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CLEAN GOVERNMENT:

Options for Governments to Buy Renewable Energy

by Virinder Singh, Renewable Energy Policy Project [1]

For many reasons, governments should purchase renewable energy technologies and green power for their own needs. At its best, government procurement can prepare renewable energy firms for the consumer markets on which they ultimately will have to depend, but only as long as governments follow certain policies that will not permanently distract firms into a unique government market.

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A Message from the Staff of the Renewable Energy Policy Project

Governments routinely invest in advanced technology through research, development and demonstration (RD&D). This has been one of the major avenues for fledgling technologies to proliferate in the private sector. The U.S. Department of Energy and various state governments have made impressive and exciting progress in bringing down the cost of renewables. However, for some technologies, investment in RD&D alone is not sufficient to facilitate a transition to everyday use in the private sector. In such cases, it may be necessary for the government to put its money where its mouth is by incorporating those technologies into the governmental infrastructure, thus underscoring the inherent value of those technologies and maximizing its research dollar.

Items ranging from advanced military material to recycled paper have all enjoyed private sector growth as a result of being included in government purchasing schedules. Iomega™ a manufacturer of portable computer memory storage devices, has captured a majority private market share after conducting a study suggesting ways in which their products would benefit governmental agencies. After being added to the U.S. government's supply schedule, Iomega™ was able to market its Zip™ drives as the new standard for portable media, with the hope of eventually replacing 3.5" floppy disk drives. While the success of Iomega™ cannot be singularly attributed to government procurement, government demand for computers shipped with Iomega™ products aided Iomega™ to broker lucrative contracts with major computer manufacturers. Iomega™ products can be found in most government agency stores ranging from the Department of Veterans Affairs to NASA. In fact, most new computers today are shipped with an internal Zip™ drive.

This paper suggests strategies that would allow renewable energy technologies — which are reliable, efficient and, best of all, better for the environment than conventional alternatives — to benefit in ways similar to the Iomega™ example. One key element is leadership that, at the very least, is open to renewables. With an Executive Order on federal procurement of renewables coming out of the White House, that leadership may finally come. But, an "order" isn't enough. Leadership must be sustained to make sure renewables are actually bought and used properly, so that installed energy capacity leads to consistent energy generation.

Just as important, leadership must also ensure that purchasing heeds the dynamics of the private market. Government procurement is only a single element of a larger strategy to provide renewables with the market exposure they deserve. The procurement process must prepare renewable energy firms for the private sector markets on which they ultimately will have to depend, rather than making them dependent on the nebulous world of government contracts. If this can be done — and we believe it can — government procurement will expose citizens to the potential of renewable energy, while providing responsible government through sustainable energy.

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Executive Summary

Government procurement is frequently mentioned as a promising strategy to advance renewable energy in the U. S. There are many good reasons why. Governments can help advance renewables for two reasons. First, they represent the single largest consumer of energy and electricity in the nation. Second, they own a wide array of facilities with different energy needs. Thus, governments can purchase a variety of renewable energy technologies that apply to different energy markets — grid and off-grid power markets, as well as residential, commercial and industrial markets. And since governments span the entire nation, they are uniquely poised to participate in regions with different renewable resource mixes and renewable energy businesses.

Purchasing renewables fulfills several important government roles. Renewables provide greater environmental benefits than more conventional forms of energy. They also generate and keep more dollars in local economies, potentially even many economies that currently rely on the production of fossil fuels. Procurement complements governments' prominent role in research and development, for it advances the technology into the field, with revenues accruing to renewable energy firms essential for product commercialization. Finally, renewables often make fiscal sense for governments — there are a variety of niche market applications for which distributed renewable energy technologies that require little or no fuel, such as solar photovoltaics and small wind turbines, are more affordable than transporting and storing fuel or extending the electricity grid.

However, it is imperative that governments and renewable energy advocates understand that governments alone are small compared to the private market. While it's size is helpful for commercializing renewable energy products already available on the private market, it is not ideal for introducing and propping up technologies that are still too immature for the private market. In short, the government is not an ideal institution to create or encourage an entirely new physical and business infrastructure for a new renewable energy product. Yet given this caveat procurement will help advance many renewable energy technologies as long as three points are kept in mind:

- If government procurement is to make an important contribution to a clean energy future, it has to be one part of a broader effort to commercialize renewables.
- Governments should identify procurement opportunities that build on existing market development efforts and business networks rather than attempting to create an entirely new physical and business infrastructure.
- Government procurement should approximate the dynamics of private markets as much as possible, while bearing in mind that its early involvement also responds to the failure of most private energy suppliers, consumers, and policymakers to make renewable energy a preferred product.

To realize the mutual benefits between governments and renewables, a number of challenges must be overcome to enable governments to buy renewables:

- High capital costs can deter purchasing departments, often funded through capital budgets, while the operations and maintenance benefits accrue to managers who operate and maintain energy equipment. The perception of high capital costs can also taint cost-effective applications.
- Government officials' have limited experience with renewables, which, due to past failures, can bias governments against renewables.
- Procurement officers often have little incentive and face professional risk to purchase renewables for their innovative values.
- There has been limited political leadership, which, if vigorous enough, can communicate to disparate agencies and officials that purchasing renewables is important and encouraged.
- Governments usually do not explicitly consider the environmental impacts of energy purchases, thereby erasing a primary value of renewables from a purchasing decision.

Yet these challenges can be met by a number of efforts, in which government officials, the renewables industry, and the public all have roles to play:

Government leaders should:

- Change procurement regulations so that governments can freely choose their electricity providers, incorporate environmental costs into their decisions, and give the operators of facilities a central role in purchasing decisions.
- Support new financing sources than can wean renewables purchases away from direct annual appropriations. New financing sources include energy savings performance contracts and tax-exempt bonds to support various public purposes which renewables address.
- Open governments to aggregation to realize savings — among agencies in one government, among different government in a locality, and/or between the government and private consumers.
- Tap into incentives available to the private market, including both regulated and deregulated electricity markets.

Renewable energy firms should:

- Educate government officials about the social benefits, consumer benefits, and overall performance of renewables and the renewable energy industry.
- Be prepared to sell quality products whose prices are lower in response to bulk government purchases

Renewable energy advocates should:

- Educate the public to create both “passive” and “active” peer pressure on the government.
- Carefully monitor governments’ progress in purchasing renewables

But even if these actions take place, several pitfalls of government procurement still exist, all of which can distract the renewable energy industry away from the tastes and needs of the private market.

- First, the government can, for political reasons not predominant in the private market, prefer technologies that do not hold promise in the private market.
- Second, the administrative demands of government contracting can siphon off valuable production and marketing resources from firms - resources that are scarce in the renewable energy industry today.
- Finally, as governments constitute a greater market share, the political risk of annual appropriations expose firms to volatility. Sudden spikes in demand can squeeze short-term supplies and dramatically raise prices for all consumers. Sudden drops in demand can leave firms with excess production capacity or make financing too difficult to obtain for ongoing operations, thus bankrupting firms.

How can government procurement help commercialize renewable energy, beyond just buying products so that firms enjoy economies of scale?

