-bid" purchasing threshold to above $25,000.<br>⇒ Extend authority for energy savings performance contracts (ESPC).<br>⇒ Expand federal government agencies' authority to commingle funds from separate agency accounts for purchases.<br>⇒ Permit tax-exempt bonds in support of renewable energy projects.<br>⇒ Enact a renewables portfolio standard (RPS) and/or systems benefit charge (SBC). |
| **National Laboratories** | ⇒ Create performance ratings for PV.<br>⇒ Educate procurement officials about renewables. |
| **U.S. Department of Energy (DOE)** | ⇒ House the Federal Energy Executive.<br>⇒ Educate government procurement officials about renewables.<br>⇒ Oversee aggregated purchases of PV between governments. |
| **U.S. Environmental Protection Agency (EPA)** | ⇒ Develop emissions evaluation methodology. |
| **Nongovernment organizations** | ⇒ Influence green power certification.<br>⇒ Influence the evaluation of emissions by EPA.<br>⇒ Educate the public about government procurement and the environment.<br>⇒ Educate and pressure governments to purchase renewables.<br>⇒ Review the implementation of government procurement programs. |
| **Industry** | ⇒ Accelerate standard-setting for balance-of-system<br>⇒ Meet government standards and warranties.<br>⇒ Make PV and other renewable products that meet government price requirements.<br>⇒ Make PV and other renewable products that meet government performance requirements.<br>⇒ Educate and market PV to government officials. |
| **Institute of Electrical and Electronics Engineers (IEEE), International Electrotechnical Commission (IEC)** | ⇒ Accelerate standard-setting for balance-of-system. |
| **State and municipal governments** (with participation from International Council for Local Environmental Initiatives and Urban Consortium Energy Task Force) | ⇒ Aggregate purchases of renewable energy with the federal government.<br>⇒ Replicate successful federal procurement policy. |
| **Solar Energy Industries** | ⇒ Establish direct customer support to government facilities. |

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| **Association (SEIA)** | ⇒ | Develop partnerships with the National Joint Apprenticeship Training Committee (NJATC) and union locals for worker training. |

# A. Resolving Conflicts in Federal Laws and Procurement Regulations

Resolving the conflicts in existing federal laws and procurement regulations is the single most important near-term step that could be taken to expand government purchases of PV and other types of renewable energy. So long as these conflicts exist, they will defeat most efforts to expand the government market for renewables.

To resolve the conflicts in federal laws and regulaions, it will be necessary to 1) eliminate the 10-year payback requirements for federal purchases to allow full use of lifecycle costing procedures for renewables; 2) grant federal agencies the authority to choose their energy suppliers; and 3) exempt renewable energy projects from the 10-year contract term limit on federal utility contracts.

## *1. Eliminate the 10-Year Payback Requirement for Federal Purchases*

Eliminating the 10-year payback requirement for federal purchases would permit the full use of lifecycle costing procedures and credit renewable energy resources for their environmental, economic, and security benefits. In the near-term, removing the 10-year requirement will serve as a way to account for the environmental costs of fossil and nuclear energy.

Both presidential and congressional action will be needed to eliminate the federal 10-year payback requirement. Presidential action could take the form of a new executive order. Executive Order 12902 adopts the 10-year payback inferences which are contained in the Energy Policy Act of 1992 (EPACT) and the National Energy Conservation Policy Act (NECPA) and codified at 10 CFR 436 and 42 USC 8254. A new executive order should supersede or remove the language in the existing authorities and encourage the full use of lifecycle costing methods.

## *2. Grant Federal Agencies the Authority to Choose their Energy Suppliers*

Permitting federal agencies to choose their electric suppliers is consistent with the changes occurring in the marketplace. Deregulation of the domestic electric utility sector is resulting in lower prices and the entrance of integrated energy supply and service companies, some of whom offer electricity generated from renewable energy resources. The savings which are possible as the result of competition could be used to cover the higher cost of renewable energy purchases. The ability to choose between suppliers means that the federal government can reward those that offer green power options and encourage those that do not.

Granting federal agencies the right to choose their own electric suppliers and expanding the contract term of power agreements for renewable energy must begin with the Congress and requires amending both federal laws and regulations. Although Congress must initiate the action, the U.S. executive branch must implement the legislated changes.

### *3. Exempt Renewable Energy Projects from the 10-Year Contract Term for Federal Utility Contracts*

Contract or accounting terms shorter than the effective life of a renewable energy system makes such a system appear considerably more expensive than it really is. Extending the term of power contracts for renewable energy—like eliminating the 10-year payback requirement—would radically improve the ability of PV and other renewable energy systems to secure outside financing.