- First, governments must buy only equipment and power that meet standards recognized by the private market. They must also purchase goods and services with warranties that last as long as the time the purchase pays for itself. These steps should help assure governments that they are purchasing goods that the private market will buy, and therefore are making purchases that should have exponential benefits in the private market. It also circumvents lengthy administrative work by both the government and vendors to verify the quality of a product and a vendor.
- Second, when governments begin to purchase renewables in earnest, they should set multi-year purchasing goals, schedules, and funding which can state political will and lower concerns of political risk among renewable energy financiers. This also allows financiers and firms to plan expansions accordingly, without excessive worry over sudden demand spikes and drops. Goals should be flexible to give individual facilities choice and accommodate market and technological innovation.

CLEAN GOVERNMENT: Options for Governments to Buy Renewable Energy

by Virinder Singh, Renewable Energy Policy Project [2]

Governments — be they federal, state, or local — represent important customers that can further the commercialization of renewable energy. At the same time, renewables can help governments meet a number of its basic obligations. Many governments have selected renewable technologies to supply energy for a variety of functions. But, as this paper shows, for the union of government and renewables to be fully realized, much more needs to be done.

Of course, government is but one sector in a huge U.S. energy economy — dwarfed by private energy consumers, who are ultimately the only market that can provide enough demand to spur investments in physical infrastructure, manufacturing, distribution and consumer finance to give renewables a market share anywhere close to fossil fuels. This should not dampen attempts to open the government to cleaner energy sources, but it should lead to three conclusions:

- If government procurement is to make an important contribution to a clean energy future, it has to be one part of a much broader effort to commercialize renewables.
- Governments should identify procurement opportunities that build on existing market development efforts and business networks rather than attempting to create an entirely new physical and business infrastructure.[3]
- Government procurement should approximate the dynamics of private markets as much as possible, while bearing in mind that its early involvement also responds to the failure of most private energy suppliers, consumers, and policymakers to make renewable energy a preferred product.

PART I: WHY THE GOVERNMENT CAN HELP RENEWABLES

Governments serve as useful customers for renewable energy for two reasons: size and diverse needs.

Size of Demand

Governments as a whole represent the largest consumer of energy and electricity in the United States. In 1995, the federal government alone consumed 1,127 trillion British thermal units (Btu) of energy, or 1.24% of total national energy use. Within that total, it consumed approximately 54 billion kilowatt-hours (kWh) of electricity — more than 1% of the total used.[4] The federal government's total energy bill was $8 billion, or 2% of the federal consumption of goods and services. Its electricity bill was approximately $3.5 billion. Perhaps more important, in 1995 the federal government used more than twice as much electricity as was gener-

For more information on renewable energy technologies (including cost, features, case studies of successful applications, standards, and policy issues), visit:

- U.S. Department of Energy's Efficiency and Renewable Energy Network at <http://www.eren.doe.gov> and Million Solar Roofs Initiative at <http://www.millionsolarroofs.org>.
- The Center for Renewable Energy and Sustainable Technology's Solstice at <http://www.solstice.org>.
- National Renewable Energy Laboratory at <http://www.nrel.gov>.

[2] The author thanks Nancy Carlisle, Joel Stronberg, Karl Rábago, Jean Wilson, Alan Miller, Roby Roberts, Adam Serchuk and Bernard Moore for their helpful comments on drafts of this paper. The views expressed are the author's, and do not necessarily reflect the opinions of REPP, its Board of Directors or the reviewers.

[3] See, for example, Matthew L. Wald, "New Postal Trucks Can Run on Ethanol, But Probably Won't," *New York Times*, 4 October 1998.

[4] U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Annual Energy Review 1996*, DOE/EIA-0384(96) (July 1997), p. 26; DOE, EIA, *Annual Energy Outlook 1997*, DOE/EIA-0383(97) (December 1996).

ated by all the solar, wind, and geothermal facilities owned by utilities and the industrial sector nationwide.[5] Thus, federal energy dollars could have a great impact on renewable energy markets.

Unfortunately, similarly comprehensive energy consumption data are not available for local and state government. But several indicators show that they are perhaps larger consumers of energy. Local governments owned or rented 7.5 billion square feet (bsf) of building space in 1996, compared to 2.8 bsf for state governments and 2.93 bsf by the federal government.[6] In 1996, state and local government spent $657 billion on the consumption of goods and services, compared with $403 billion by the federal government. Similarly, state and local governments' gross investment in structures and equipment, which amounted to some $146 billion in 1996, exceeds similar investments by the federal government, which came to nearly $63 billion.[7] And states may use energy more intensively than the federal government. The state of Maryland's facilities used 1.47 billion kWh of electricity at a rate of 293 kWh per resident in fiscal year 1998 — a more intensive use per resident than at the federal level.[8] With more facilities and potentially more intensive energy use, state and local governments' combined energy use should exceed federal energy use.

Diversity of Demand

Federal, state, and municipal governments own and manage a wide range of facilities that have energy needs that differ according to fuel, time of use, reliability requirements, and consumption intensity. The government is perhaps most identified with buildings. But buildings have different uses. Certainly, office buildings are important. But among building rentals by the federal government they are a minority — 46 percent of the total in 1997.[9] The remainder consist of post offices, storage, housing, schools, research and development, and other facilities. Government buildings include the National Park Service's and analogous state agencies' remote ranger stations. Federal, state, and municipal governments oversee public housing authorities who manage civilian housing in all 50 states. And federal government laboratories need a reliable energy supply for both commercial and industrial applications.

Energy use is not restricted to buildings. Municipal governments and state transportation agencies need small, freestanding generators of electricity for highway lighting, call boxes, and emergency services. The armed services operate remote monitoring sites such as buoys, along with housing for their personnel and their families. And many governments own and maintain extensive fleets of vehicles.

In the federal government, the Department of Defense (DoD) towers above all other agencies in energy use (though much of this may be jet fuel, which has no renewables-based substitute).[10] Other agencies such as the U.S. Department of Energy (with its laboratories and testing facilities), the U.S. Postal Service (with its post offices and vehicle fleets), Veterans Affairs (with its many hospitals), and Transportation (with the Coast Guard) are also significant (see Table 1 on Page 5).

The diversity of government facilities is not restricted to needs; it also includes locale. Government facilities stretch across the nation, and are found in regions that have abundant solar insolation, wind potential, geothermal reserves, and biomass resources. They are also located in regions with load profiles in which certain renewables can fit economically.[11]

Diversity is an important factor in the government's ability to help commercialize renewables. The government is a consumer whose needs reflect the diversity of the private market — and one that can offer demand that could support the efforts of renewable energy firms to enter numerous customer markets simultaneously.

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[5] DOE, EIA, *Renewable Energy Annual 1997*, Vol. 1, DOE/EIA-0603(97)/1 (February 1998). EIA estimates that approximately 26.9 billion kWh of electricity were generated by biomass, geothermal, solar, and wind facilities owned by the industrial (including PURPA qualifying facilities) and utility sectors in 1995.