### *4. Incorporate Environmental Considerations into Procurement Decisions*

Ultimately, the federal government must develop a standard environmental accounting procedure for use by all federal agencies. The procedure will assist efforts to level the playing field so that the competition between traditional and alternative energy sources is more even. The President should direct U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) to develop the necessary cost accounting methodologies. The agencies, with the possible assistance of advocacy organizations, should develop a methodology for assessing emissions of criteria pollutants and greenhouse gases associated with energy use (including grid power and distributed energy such as diesel generators) at individual federal facilities.

Although such methodologies could not be fully implemented without congressional approval, the President does have the power to develop the procedures and to use them within existing budget and legislative boundaries. However, congressional legislation should direct federal facility managers to include emissions data consideration in energy procurement decisions.

## B. Creating an Overall Framework for Federal Government Procurement of Renewable Energy

Creating an overall framework for federal government procurement of renewable energy will require several steps. We recommend the following steps: 1) commit to increased federal government purchases of renewable energy; 2) streamline the existing federal procurement process; 3) permitting government agencies to purchase either renewable energy technology or green power; 4) aggregate federal and other purchases of renewable energy; 5) establish a Federal Energy Executive to oversee implementation of increased government procurement of renewable energy; 6) set goals/parameters for federal government procurement of renewables; and 7) require periodic reviews of the federal procurement program.

### *1. Commit to Increased Federal Government Purchases of Renewable Energy Technologies*

The first step in creating an integrated procurement framework is the issuance of a specific policy statement which recognizes the importance of PV and other renewable energy technologies for addressing environmental concerns. The statement should squarely confront the matter of higher price versus greater value. Both the President and the U.S. Congress need to indicate their commitment to an expanded federal market for renewable energy technologies. They must indicate the government's permanent intention to meet an increasing share of its total energy demand with renewable energy resources.

For the President, the best opportunity to make such a statement is within the preamble of an executive order. The intent of Congress is most appropriately announced within enabling and annual appropriations legislation. Current statements in law and executive orders are forceful in their support for clean energy alternatives but ambivalent on the matter of whether these technologies are worth the extra expense. The failure to address the problem and to accept the cost of the solution results in the continued use of lowest price as the operable procurement standard.

### *2. Streamline the Existing Federal Procurement Process*

Significant progress has already been made in the area of streamlining the existing federal procurement process. Innovations developed and implemented by the U.S. Department of Energy's (DOE) Office of Federal Energy Management Programs (FEMP) and the General Services Administration (GSA)—for example, Super ESPCs (energy savings performance contracts) and areawide utility service agreements—have already made the procurement process easier. In the near future, efforts to expand the use of GSA's Federal Supply Schedule (FSS)[32] should be intensified. Facility managers can purchase products off of the FSS after evaluating procurement needs and examining product options. The FSS allows managers to bypass a lengthy contracting process that requires a request for proposal, proposal evaluation, and final selection.

Another innovation that should be emphasized is the "low-bid" contracting process, in which a facility manager can get PV system information and price quotes from three different suppliers and then choose a supplier. This method is most efficient for federal purchases under $25,000 and has been identified as an efficient, informal process that empowers a federal manager to make prudent decisions without excessive red tape, while at the same time remaining true to competitive principles.[33] It also benefits firms, particularly small firms, since it avoids the lengthy request-for-proposal process. It is highly recommend that the federal government increase the dollar limit so that facility managers can use this process for federal purchases that exceed $25,000.

[32]The Federal Supply Schedule (FSS) has a listing of PV companies that have contracts with GSA for "indefinite quantity and delivery." Companies respond to a General Services Administration (GSA) Standing Request for Proposals, which has selection criteria but does not have specifications or projects in mind. Companies get listed on the FSS for a broad category of products. The contract with GSA specifies prices for specific products. The prices are based on the commercial prices offered for these products in the private market, as required by Federal Acquisition Regulations (FAR) for "fair and reasonable" pricing. The contract contains a price adjustment policy that mirrors prices in the private market for a company's products. Vicki Moore, General Services Administration, Fort Worth, Tex., personal communication, June 22, 1998.

[33]For purchases below $25,000, the facility manager can collect information and price quotes from three potential vendors. For purchases above $25,000, the purchaser has to advertise a request-for-proposal through the *Commerce Business Daily* and then evaluate submitted proposals. Doug DeNio, formerly of National Park Service, Lakewood, Colo., personal communication, May 19, 1998.

### 3. Permit Government Agencies to Purchase Either Renewable Energy Technology or Green Power[34]

A particularly innovative approach to increasing federal demand for renewable energy was adopted by the General Services Administration (GSA) in New England. Located in a region with deregulated electricity sectors (in Massashusetts, Rhode Island, and New Hampshire), GSA found an energy service provider that offered a lower electricity price than it currently pays. GSA used the savings it was able to realize in its rate negotiation to cover the higher cost of green power. The contract provides for a federal purchase (of up to 4% of its electric needs) from renewable resources. This innovation was important because it expanded federal purchases beyond distributed renewable energy generating systems and into green power.