[6] Federal data from Seth Hamblin, "The Government's Property," *The Washington Post*, 23 March 1999. State and local data from Doug Gatlin, "Energy Upgrades in State-owned Buildings," presentation at EPA-NASEO SIPs Workshop, Washington, DC, 23 March 1999.

[7] U.S. Department of Commerce, Bureau of Economic Analysis, *Overview of the Economy*, <http://www.bea.doc.gov/bea/glance.htm>. Accessed 5 October 1998.

[8] Total Maryland energy consumption from Tim La Ronde, Maryland Energy Administration, personal communication, 9 March 1999. In 1998, Maryland population was 5 million. The U.S. federal government consumed 205 kWh per U.S. resident in 1995 (1995 U.S. population was 262.76 million).

[9] See Hamblin, op. cit note 6.

[10] In 1996, the federal government consumed 521.1 trillion Btu in jet fuel, which according to the EIA is primarily by the Department of Defense (DoD), though it is not clear exactly how much. DOE, *Annual Energy Review 1996*, op. cit. note 4, p. 29.

[11] For example, photovoltaics in New England can operate during the summer, when electricity demand peaks due to cooling needs. PVs can supply the extra electricity for the summer, serving to "shave" electricity demand "peaks" economically and avoiding the need for expensive central power plants.

PART II: WHY SHOULD THE GOVERNMENT PURCHASE RENEWABLE ENERGY?

Governments seek to promote environmental quality, local economic development, technological development, and fiscal responsibility — all of which are well served by renewable energy. (See Box 1 on Page 6 for an overview of some questions for governments to ask when considering whether to buy renewable energy.)

ENVIRONMENTAL PROTECTION

All governments have important legal and moral roles in environmental policy and regulation, including protection of air, water, and land resources. At the same time, the government's energy consumption has significant environmental impacts. If the federal government in 1996 relied on emissions-free renewables to meet just 5% of its power needs, it would have avoided using enough electricity from the national grid to avert almost 400,000 metric tons of carbon, or the emissions of 72,000 Americans.[12] Including state and municipal governments in such an effort would have pushed this total much higher.

By replacing fossil fuels, renewables can also avert many local environmental pollutants, including those that form ground-level ozone and smog, and toxic pollutants such as mercury that pose substantial human health threats.[13] This is of great importance to federal facilities such as Acadia, Grand Canyon, and Great Smoky Mountains National Parks, which suffer from reduced visibility due to energy production and consumption. It is also of special importance to state and local governments, where both industry and private citizens face stringent penalties if they are not in compliance with Clean Air Act regulations for sulfur dioxide, nitrogen oxide, particulate matter, and other pollutants. Governments can even receive direct credit for adopting renewables — the U.S. Environmental Protection Agency is proposing a special allowance for federal facilities that purchase renewables to receive tradeable credits for reducing nitrogen oxide emissions.[14]

Table 1: U.S. Government Energy Consumption, 1996

Agency	Energy Consumption (trillion Btu)	(%)
Department of Defense	926.0	82
Department of Energy	45.8	5
U.S. Postal Service	38.6	3
Department of Veterans Affairs	26.8	2
Department of Transportation	19.4	2
General Services Administration	14.5	1
Other*	57.7	5

* Includes 20 agencies, including the U.S. Environmental Protection Agency, U.S. Department of Housing and Urban Development, the U.S. Department of State, and the Federal Emergency Management Agency.

Source: Energy Information Administration, *Annual Energy Review 1996* (Washington, DC)

[12] Based on data from DOE, EIA, *Annual Energy Outlook 1998*, DOE/EIA-0383(98) (December 1997). Total carbon emissions from the electricity sector was 516.7 million metric tons of carbon (mmtC) in 1996, while total U.S. electricity consumption was 3,481 billion kWh. Thus average carbon emissions per kWh were 0.148 kilograms/kWh. Total federal government electricity consumption was 54 billion kWh. Annual per capita emissions in the United States were 5.55 kg.

[13] See Curtis Moore, *Dying Needlessly: Sickness and Death Due to Energy-Related Air Pollution*, Renewable Energy Policy Project Issue Brief No. 6 (College Park, MD: February 1997).

[14] U.S. Environmental Protection Agency, Office of Air Radiation, Office of Atmospheric Programs, *Guidance on Establishing an Energy Efficiency and Renewable Energy (EE/RE) Set-Aside in the N0x Budget Trading Program* (Washington, D.C.: March 1999). The guidance only applies to states that are a part of the Ozone Transport Assessment Group, mainly in the eastern U.S.

Box 1: Should My Government Purchase Renewable Energy?

Most likely it should if it can answer "yes" to one or more of these questions:

- Is it located in or near a Clean Air Act nonattainment area?
- Do its constituents support renewables?
- Does it pay a lot for electricity?
- Is there an abundance of a particular renewable resource in the region and/or on the electricity grid?
- Are there any renewable energy businesses in the region?
- Are there relevant incentive programs (such as utility incentives, public trust funds in states with deregulated electricity markets, federal incentives) that can make the cost of renewables more attractive?
- Are there certain applications where distributed renewables are the least-cost option?

Economic Development

Governments want to stimulate and attract businesses that provide jobs and tax revenues. Renewable energy technologies are much better suited than fossil fuels to exploit local energy resources such as wind, solar insolation, and biomass. Further, many renewable energy technologies are more labor-intensive. A New York State Energy office study found that wind power can create 27% more jobs than a coal plant would and 66% more than a natural gas plant.[15] And distributed applications such as photovoltaic (PV) cells require an extensive work force of installers and buildings contractors not typically involved in central-station fossil fuel electricity generation. At the same time, many competing fossil fuel industries, such as coal, are becoming increasingly mechanized — while coal production grew at an annual average rate of 1.6% between 1992 and 1996, jobs fell dramatically, at an average annual rate of 6.7%.[16]

As a result, renewable energy can provide more jobs for many regions, including some with fossil-fuel-related employment, by harnessing local energy sources with local energy generation products. A study for Wisconsin found that displacement of fossil fuel energy by local renewable energy would prevent the flight of $6 billion from the state to pay for the extraction, refinement, and transportation of fossil fuels. With accelerated economic growth, renewables could provide between 48,202 and 63,234 new job-years to the state, assuming all energy production was located there.[17] Renewable energy firms can also form a formidable economic sector that contributes significantly to a locality's economic well-being. Washington's Department of Trade and Economic Development, for example, identified 134 renewable energy firms in the state. The companies had 900 employees and annual sales of $147 million in 1997.[18]

Some governments have recognized the link between renewables and job creation. For example, Iowa's Energy Office has developed funds for corn-related ethanol projects whose cost (2–20¢ per gallon higher than fossil fuels) is offset by the local benefits to in-state corn growers.[19] The city of Tucson, Arizona, is planning to construct facilities supported by PV and solar thermal equipment as a part of its effort to become a "solar capital" and thereby attract and support local industry, including a manufacturer of advanced thin-film PV cells.[20] Perhaps 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 attracted a local PV manufacturing plant.[21]

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[15] National Wind Coordinating Committee, *The Effect of Wind Energy Development on State and Local Economies*, Wind Energy Issue Brief No. 5, January 1997. Visit the NWCC at <http://www.nationalwind.org>.

[16] EIA, <www.eia.doe.gov/cneaf/coal/cia/t1p01.txt> and <www.eia.doe.gov/cneaf/coal/cia/t40p01.txt>. Accessed 20 April 1998.

[17] Steve Clemmer and Don Wichert, *The Economic Impacts of Renewable Energy Use in Wisconsin* (Madison, WI: Wisconsin Energy Bureau, 1994). Contact the Bureau at 101 E. Wilson St. 6th Floor, Madison, WI 53707-7868.

[18] Washington Department of Community, Trade and Economic Development, <http://www.energy.cted.wa.gov/ ECONWReport/ Default.htm>. Accessed 15 January 1998. Renewable energy firms include biomass, electric vehicles, fuel cells, geothermal, solar (including balance-of-system items such as energy storage and inverters), hydroelectric below 30 megawatts, and wind.

[19] Ward Lynn, Iowa State Energy Office, personal communication, 14 July 1998.

[20] Vinnie Hunt, City of Tucson, personal communication, 15 July 1998.

[21] Don Osborn, Sacramento Municipal Utility District, Sacramento, CA, personal communcation, 11 February 1998. Manufacturing facilities for PV modules and balance-of-supply components were set for operation by the end of 1998.

Technological Development

The government, especially at the federal and state levels, has been a central participant in the research, development, and demonstration (RD&D) of advanced technology, including many renewable energy technologies. While the government continues with RD&D, however, it has had difficulty completing its commercialization efforts. According to one expert, there is a "valley of death" for government-funded technologies — after a technology has passed through basic research, technical feasibility, and demonstration, it is difficult for it to graduate to commercial acceptance. The problem lies in attracting private firms to provide managerial and financial cost-sharing with the government, since the advanced technologies lack a clear market in the short term, while long-term success is uncertain.[22]

The "valley of death" means that the government is not getting full value for its RD&D dollar. Instead, technologies with uncertain markets can fall out of a competitive marketplace even though they have long-term viability and provide public benefits such as environmental protection and local economic development. While such a process can prune technologies that are technically and commercially doomed, it also hurts technologies, such as many renewables, that do not fit within the conventional power production system of high-capacity, central-station generation plants, but that do have substantial promise to provide clean, efficient services given greater investment and market share.

For this reason, the President's Committee of Advisors on Science and Technology, a select group that reviewed the U.S. energy RD&D portfolio at President Clinton's request, cited "aggressive government procurement" to "buy down the price" of renewables as a part of a commercialization strategy, bound by cost and time, "to complement national R&D work" and to address renewables' "chicken-and-egg problem…of being generally high cost and thus limited to low market volumes, but needing large market volumes to drive costs down."[23]

More specifically, government procurement of close-to-economic technologies with substantial public benefits can help make renewables a business priority for firms and financiers.

Fiscal Responsibility

Government procurement of renewables often makes fiscal sense even without the benefits just described. Many renewable energy technologies use little or no fuel and have lower operating and maintenance costs than fossil or nuclear fuels. As a result, there are many cost-effective applications for renewables, particularly distributed applications such as PVs, solar water heaters, and small wind turbines. These technologies can stand alone or be combined with more conventional technologies such as diesel generators to provide "firm," uninterruptable power. They can become a secure source of power for governments, allowing them to operate facilities and equipment far from the power grid. They also protect governments from costly power blackouts and sudden spikes in the price of power from the grid.

There are many examples of governments realizing that renewables make fiscal sense. Because of cost-effectiveness, three federal agencies have installed in total at least 4,000 PV systems, while the Department of Defense's Tri-Service Photovoltaic Review Committee identified 3,900 cost-effective applications for PVs, amounting to 423 megawatts (MW) of power — more than three times the world market for PVs in 1997.[24] Cities such as Albuquerque, New Mexico, have found ways to incorporate PV technology into their energy purchases based on cost-effective applications. And a Navy SEAL station on remote San Clemente Island, off the California coast, is installing three 250-kilowatt wind turbines to avoid $112,000 in annual diesel engine maintenance costs.

PART III: CHALLENGES FOR RENEWABLES

In numerous cases, federal, state, and local governments have managed to install distributed energy technologies and to purchase "green power" (electricity generated from renewable energy).[25] But many of the success stories rely strongly on "project champions" — motivated government officials who believed in the value of renewables and found a way to procure them despite the conventional method of making energy decisions. While project champions are an important source of early adoption of technologies, they are not enough to make government procurement an important vehicle for

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[22] Richard Marczewski, "Bridging the Virtual Valley of Death for Technology R&D," *The Scientist*, January 1997, p. 11. Also see President's Committee of Advisors on Science and Technology (PCAST), *Federal Energy Research and Development for the Challenges of the Twenty-First Century* (Washington, DC: November 1997), pp. 7-14 to 7-20.

[23] PCAST, ibid.

[24] The agencies are the Department of Defense, the Department of Interior (including the National Park Service and the Bureau of Land Management), and the U.S. Forest Service. From Government Procurement Project's Energy Ideas Web site, <http://prince.essential.org/orgs/GPP/energy_ideas/EI.0296/ EI.0296.04.html>. Accessed 13 July 1998.

[25] Due to space constraints, Parts III and IV focus primarily on renewable energy power generation rather than fuels such as ethanol. While such fuels may present important environmental and economic development benefits, they also present unique issues that focus on transportation policy and infrastructure, and would not be well served with a brief analytical treatment.

the commercialization of renewables. What is needed is a system that can both champion renewables and foster project champions. A number of challenges still need to be addressed in order for this to happen.

Capital Costs

Many renewable energy technologies use little or no fuel and have lower operating and maintenance (O&M) costs than fossil or nuclear fuels. For most applications, however, renewables tend to have higher initial capital costs. Since cost-benefit analyses tend to value present costs higher than those deferred to the future, high initial costs can make renewables seem more expensive, even though their "life-cycle costs" (initial costs upon purchase, ongoing operations costs, and ancillary costs such as environmental controls and impact) may be lower. High initial costs can kill a bid to the government. According to a Sandia National Laboratories study of PV system use in three federal agencies, the largest perceived barrier for two agencies, and the second largest for the third one, was the initial cost of the systems.[26]

This raises two issues. First, government budgets are frequently split into capital and O&M accounts. Many renewables require more of the former, but do not incur high O&M costs. Yet often the "capital department" makes the purchasing decision, so the initial high costs of many renewables will have more weight. To prevent this "split incentive" from dooming renewables, the benefits for O&M should be considered in any purchasing decision.

Second, the perception of higher capital costs for some renewables can indiscriminately include all renewables for all applications. In fact, many renewables are cost-effective right away for off-grid and mobile applications. This perception problem, unlike the issue of split capital and O&M accounts, does not require a regulatory fix; it can be addressed by greater awareness of affordable renewables applications.