Expanding federal options to include the purchase of green power is important for several reasons. Government green power purchasing can be combined easily with similar purchases by nonfederal consumers—that is, commercial and residential customers—thereby offering a simple and efficient aggregation strategy. The existence of so large a potential green power customer as the federal government in a state or region will encourage power producers to include green electricity in their offerings and financiers to capitalize their efforts.

Most importantly, the authority to purchase green electricity will permit federal, state, and local governments to draw upon PV resources as either a distributed or centralized energy source. Although PV products are principally sold today as distributed systems, there is evidence to suggest that electric generators will rely on this technology in the future to produce power for distribution through the central grid. In designing a government procurement system responsive to renewable energy, it is important to craft an approach which is open to changes in market patterns.

Extending federal authority to include the purchase of green power will require new authority and changes in existing Federal Acquisition Regulations. A corollary of the authority to purchase green power is the need for certification. There are currently a number of private market programs, such as the Center for Resource Solution's Green-e program, which are intended to provide consumers with the information they need to discern if what they bought is what they got.

We strongly recommend that a federal green power purchasing program follows the lead of the market in the matters of certification and disclosure. Accordingly, the Federal Energy Executive (see below) should consult with relevant nongovernment organizations, such as the Center for Resource Solutions, to coordinate government certification decisions with those of the private market.

### 4. Aggregate Federal and Other Purchases of Renewable Energy

Realistically, there is nothing to prevent the President from directing federal agency and department executives to develop and implement an appropriate aggregation strategy. Although each federal agency receives its own appropriations and is permitted to craft many of its own specific procurement rules, there is no law which says agencies cannot cooperate. The primary responsibility for encouraging the desired interagency cooperation rests with the President. There are a number of

[34]Green power is defined as 100% renewable from solar, wind, biomass, small-scale hydro or fuel cells and as firm and uninterruptible.

appropriate vehicles by which the President could encourage interagency cooperation—among them an executive order, or a directive to the Office of Management and Budget (OMB) or Council on Environmental Quality (CEQ) to take the lead.

Although an overall aggregation strategy is ultimately required, it is possible to begin aggregation activities on a smaller scale. For example, OMB's Office of Federal Procurement Policy and the U.S. Department of Energy's Million Solar Roofs program should select metropolitan areas for aggregated purchases of PV. Criteria for selecting metropolitan areas could include the following: 1) nonattainment status for one or more criteria pollutants under the Clean Air Act; 2) average electricity costs above the national average; and 3) good coincidence of PV electricity supply and peak demand.

- First, the federal government—in cooperation with state organizations such as the National Association of State Energy Offices (NASEO), and municipal organizations such as the Urban Consortium Energy Task Force, as well as the relevant state, city, and metropolitan governments—could identify regulatory, practical, and cultural barriers to aggregation.

- Second, participating governments can remove such barriers through legislation, intergovernmental agreements, and administrative action.

- Third, governments can conduct an audit of government facilities to determine the most cost-effective applications for PV.

- Fourth, governments should complete an aggregated purchase of PV, either based on selected certain cost-effective applications, or combining such audits with an explicit purchasing goal (e.g., 2 MW of PV). If the aggregation is successful, additional cities can be included in the program. Further, the lessons learned from the program (including barriers found, policy catalysts) can be publicized to other governments through a report completed by the project participants.

### *5. Establish a Federal Energy Executive to Oversee Implementation of Increased Government Procurement of Renewable Energy*

The President should establish the position of Federal Energy Executive, with responsibility for implementing, overseeing and enforcing executive orders and laws intended to increase government purchases of renewable energy. The importance of designating a federal position is to show that the President is earnest in his intentions to spur government procurement of renewables and to make someone responsible for the day-to-day implementation activities that are necessary.

The duties of the Federal Energy Executive would include the following:

- developing methodologies and analysis tools for determining lifecycle costs and a system of credits reflecting the contribution which renewable energy sources make to meeting multiple national priorities;

- providing guidance to the agencies on their development of the requisite acquisition strategies, reporting requirements, technological and building design options, innovative financing options, and on other matters deemed necessary;

- providing guidance on the integration of the requirements and goals of the executive order into existing procurement practices;
- engaging in discussions with utilities, independent producers, technology developers and others in the private sector to ensure the availability of adequate renewable energy sources;
- annually reporting on the impact which federal procurement practices are having on the operation of the private market, with particular attention paid to any distortions created by too rapid an expansion of demand for renewable energy options and technologies; and
- developing recommended goals for federal purchase and utilization of renewable energy resources, technologies and designs for the period beyond 2005.

In proposing the creation of a new federal position, we are not intending to create an additional bureaucratic layer. An equally plausible and effective strategy could be to expand the duties of the Director of the Federal Energy Management Program (FEMP) in the U.S. Department of Energy (DOE).