Limited Experience With Renewables

Many government officials believe that renewable energy technologies are unreliable and uneconomical. Discussions with federal, state, and local officials yield a common concern — that stories of past failure of renewable energy technologies have clouded the overall reputation of renewables among government officials at all levels. For example, the Sandia Labs survey of PV system use in federal facilities found the largest perceived barrier for one agency, and the second largest for the remaining two, was lack of familiarity with PVs, and "related to this is uncertainty with PV's performance record."[27]

Technological failure is a costly mistake in any market — it is particularly costly in the government procurement community. One former federal engineer even asserted that "bad news travels 10 times faster than good news" in the federal procurement community.[28] Based on interviews, it appears that skepticism is even higher within many municipal governments that do not have an office devoted to renewable energy.

Few "Bottom-Up" Incentives: The Procurement Culture

The system within which contracting officers function creates a conservative approach to purchasing decisions, and can hinder renewables' prospects. Contracting officers have few incentives to encourage innovation. If anything, they traditionally face many penalties for errors and for decisions that lead to failure. According to a study by the Center for Strategic and International Studies' Working Group on Federal Acquisition Regulation Reform, "contracting is one of the very few functions in the federal government in which employees may be criminally liable for errors they make on the job."[29] Contracting officers also face a mountain of regulations, administrative orders, and oversight processes that, when combined with the possibilities of severe penalties, offer little latitude for innovative decisions on particular facilities and projects. Finally, due to these unique pressures, contracting officers are frequently cut off from managers of facilities for which the purchases are intended, who are not criminally liable for poor purchases. Thus contracting officers may focus on the most simple bottom-line, short-term cost. Less attention may be paid to more complex considerations of product value, environmental impact, and the long-term costs of energy choices to be borne by the facility or project.

On a positive front, public administration innovators are slowly making "best value" and "customer focus" central tenets of procurement. In particular, Vice President Al Gore's National Performance Review and Reinventing Government initiatives have sought to elevate high-value purchases above

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[26] DOE, *Federal Technology Alert*, DOE/GO-10098-484 (April 1998), p. 15,visit DOE's Alternative Fuels Data Center at <http://www.afdc.doe.gov>.

[27] Ibid.

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

[29] Debra van Opstal, *Road Map for Federal Acquisition (FAR) Reform* (Washington, DC: Center for Strategic and International Studies, 1995). Contact CSIS at 202-887-0200.

mere price considerations. There have been several recent efforts to provide positive incentives for good government procurement and management, such as the Kennedy School of Government's Innovations in American Government award program and Vice President Gore's Hammer Awards. The latter program only rewards teams, providing an important incentive for contracting officers and facility managers to work together and allow value — a strength for renewables — to take precedence over short-term cost and rigid regulations.

Nevertheless, a recent federal employee survey found that only one-third of 14,000 respondents said their organization rewards creativity and innovation.[30] Much more work is required on this front to support purchases of less conventional technologies providing new values.

Few "Top-Down" Catalysts: Limited Political Leadership

If government procurement officers are to purchase renewables for reasons not currently emphasized in the procurement process, they need clear signals that elected officials and their administrative appointees believe renewable energy purchases are a priority. Such leadership can build on recent government efforts to emphasize performance-based decisions rather than those centered on short-term costs.

Political leadership can also help coordinate different offices that must work together to promote renewables. Problems include the gap between the facilities that use products and the supply agencies that can offer expedited purchases of products, and the decisionmaking gap mentioned earlier between capital budget managers and O&M budget managers. Leadership can convey the message that renewables are important, require the involvement of disparate offices, and should not be left on the shelf due to administrative divisions.

Examples abound of directives and orders that encourage procurement officers to buy products for reasons other than cost. Many of these have fallen flat, however, because they did not include forceful language or subsequent oversight from those who issued them. A good example is Executive Order 12902, issued by President Clinton in 1993. This directed executive agencies to purchase renewables, but it does not carry the force of law.[31] Instead, it relies on the White House to make sure that agency heads comply with the order. Yet the order's wording provides little force, stating that "Each agency…*shall attempt* to incorporate cogeneration, solar and other renewable energy technologies" or "utilize passive solar design and adopt active solar technologies where they are cost-effective."[32] Its emphasis on process (the attempt to purchase renewables) rather than results (actually buying them) meant it had little effect on federal energy purchasing decisions.[33]

With several executive orders coming out of the White House each year, and with new administrations often rescinding executive orders issued by their predecessors, it is no surprise that procurement officers defer to procurement statutes and regulations that carry the force of law.

At best, directives with good intentions but little political, legal or financial support will encourage a few project champions within the government to take on the burden and risk of purchasing renewables. The Renew the Parks campaign by the National Park Service (NPS) spurred renewable energy purchases. Although the program was barely funded, it provided a platform for officials to convert their long-time interest in renewables, and particularly PVs, into a working reality for NPS's many remote, off-grid needs. In this case, the directive matched well with the economical opportunities to install renewables.

On the downside, relying on project champions to advance renewable energy will not make up for a procurement system that can discriminate against it. In fact, the system can stifle the attempt of project champions to make renewables a mainstream technology for the government. (See Box 2 on Page 10.)

Political leadership in state and municipal government is just as important and potentially more influential in directing government policy. The small size of many state and municipal governments can make high-level political leadership a powerful tool in convincing departments and officials — many of whom are just down the hall — to fulfill the interests of the executive.

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[30] "Vice President Gore Announces the Results of Employee Survey," *Reinvention Express*, 22 December 1998, <http://www.npr.gov/library/express/1988/vol14no14.html>. Accessed 7 January 1999.

[31] For example, it has no legal enforcement mechanism that allows citizens to sue non-complying agencies. Executive Orders can explicitly allow citizens the right to sue, and can incorporate existing statutory language for enforcement.

[32] Executive Order 12902, "Energy Efficiency and Water Conservation at Federal Facilities," March 1994, Federal Register 59, No. 47, 10 March 1994, pp. 11463–71.

[33] The one tangible result of the order was the initiation of the "Federal Procurement Challenge," an effort headed by DOE to encourage voluntary purchases of renewables within federal agencies.

No Accounting for Environmental Impacts

Two reasons that renewables frequently cost more than conventional fuels are a part of the same problem — there is no established method for procurement officials to account for the public impacts of their energy decisions. The benefits of renewables — including lower environmental impact — are not incorporated into cost analyses. And the environmental costs of conventional energy are not included in energy analyses.

There have been several efforts to incorporate environmental considerations into government energy choices. For example, to help in energy purchasing decisions, the U.S. National Park Service estimated dollar values for emissions of pollutants, such as carbon dioxide and nitrogen oxide. Many local governments, such as that in Portland, Oregon, have committed voluntarily to reduce carbon emissions under the International Council of Local Environmental Initiatives' Urban Carbon Dioxide Reduction Program by purchasing renewable energy.[34] But further action is required at all levels to account for environmental impacts, so that choosing renewables does not mean subsidizing an uneconomical energy option but instead supporting an energy option with numerous benefits, many of which do not show up in conventional accounting systems.

PART IV: WHAT CAN BE DONE TO ENCOURAGE GOVERNMENT PURCHASES OF RENEWABLES?

There are a number of measures that can open government procurement to renewables, and do so in a way that will help to build an industry for the private market.