Whether a new position is created or an old position is expanded, it will be important to provide the individual assuming the position with the staff and resources necessary for accomplishing these assigned duties. One possible source of such support is the FEMP office. The President should issue an executive order to designate individual agency officials who are expected to work with the Federal Energy Executive. Possible candidates include agency executives who are members of the "656" Committee or representatives on its Interagency Energy Task Force.

### *6. Set Goals/Parameters for Federal Procurement of Renewables*

It is important for the renewable industry and investors to know with certainty what the demand of the federal government for renewable energy will be both on an annual and multiyear basis. Thus, we recommend that the federal government establish transparent procurement goals that communicate to investors, industry, and consumers how the federal market may behave, and how it may affect the industry and private market. Just as important, it should strongly communicate the will of political leaders to purchase renewables.

Manufacturers and investors, in particular, require this information about the federal market for planning purposes. If a PV company knows what the federal government will require, it can plan for expansion and raise adequate investment capital based on known quantities and terms. Investors similarly incorporate established goals into their calculations. Finally, goals permit government and nongovernment leaders to evaluate the progress of the procurement program and to adjust its demands to better conform to the capacity of the industry to deliver.

There are problems with goals. One problem, for example, is that goals often become program ceilings and not the floors they are intended to be. Similarly, organizational planners tend to be cautious about new technologies and conservative in their estimates of what is acceptable. Notwithstanding the negative aspects of goal setting, the benefits are believed to outweigh the costs. Building flexibility into the process of establishing goals and requiring regular review and analysis of the operation helps to soften any negative consequences.

Some of the options for setting goals for federal procurement of renewables are described below. Each of the options would provide the information necessary for the renewable energy industry and the investment community to plan for measured and steady growth. Each of the options would contribute to a significant expansion of the current federal market for renewable energy and lower technology prices. Although different, each option is based on the assumption of technological reliability (see section "Building Consumer Confidence in PV Systems" below).

- *Option 1: Establish federal procurement goals related to the relative price and/or performance of PV and other renewables.* In this option, all renewable energy technologies would compete against each other. With a permanent commitment to federal procurement of renewables in place, the Federal Energy Executive could establish procurement goals based on total electricity consumption. For example, the federal government could commit to purchasing renewables to meet 10% of its electricity needs by 2010, but only if PV and other renewables meet declining price targets and meet reasonable performance standards that reflect the needs of private consumers. Applications can be determined by individual agencies, with each committing to a minimum of 1 MW of renewables purchases each year.[35]

  This option would provide the government with maximum flexibility in selecting clean energy. The disadvantage of this option, however, is that distributed energy applications, including PV, would often lose out to cheaper technologies and green power.

- *Option 2: Create broad bands for distributed renewable energy technologies and green power*. The bands should communicate to industries, and investors, that the government is willing to purchase certain technologies given that they meet performance criteria and annual declining cost ceilings. Distributed renewables can include PV systems, as well as small wind turbines. The importance of distributed technologies is justified based on avoidance of seasonal price spikes, and the social value of developing distributed technologies to lower congestion in the grid, reduce line losses, and avert potential emissions from central station plants.

- *Option 3: Create specific technology bands—i.e., for wind, biomass, geothermal, solar with a PV focus, and small hydro—and make annual purchases only if technologies meet cost targets, which may drop each year*. The advantage of this option is that it nurtures all dominant renewable technologies, which are still immature. It also guarantees some level of performance-based benefits for all leading renewable energy industries. The disadvantage is that the government is choosing individual technologies, without cost and performance as the primary factor for allocating funds among different renewables industries.

- *Option 4: Pay a fixed premium for a certain amount of green electricity*. In essence, this option is based upon green power offerings made by a growing number of utilities to their residential customers. Electricity, not hardware, is the product being purchased. This option would tend to preclude distributed energy systems; it could, however, accommodate an agency's leasing a distributed system from an energy service provider. This option also supports net metering and other utility options with a beneficial impact on the sale of

[35]The 1 MW minimum is designed to encourage learning in each agency and promote diverse demand for the PV industry, while providing flexibility to the federal government to channel projects to the most cost-effective applications.

distributed systems. Of all the options, this one is the most market-oriented in that electric suppliers would choose the technologies to be used. It is also easy to administer and the least costly approach. However, among all the options, this has least direct impact on distributed technologies such as PV.

Any of the foregoing options could have a tremendous impact on PV purchases. For example, if the federal government committed to purchase PV to supply 1% of its electricity supply, and evenly spread the commitment over 10 years, up to 33 MW of PV might be purchased annually. [36] That amount, 33 MW, represents 26% of world PV shipments in 1997.[37]

The tables below present simple estimates of the cost of a 10-year federal commitment to purchase distributed PV technologies (Table 2) and green power (Table 3); these tables illustrate the possible ceilings and floors of a PV and renewables procurement program, though the mix of PV in the green power option is not known. Estimates of the total annual cost of green power purchases in Table 3 are based on the assumption that the green premium equals 2¢ per kilowatt hour (kWh); this estimate is based on a national average estimated in a survey of utility green pricing programs by Ed Holt.[38]

As the goals outlined below involve expenditures, action on these items will include appropriations legislation as well as enabling legislation. The need for flexibility suggests that a federal executive—for example, the proposed Federal Energy Executive or the U.S. Secretary of Energy—be charged with the periodic responsibility of proposing the goals under which the federal government will act. The general authority for the procurement program would come through the enactment of legislation (either stand-alone or as an amendment to the National Energy Conservation Policy Act (NECPA), the Energy Policy Act of 1992 (EPACT), and others) while implementation responsibility would lie with the Executive. The framework should be reflected in regulations, such as the Federal Acquisition Regulations (FAR), and presidential directives, such as an executive order.

[36]Based on the following: The government's 1996 electricity use was 184.3 trillion Btu, or 53.9 billion kWh. Assuming that a PV system has an average capacity factor of 18.5% (the median capacity factor value inferred from Wenger et al., *Niche Markets for Grid-Connected Photovoltaics*, IEEE Photovoltaic Specialists Conference, Washington, D.C., May 13-17, 1996), it would produce 12,965 kWh of electricity annually. In total, 1,230 MW of PV would be required to fulfill the total solar technology band during the 10-year program period. Annual sales would amount to 123 MW annually.

[37]Paul Maycock (ed.), *PV News*, Vol. 17, No. 2 (February 1998), p. l.

[38]Ed Holt, Ed Holt and Associates, South Harpswell, Maine, personal communication, Sept. 24, 1998. The study covers programs that offer green power through an energy tariff, based on the amount of energy used by the customer. Holt estimates that over half of the green pricing programs nationwide are based on energy tariffs. The programs surveyed included a mix of existing and new renewable energy capacity (not including large hydroelectric electricity generation) and does include PV. A concerted government procurement program would require a greater contribution from new renewable sources, which tend to cost more than existing sources in which extra electricity production does not add to capital costs but merely increases operations costs. However, a concerted procurement program would reduce the average costs of new projects through improved economies of scale for renewable energy technology production and installation. Thus, the 2¢ premium is retained.

## Table 2: Scenarios for a 10-Year Federal Commitment to Purchase Distributed PV[a]

| Percent of total annual federal electricity use | Total PV purchased (in MW) | Total cost (in millions) | Total incremental cost (in millions) | Annual incremental cost per year over 10-year period (in millions) |
|---|---|---|---|---|
| 0.05% | 16.71 | $57.1 | $555.3 | $5.7 |
| 0.1% | 33.42 | $114.1 | $110.6 | $11.4 |
| 0.5% | 167.11 | $570.5 | $553 | $56.9 |
| 1% | 334.23 | $1,141 | $1,106.1 | $113.8 |
| 2% | 668.45 | $2,282.1 | $2,212.1 | $227.5 |
| 5% | 1671.13 | $5,705.2 | $5,530.3 | $568.8 |
| 10% | 3342.25 | $11,410.5 | $11,060.7 | $1,137.5 |
| 15% | 5013.38 | $17,115.7 | $16,591 | $1,706.3 |

[a]Assumptions are the following:

- ***Annual federal electricity use*** from 2000 to 2009 is 53.9 billion kWh, or total electricity use for fiscal year (FY) 1996 (184.3 trillion Btu, with 3,412 Btu equal to 1 kWh). Constant annual electricity consumption was chosen since annual federal electricity consumption has fluctuated upwards and downwards during the last 5 years.
- PV has an ***average capacity factor*** of 18.5%.
- ***Cost of a PV system*** in 2000 is $5.07 per installed peak watt, and in 2001-2009 is $3 per installed peak watt (based on Sacramento Municipal Utility District (SMUD) estimates, for PV systems with 30-year lifetime and levelized annual costs, as cited in *The Solar Letter*, April 10, 1998).

The figures were chosen assuming that government procurement can achieve price savings based on volume purchases, and that government purchases can assist in reducing average system costs. Total incremental cost was calculated by subtracting current baseline costs to purchase the relevant percentage of electricity supply from the total cost of purchasing distributed PV to supply the relevant percentage of electricity supply. Baseline cost was estimated at 6.49¢/kWh, based on FY 1995 electricity consumption and electricity expenditures. Annual cost was estimated simply by dividing total incremental cost by 10.

## Table 3: Scenarios for a 10-Year Federal Commitment to Purchase Green Power

| Percent of total annual federal electricity use[a] | Kilowatt-hours supplied by green power (in millions) | Total annual cost (in millions) |
|---|---|---|
| 0.05% | 26.9 | $0.54 |
| 0.1% | 53.9 | $1.1 |
| 0.5% | 269.3 | $5.4 |
| 1% | 538.7 | $10.8 |
| 2% | 1,077.3 | $21.5 |
| 5% | 2,693.4 | $53.9 |
| 10% | 5,386.9 | $107.7 |
| 15% | 8,080.3 | $161.6 |

[a] Based on fiscal year 1995 electricity consumption.