Box 2: CSTRR's Experience

The Corporation for Solar Technology and Renewable Resources (CSTRR), an independent, non-profit development authority with tax-exempt status and the ability to float bonds, sought to develop 120 MW of solar-based electricity generation in the Nevada desert. The U.S. Department of Energy provided $3 million in funding and offered cooperation from the Western Area Power Administration (WAPA) — a federal power marketing administration — to deliver green power to federal facilities from the central-station solar farm. Unfortunately, CSTRR found out firsthand the problems of selling renewable energy to the federal government.

First, most federal facilities cannot enter into power purchase agreements for longer than 10 years. (The exceptions are DoD facilities, and even they require rarely granted waivers for contracts over 10 years.) For capital-intensive renewable energy projects, uncertain demand during the project financing period can force suppliers to raise electricity prices substantially during the purchase period to recover the full investment. CSTRR tried to circumvent this obstacle by entering into long-term agreements with WAPA itself, which could then contract with federal facilities for shorter time periods.

A second problem emerged: unlike wholesale customers, most federal facilities in regulated electricity markets could only contract with their local franchise utilities. Few of these were interested in teaming with CSTRR to support its generation facilities, which they felt could cut into their sales and would be supporting a potential competitor in a deregulated market. Third, the National Park Service, which was interested in purchasing green power, could not coordinate its many southwestern facilities into a single power purchase solicitation. Fourth, one key financial foundation of CSTRR — tax-exempt financing such as industrial development bonds — was eliminated by a 1996 federal law for energy projects that could eventually compete in the deregulated electricity market. And finally, within the few federal facilities that expressed great interest in purchasing green power, project champions were usually overruled by their bosses, who saw that "statutes that require competition and least-cost purchasing prevail over the less specific policies that encourage renewable energy use." *

In a sharp change of course, CSTRR has since shifted its attention to forming partnerships with private homebuilders to install distributed solar technologies, such as solar water heaters and PVs.

* McNeil Technologies. (Kevin DeGroat and Jonathan Cross, Principal Investigators), *Barriers to Large-Scale Procurement of Renewable Energy by the Federal Government: CSTRR's Experience*. March 1998.

[34] Learn more about the program at <http://www.iclei.org/us>.

Change Procurement Laws and Regulations

At least three changes in procurement regulations are essential.

- First, many large government facilities, in both regulated and deregulated state electricity markets, should be free to choose their electricity service providers, including green power providers. Most large wholesale customers, such as industrial and large commercial facilities, can choose their supplier in both regulated and deregulated markets. Unfortunately, in regulated markets unless a government facility is directly connected to a federally owned transmission system, it is a captive customer of the local franchise utility.[35] Fortunately, deregulation of the domestic electric utility sector is creating lower electricity prices and the entrance of integrated energy supply and service companies, some of which offer electricity generated from renewable energy resources. The savings possible as the result of competition could be used to cover the higher cost of renewable energy purchases.[36] The ability to choose between suppliers means that the federal government can reward those that offer green power options and provide incentives to those that do not.
- Second, environmental costs and benefits should be incorporated into government energy purchasing decisions. Beyond using life-cycle costing procedures, government officials could credit renewable energy systems for their contribution to the environment through green accounting procedures. One possible option is a standard method or technology/power pool profile to assess emissions of Clean Air Act criteria pollutants and greenhouse gases associated with energy use (including grid power and distributed energy, such as diesel generators) at individual government facilities, and to accord sufficient weight to the assessment within an overall decision to purchase energy. This could ultimately take advantage of environmental disclosure requirements for power generation that are emerging around the nation. (Environmental disclosure requires energy providers to inform customers of the fuel mix in their power supply, and can also provide information on the typical impacts on air quality of different fuels.) A simpler, though less accurate method would be to grant a percentage reduction in renewable energy costs as a proxy for environment benefits. While legislation is ultimately needed to make such accounting mandatory for all facilities, agencies and the executive branch can develop procedures and use them within existing budget and legislative boundaries.
- Third, in cases where equipment purchases are determined by a contracting officer from an agency's capital department or by purchasing departments that use budgets based on up-front costs, policymakers should also give operations departments and facility managers — the people who must work with the equipment — a strong voice in energy purchases. Awards programs that recognize innovative procurement practices can encourage teamwork between capital and operations departments so that they purchase products with the greatest value, including both cost and performance. When such teams are formed, the life-cycle cost and performance of renewables, and not just the short-term price, will be considered more closely in purchasing decisions. Although current awards programs are making teamwork a central criterion, a greater focus on rewarding teamwork in energy decisions will directly benefit renewables.

Support New Financing Sources

Relying solely on annual direct appropriations to government agencies can prove volatile for any multiyear procurement effort. Two other financial methods deserve close attention.

Energy Savings Performance Contracts

Authorized by the U.S. Congress in the Energy Policy Act of 1992, Energy Savings Performance Contracts (ESPCs) allow federal facilities to install energy-efficient technologies by

[35] Federal Acquisition Regulation Subpart 41.2—Acquiring Utility Services, states that the DoD Appropriations Act of 1988 prohibits federal agencies from using appropriations to purchase electricity "in any manner that is inconsistent with state law governing the provision of electric utility service, including state utility commission rulings and electric utility franchises or service territories established pursuant to state statute, state regulation, or state-approved territorial agreements." An exception is made for DoD facilities if the "applicable state-approved franchise…[is] unwilling or unable to meet unusual standards for service reliability that are necessary for purposes of national defense."

[36] For example, the General Services Administration (GSA) in New England awarded a contract to Enron Energy Services (EES) whereby federal facilities in northeastern states with deregulated electricity markets can essentially order their inclusion in the contract. EES guaranteed GSA a significant reduction in electricity bills due to federal facility aggregation. GSA thought the reduction significant enough to finance a commitment to purchase 4% of its electricity needs from renewables. GSA's commitment should amount to approximately 2 MW. Under the contract, EES will be searching for local sources of green power, which is defined in the GSA contract as renewable energy technologies that are included in definitions in each state's deregulation legislation. GSA can pay up to 120% of the cost for conventional electricity. It is looking at biomass-based electricity generation, as well as integrated solar roofs.

spreading payments over 25 years, so as to finance the payment of energy cost savings. Energy service companies (ESCOs) assume the capital costs of retrofits and services, as well as the design, installation, O&M, and finance costs, that lead to greater energy efficiency. The ESCO guarantees the federal facility a fixed amount of energy cost savings for up to 25 years. The federal government pays the ESCO a share of the total energy cost savings during the life of the contract, and keeps the rest. Once the contract ends, the government retains all the savings and equipment.

DOE's Federal Energy Management Program (FEMP) has built on its experience with ESPCs to create "Super ESPCs" for distributed renewable energy technologies. FEMP selects certain ESCOs to enter into "indefinite delivery, indefinite quantity" (IDIQ) contracts (that is, the ESCO can take purchase orders over several years for an indefinite number of products or services). By participating in these, the ESCO can contract with individual government facilities without going through a lengthy solicitation process each time. Individual agencies can "piggyback" on the contract and select the ESCO to supply and even install renewable energy equipment. Currently, Super ESPCs are meant to last for 25 years. Agencies can place orders within three years of the award.