### *7. Require Periodic Reviews of the Federal Procurement Program*

The General Accounting Office (GAO) should periodically review the federal procurement program. GAO should as well assess whether the contracting process emphasizes best value; the government has purchased enough renewables; distributed renewables applications are consistently maintained and functioning; and, federal purchases are distorting the market.[39] Just as important, GAO should review the program without imposing excessive reporting requirements on federal facilities.

In addition to reviews by GAO, outside peer reviews should be conducted. The ability of the federal procurement program to leverage private market activity, as previously stated, depends upon the compatibility of public and private purchasing procedures. Outside review by representatives from industry, the financial sector, state and local governments, and other institutions will help ensure that maximum leverage is being achieved.

Finally, it is important for renewable energy and sustainable procurement advocates to have access to performance evaluations. Such organizations are important for creating outside pressure for full compliance, and should not spend their scarce resources collecting data that can be collected by the government itself during periodic reviews.

## C. Building Consumer Confidence in PV Systems

Consumer confidence is an essential ingredient of an expanded government market for PV. Although significant technological improvements have been made in recent years**,** PV and other renewable energy technologies still suffer the effects of past failures. Thus, it is important that government, industry, and the advocacy community work to improve the image of PV and other renewable energy technologies. Specifically, we recommend the following: 1) improving PV warranty protections; 2) developing standards and performance measures for PV systems; 3) educating government officials and the public about PV and other renewables; and 4) training personnel to maintain and service PV systems.

### *1. Improve PV Warranty Protections*

A problem with previous government PV purchases has been poor maintenance of PV systems. Consistent with the need to build consumer confidence, the green power source or hardware must provide electricity without interruption due to inadequate maintenance. We recommend that the government require PV suppliers to provide warranties for a minimum period of time (e.g., along the lines of the warranty requirements of the California "buydown" program).

Industry organizations also have an important supplemental role to play in the matter of warranties and service. There is ample evidence to support the contention that purchasers of renewable energy systems—e.g., PV and water heating—have often been unable to find or cajole a manufacturer into doing the warranty work which is required to keep their system running.

[39]It is important to note that excessive sales may inflate PV prices as supply scrambles to meet a sharp demand increase—and hamper government purchases of PV for the following year under a declining-cost scheme. Such market impacts must be incorporated into a federal analysis, in cooperation with renewable energy trade associations, that seeks to maintain "sustained orderly development" of the PV industry.

Thus, the government should appoint product trade associations—for example, the Solar Energy Industries Association (SEIA)—to become the *repairers of last resort*. One way this might work is this: SEIA could advertise an 800 number that could be used by any consumer unable to obtain the needed service from the supplier. SEIA staff would receive the call and either intercede with the company or send contract help out to the site.

### *2. Develop Standards and Performance Measures for PV Systems*

The existence of standards and performance measures are important to public and private consumers. Labels such as those that Underwriters Laboratories (UL) places on products it has tested offer consumers an important level of comfort.

The PV industry must provide PV systems that pass accepted standards of performance, reliability, and safety before contracting with the government. PV firms should sell only those PV systems that have passed all relevant performance and safety standards—for example, the standards of the International Electrotechnical Commission (IEC), the Institute of Electrical and Electronics Engineers (IEEE), and Underwriters Laboratories—and have met the best available standards for the "balance of system" (BOS). In addition, PV firms should sell only those PV systems that pass relevant safety codes, including UL 1703.

All government purchasers of PV systems—for example, the General Services Administration (GSA), which administers the Federal Supply Schedule, and GSA's state equivalents—should demand that all purchased PV systems pass relevant IEC, IEEE, and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards for environmental testing.

As discussed earlier, the standards-setting process undertaken by organizations such as IEC and IEEE is slow. We recommend, therefore, that in support of an ongoing government procurement program, the PV industry and the government develop a standards process that is able to quickly and reasonably reflect the state of the technology. As members of IEC and IEEE, and as prominent institutions, the PV industry, Sandia National Laboratory, the U.S. Department of Energy (DOE), and utilities (with assistance from the Utility Photovoltaic Group) must place environmental testing standards for BOS on a "fast-track" so that they are in place at the beginning of a concerted government procurement program.

National laboratories, in cooperation with the National Institute for Standards and Technology (NIST), the Environmental Protection Agency (EPA), and DOE, should work with the PV industry to formulate performance ratings for PV systems for universally valued criteria, including conversion efficiency, maintenance requirements, reliability within the grid, and other criteria. The newly designated Federal Energy Executive (see above), in cooperation with the Department of Defense (DoD), GSA, and Federal Energy Management Program (FEMP), should consider how to use these performance ratings in purchasing decisionmaking. Such ratings should also be developed, or at least adopted, in state governments and local governments. Although funding for such an effort is required and is likely to come from congressional appropriations, there is nothing stopping government and industry from beginning this action in the near term through consultations.

### *3. Educate Government Officials and the General Public about PV*

#### a. PV Education for Government Officials

Before the launch of a federal procurement program for renewables, current educational efforts should be intensified. This will require greater funding from governments and foundations for existing educational projects. As a part of this effort, educators should attempt to reach out to federal agencies and federal facilities to inform them of the reliability, performance, safety, and costs of PV. The program should draw upon existing educational programs—for example those of the Interstate Renewable Energy Council (IREC), national laboratories, and the Utility Photovoltaic Group (UPVG)—to draw upon an extensive pool of experience, and to guarantee sufficient outreach to each federal facilities.

Existing state educational efforts, such as those undertaken by IREC, should be continued and intensified. Attempts should be made to reach all state energy procurement offices to educate these offices about the reliability, performance, safety, and costs of PV. Educational efforts should include technology fairs and field trips, which introduce both elected and appointed officials to basic technical and industry information.

The Urban Consortium Energy Task Force, in cooperation with the International Council on Local Environmental Initiatives' energy auditing office, IREC, the Federal Energy Management Program (FEMP), the National Labs, and the Solar Energy Industries Association (SEIA), should launch a series of affordable regional conferences directed at local procurement officials.

The PV industry must intensify its outreach to federal, state, and local governments. In particular, the industry must inform the government about existing standards—for example, those passed by the International Electrotechnical Commission (IEC) and the Institute of Electrical and Electronics Engineers (IEEE) and the Underwriters Laboratories (UL)—warranties, cost trends, and the status of the industry. It is crucial for PV firms to work with their local and state governments, thereby emphasizing the promise of local economic development. SEIA can launch a multiyear program that guarantees that every state procurement office, and every major municipal government, has met with a PV firm proposing to supply PV.

#### b. PV Education for the General Public

For recommendations on education that cultivates general support of renewables, please refer to the recommendations of the education paper prepared for this project.[40] Here, we emphasize the role of foundations, and their relationship with grassroots advocates, in funding public education efforts in light of lower government spending.

For "direct pressure education," the American Solar Energy Society (ASES) should produce guides for industry and advocates on the government procurement process. In addition, ASES should compile a directory of relevant federal, state, and local government offices that advocates should contact to educate them about PV. The Energy Foundation should provide specific funding to

[40]See Larry Shirley, Shawn Fitzpatrick, and Chris Larsen, "Public Education and Professional Training," *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998).

advocacy organizations to advocate government procurement of renewables in state legislatures and local government. Earth Day 2000 should also include government procurement of renewables as a priority legislative goal in its communication strategy—a "Let's Make Our Government Clean" strategy can target both policy-makers and individual government facilities.

### *4. Train Personnel to Maintain PV Systems*

The Federal Energy Management Program (FEMP), in close partnership with the PV industry, should train federal facility maintenance staff to recognize the unique technical features of PV and to provide light maintenance for minor repairs. In addition, the PV industry, including the Solar Energy Industries Association (SEIA) and the National Joint Apprenticeship Training Committee (NJATC), should develop and continue partnerships with unions such as the International Brotherhood of Electrical Workers (IBEW) the International Union of Electricians (IUE), and roofers' unions to train union locals to install and maintain PV.[41]

By creating an extensive PV maintenance infrastructure, the PV industry will strengthen PV warranties; it will also create local constituencies with an interest in promoting local government procurement and local aggregated purchases of PV. Training local unions will strengthen the economic development features of expanded PV markets, and assure skeptical government officials that their systems will be maintained.

## D. Financing Federal Government Purchases of Renewable Energy Technologies

Several actions could be taken to finance an expanded U.S. government purchasing program for renewable energy technologies: 1) increase federal agency appropriations to cover the higher initial cost of renewables; 2) extend the energy savings performance contracts (ESPC) authority for a minimum of 15 years; 3) expand agency authority to use funds from separate accounts for related purposes; 4) change the federal tax code to permit issuance of tax-exempt bonds in support of renewable energy projects; 5) extend the maximum time period for federal utility contracts; and 6) enacting a national renewables portfolio standard (RPS) and/or systems benefit charge (SBC).

In the matter of financing, the U.S. Congress, the Administration, and the PV advocacy community have major roles to play. Many of the proposed changes go beyond the agendas of either the Congress or the President. Although federal laws are ultimately enacted by the Congress, the introduction of legislation is really the task of organizations like the American Solar Energy Society (ASES), the Solar Energy Industries Association (SEIA), the Interstate Renewable Energy Council (IREC), and others.

[41]This suggestion is currently under development by the National Joint Apprenticeship Training Committee, which is working with the Inernational Brotherhood of Electrical Workers (IBEW), United Power Limited, and the National Electrical Contractors Association to certify IBEW locals for PV installation. The effort will seek to train over 1 million union electricians in PV installation. Paul Maycock (ed.), *PV News*, Vol. 17, No. 7, p. 2.