FEMP has created Super ESPCs that are "region-specific" (focusing on one DOE region) and "technology-specific" (open to the entire nation but focusing on one technology). Under "technology-specific" Super ESPCs, DOE has awarded IDIQ contracts to firms for photovoltaics, geothermal heat pumps, and parabolic trough collectors.[37]

DOE includes distributed renewable energy technologies in the ESPC program under the premise that renewables save energy by avoiding grid power, especially during periods of peak electricity demand and high prices. Thus the renewable energy purchase must save a facility some money. In reality, federal agencies purchase renewable energy technologies and "bundle" them within a conventional energy efficiency ESPC. By doing so, the agency pays for the technology through energy savings — though primarily from conventional energy efficiency measures.

As a trade-off, the agency receives less of the annual energy cost savings from the conventional efficiency measures, the payback period for the total project is extended, and the savings-to-investment ratio drops. The size of the renewable energy purchase is thus limited by the size of the conventional energy efficiency investment and the willingness of the agency to lengthen the payback period.[38] While ESPCs are amenable to well-developed technologies such as solar water heaters and PVs, it is less likely that more experimental and expensive technologies such as PV concentrators will be chosen by participants.

Many states, including Maryland and Ohio, have begun their own ESPC programs. Through DOE incentives programs and general word-of-mouth, more states are likely to adopt ESPC programs and should make sure that renewable energy benefits from improved energy efficiency.

Tax-Exempt Authorities

Governments have a unique opportunity to use tax-exempt financing from non-profit authorities, such as bond issuances, to finance renewable energy projects and subsequent energy generation. Such financing usually offers more favorable interest rates than taxable financing. As a result, it can greatly reduce the cost of renewable energy projects, which tend to be capital-intensive and therefore sensitive to interest rates. Before 1996, qualifying non-profit organizations could issue up to $150 million in tax-exempt financing for electricity and gas services. A 1996 change in federal law has complicated the use of tax-exempt bond financing for local electricity and gas services.[39] Nevertheless, tax-exempt bonds in support of industrial development, economic development, research, and other public purposes that can benefit renewables are still available. Such bonds could support new renewable energy purchases, or the installation of renewable energy capacity to make subsequent government power purchases attractive[40].

Open the Government to Aggregation

Clearly one of the strengths of government procurement of renewables is the potential for high-volume purchases. Volume purchases also benefit the government, since it can buy equipment and power at relatively cheap wholesale rates.

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[37] For more information on Super ESPCs, visit FEMP at <http://www.eren.doe.gov/femp/financing>. For information on technology-specific ESPCs, contact Tatiana Muessel, DOE, at 202-586-9230. Solicitations can be found at <http://www.eren.doe.gov/golden/solicit.htm>.

[38] For example, suppose a facility purchased a 24-kW PV system with $671,000 in total project costs, on top of a conventional energy efficiency project costing $979,000. Because the PV purchase will reduce annual energy cost savings, the agency cuts its share of annual energy savings, compared with an ESPC without the PV system, from 37% to 1% (or from $38,000 to $650) to allow the ESCO sufficient annual revenue from the savings. Since the agency has cut its share of annual savings, the payback period for the project is lengthened from 9.5 years to 15.4 years. Joe Bourg, NEOS Corporation, presentation to federal Interagency Energy Task Force, Washington, DC, 24 September 1998.

[39] Public Law 104-108 (Section 1608: Termination of Future Tax-Exempt Bond Financing for Local Furnishers of Electricity and Gas).

[40] See Joel Stronberg and Virinder Singh, "Government Procurement to Expand PV Markets," in *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998.)

Unfortunately, different governments, and even different agencies within government, have difficulty aggregating their purchases to achieve savings based on volume.

The Benefits of Aggregation

Aggregation among governments is beneficial for reasons other than its capacity to drive volume discounts. First, aggregating government energy purchases in a single region could create a substantial market, and would present economic development opportunities by encouraging manufacturing and service firms to locate near their customers. Second, it also allows governments to help tackle regional air quality problems that affect human and ecological health and that could impede the economic growth of a region through regulatory penalties, particularly to private businesses and consumers.

Third, aggregation supports the transfer of knowledge of governments experienced in a particular renewable energy product to less experienced governments. For example, federal supply schedules (discussed later) that screen products based on quality will help government officials who are uncertain about particular products. Aggregation also reduces government transaction costs, since every government agency does not have to create separate contracts for similar services.

Finally, it can help smaller governments who are interested in very small purchases, and consequently may not receive the attention from vendors that larger government purchases would. The city of Ashland, Oregon, is facing this problem in its participation in the Million Solar Roofs program — an initiative announced in 1997 by President Clinton to install solar energy equipment on 1 million roofs nationwide with the participation of utilities, governments, and private consumers.[41] Ashland expects to order a small number of solar products compared with other customers, and anticipates both high prices and low delivery priority. The city is now looking at aggregating its order with those of larger customers, including other utilities and a solar purchasing cooperative.[42]

Unfortunately, aggregation with other governments has not been explicitly considered by Ashland, though options should be made available by other municipal governments, as well as the state government.

Ashland's options for aggregation point to another promising policy for government procurement — aggregation with private customers, including residential loads. This strategy directly ties the private market with government procurement. Private consumers can benefit from lower prices for renewable energy technologies and green power due to volume purchasing. They also benefit from the negotiation power of the aggregating authority to require quality products and services. Further, this can avoid a scenario where small private customers are subsidizing cheaper electricity rates for aggregated government facilities.[43] Finally, it can support municipal aggregation strategies in a deregulated environment. By combining different loads such as office buildings and homes in an aggregated energy purchase, municipal aggregation makes residential customers increasingly attractive to energy providers, including green power marketers.[44]

One Trick - Different Facilities, Different Terms

One problem with aggregation is that different facilities have different capital turnover periods and contract terms, and therefore cannot aggregate purchases within a year. One solution is to allow staggered entry by individual facilities into a broad contract between a government and a supplier. This option may favor purchases of more modular renewable energy technologies, such as wind turbines and photovoltaics, that vendors can supply with some flexibility to gradual increases in demand. Another option, a slight variation of the one just mentioned, exists today — supply schedules.

Existing Opportunities for Aggregated Purchasing

Supply schedules are a convenient way for governments to consolidate purchases, and for firms to benefit from such pur-

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[41] For information on grants and incentives for governments under the Million Solar Roofs program, visit <http://www.eren.doe.gov/millionroofs/grantin.html>.

[42] Letter from Angus Duncan, Columbia/Pacific Institute and Dick Wanderscheid, City of Ashland, 24 August 1998.

[43] The concept of "conjunctive billing" in regulated utility markets means that if a utility charges low rates for one customer class it can charge higher rates for another customer class, to make up for lost revenue per unit of electricity sold and cover its cost of providing service. Generally, government facilities have paid more for electricity so that private consumers pay less. However, this should merely result in higher taxes for private consumers, with little real savings for either group. By spreading out the cost of electricity over many customer classes due to aggregation among government and residential customers, the default price of electricity (or the price of electricity the customer would pay without explicitly choosing its own provider or aggregation program) paid by non-aggregated consumers may rise. This may make green power options more attractive to these classes, since the premium to be paid for green power would not be as high as it would be with a lower default price.