### 1. Increase Federal Agency Appropriations to Cover the Higher Initial Cost of Renewables

Each year, Members of Congress respond to the President's budget request and enact appropriations for various federal agencies and programs. The most effective strategy for covering costs of a federal government procurement program for renewable energy in the annual budgets of the appropriate federal agencies would be to work both with the President's staff in their development of the annual budget request and with Members of Congress overseeing the appropriations process (e.g., members of the House and Senate energy and water appropriations panels).

### 2. Extend the Energy Savings Performance Contracts (ESPC) Authority for a Minimum of 15 Years

The authority to enter into ESPCs was granted by amendments to the Energy Policy Act of 1992 (EPACT). In granting this authority, however, Congress limited the use of ESPCs to 5 years from the implementation of the program. The authority for ESPCs will lapse at the end of 1999. To extend and/or expand the use of these instruments, therefore, it will be necessary for Congress to pass and the President to sign new legislation.

It appears that the U.S. Department of Energy (DOE) has already begun drafting proposed legislation. When it is concurred to by the appropriate federal agencies (e.g., the General Services Administration and Office of Management and Budget), the White House will submit it, through a member, for congressional action. Not knowing if the version proposed by the Administration will be acceptable, it is advisable for renewable energy and energy efficiency organizations like the American Solar Energy Society (ASES), the Solar Energy Industries Association (SEIA), the Alliance to Save Energy, and the American Council for an Energy-Efficient Economy to develop common positions (including key legislative provisions) that reflects the shared interests of renewable energy and energy efficiency. Key legislative provisions adopted by renewable energy and energy efficiency organizations could be used in discussions with Administration officials as they develop and to evaluate the Administration's final proposal. They could also be used to educate the Members and staff of the Congress.

### 3. Expand Federal Agencies' Authority to Use Funds from Separate Accounts for Related Purposes

In order to expand federal agencies' authority to use funds from separate accounts for related purposes, Congress must enact specific authority for agencies to use funds from multiple but related accounts. The Federal Acquisition Regulations (FAR) and the individual rules governing individual agency actions will have to be modified to reflect the terms and conditions of such use and to establish an acceptable tracking system.

Although nongovernmental organizations such as ASES, the Renewable Energy Policy Project (REPP), and SEIA can develop an objectives statement, the most effective strategy for developing supportive federal procurement rules is a strategy that integrates the concerns of the community with the expertise of federal procurement officials. We recommend, therefore, that nongovernmental organizations (NGOs) begin a dialogue with federal executives to develop the proposed language and authorities. Enactment of the new regulations will then require action by Congress, as well as executive followthrough and oversight. As was the case with extending ESPC authority, this matter

lends itself to an alliance of energy-efficiency and renewable energy interests.

### 4. Change the Federal Tax Code to Permit Issuance of Tax-Exempt Bonds in Support of Renewable Energy Projects

Although congressional decisions about federal agency budgets are made on an annual basis, agency authorities and tax code changes are more permanent. When considering what actions can be taken to finance an expanded federal purchasing program for renewable energy, therefore, it is important to consider possibility of changes in agency authorities or tax codes.

Expanding the opportunity to use tax-exempt bonds as a source of capital for renewable energy projects would require the involvement of the congressional tax committees. Like appropriations legislation, tax proposals must formally begin in the U.S. House of Representatives.

### 5. Extend the Maximum Time Period for Federal Utility Contracts

On Capitol Hill, both government operations committees and agency budget authorization committees have jurisdiction over buying green power and using funds from separate accounts for related purposes (e.g., maintenance and operations). [42] They also have authority over extending the contract term of a renewable energy power agreement beyond the current 10-year limit. Because extension of the contract term will do much to improve the economics of renewable energy project finance, it is recommended that the relevant Congressional committees extend minimum contract terms beyond 10 years.

### 6. Enact a National Renewables Portfolio Standard (RPS) and/or Systems Benefit Charge (SBC)[43]

Federal legislation to restructure the U.S. electricity sector has been proposed by Members of the Congress and the President and is pending. Although unlikely to be acted upon in the near future, proposals supporting a national renewables portfolio standard (RPS) and/or systems benefit charge (SBC) should be supported. Moreover, we recommend additional study of ways in which state RPS and SBC funds could be used to meet federal renewable energy demands—for example, as a source of investment capital in a project designed to meet the needs of a local federal facility.

[42] Government operations committees are involved in matters having to do with government organization and operation. Authorizing committees are responsible for telling agencies how they may use their appropriations. An appropriations with no specific authority may not be expended.

[43] For a discussion of the national renewables portfolio standard (RPS), see Ray Williamson, "Appendix A: A Portfolio Approach to Developing Renewable Resources," *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998). For a discussion of the systems benefit charge (SBC) in California, see Thomas Starrs and Vincent Schwent, "Government Buydowns for the Residential Market," *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998).