[44] See Peter Asmus, *Power to the People: How Local Governments Can Build Green Electricity Markets* Renewable Energy Policy Project Issue Brief No. 9 (Washington, DC: January 1998). One example of public-private aggregation mentioned, although in a regulated electricity market, is the Windsource program in Colorado. Public Service of Colorado, an investor-owned utility, has aggregated demand from the cities of Denver, Boulder, and Colorado Springs with non-government loads to finance wind power at a small premium.

chases. In the federal government, supply schedules are administered by the General Services Administration and the Department of Defense's Defense Logistics Agency. (See Box 3, Page 15 on GSA's program.) These agencies consolidate procurement requirements of multiple federal agencies, and can get guaranteed, private market prices through volume purchasing. Many state equivalents to GSA, such as New York's Office of General Services, administer supply schedules from which state governments, municipal governments, and nonprofits can purchase products. Unfortunately, the federal government cannot allow state and local governments to purchase from its supply schedules, nor can it purchase products from state or local supply sources.[45]

For power purchases, the General Services Administration can aggregate area federal agencies to negotiate power from a local utility. GSA's area-wide agreement relieves federal agencies in the same area of having to negotiate and execute individual contracts. The agency negotiates one generic contract, and any federal agency can then place authorizations detailing a specific project into the contract, using it to make their individual purchases. Eliminating the need for separate agreements offers significant administrative economies of scale and greatly reduces the time needed to execute a federal purchasing decision.

Municipal governments can also drive renewable energy markets simply by aggregating their own facilities, either by renegotiating a utility contract in regulated electricity markets (as in Portland, Oregon; see Box 4 on Page 16), or by signing up facilities with green power marketers in a deregulated electricity market, as in Santa Monica, California. Santa Monica aggregated its energy bills, totaling $2.3 million per year, and issued an RFP to buy 5 MW of green power. At a 5% premium ($140,000 annually), the city will meet all its power needs from existing geothermal plants, with the electricity provider promising new plants in the future.[46]

Aggregation's Impact on Contractors

One controversial impact of aggregation falls on contractors. Since aggregation's primary purpose is to reduce prices and the profit a vendor makes per unit of product sold, it could theoretically squeeze small businesses that have low sales volume. However, if government procurement is to help open the private market to renewables, volume purchases and lower profit margins can only help, as long as there is enough profit to allow firms eventually to recoup start-up losses in a young industry, to expand manufacturing and distribution operations, and to provide innovative products and services. As markets for renewables grow, firms will have to be increasingly poised to respond to higher volumes of demand with lower prices.

Aggregation does not automatically squeeze small businesses out of the government contract business. According to the U.S. Small Business Administration, federal contract consolidation grew from 1991 to 1995 — average contract values increased, and the share of "large" contracts ($100,000 or more) increased by 20% during the same period. But small businesses' share of the number of awarded contracts fell only slightly, from 60.5% in 1992 to 58.9% in 1995. Average contract size grew among small businesses. In 1991, a third of all contracts were large. By 1995, this portion grew to half. These results do not point to a dramatic impact on small businesses, though they do show that aggregation does not automatically favor them.[47]

Educate Government and the Public

Government

If government is to use renewables to meet a greater share of its energy needs, officials need to know about the performance, reliability, safety, and diverse benefits of these energy sources. Educating the government about renewables is not a new concept. A number of organizations already provide educational materials and services to governments, though many of these efforts have tended to focus exclusively on PVs. For example, the Urban Consortium Energy Task Force and the City of Albuquerque, New Mexico, produced a PV purchasing guidebook directed at local and state governments.[48] Sandia National Laboratory has run the Photovoltaic Design Assistance Center to help governments find cost-effective PV applications.[49] And the Interstate Renewable Energy Council has held conferences with procurement officials, educating them about PVs and encouraging procurement by providing contact information on PV firms.[50]

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[45] The Government Corporation Control Act (31 U.S.C. 9101) limits federal supply sources to supply property and services to executive agencies, mixed-ownership government corporations, the District of Columbia, the Senate, the House of Representatives, the Architect of the Capitol, and "certain other organizations."

[46] For more information on the Santa Monica program, contact Susan Munves at 310-458-8229.

[47] U.S. Small Business Administration, Office of Advocacy, *Bundled Contract Study FY 1991-1995*, *Research Summary* (Washington, DC: 1997). Available at <http://www.sba.gov/ADVO/research/rs177.html>.

[48] Glen Coontz, *Photovoltaic Purchasing Guidebook for Local and State Governments*, a project of the Urban Consortium Energy Task Force of Public Technology, Inc. (PTI) and the City of Albuquerque, N.M. Visit PTI's Urban Consortium Energy Task Force at <http://www.pti.org>.

[49] Contact the Center at 505-844-3698.

[50] Visit IREC at <http://www.eren.doe.gov/irec>.

Box 3: The GSA Federal Supply Schedule

The General Services Administration is a federal agency that, in addition to running federal courthouses and buildings, offers federal agencies expedited procurement services. The Federal Supply Schedule (FSS) can save both the procurer and vendor months and even years of administrative effort.* For example, the FSS has a listing of PV companies that have contracts with GSA for indefinite quantity and delivery — that is, for no specific project in particular, but open to all orders. Companies get listed on the FSS for a broad category of products. The contract with GSA specifies prices for each product, with the listed prices based on the commercial prices offered for the products in the private market. The contract also contains a price adjustment policy that mirrors prices in the private market for a company's products.** Contracting Officers from any agency that recognizes the FSS can then select any product from it to fulfill their project needs.

By choosing products from a supply schedule, procurement officers can avoid a lengthy Request for Proposal (RFP) process for an individual project, since GSA has already screened and approved products through the standing RFP process. By placing their products on a supply schedule, companies can reach practically the entire procurement community through one process, saving valuable time and energy. Renewable energy products on the FSS currently are limited to distributed energy technologies. However, several GSA officials have hinted at making "green power" a new product category, giving agencies the opportunity to choose the cheapest (and, it is hoped, certified) green power.

Because GSA receives a fee for each purchase it brokers, it will only list products if there is sufficient demand from its agencies. But how can agencies purchase renewables if they cannot do so easily from the FSS? This "chicken-and-egg" problem means that facility managers interested in using renewable energy may not know where to find a reliable vendor, or will avoid a lengthy contracting process. Conversely, supply agencies such as GSA will not list products that their customers do not want to buy. This points to the importance of renewable energy firms and advocates pushing GSA and similar agencies to list renewables on their supply schedules, combined with efforts that convince facility managers to buy clean energy and that push political leaders to make renewables a priority throughout the government.

*(DoD's Defense Logistics Agency (DLA) administers a similar schedule. DLA works closely with GSA to avoid listing duplicate products. DoD facilities can also purchase from the GSA Federal Supply Schedule.

**Vicki Moore, GSA, Fort Worth, Tex., personal communication, June 22, 1998. For a copy of the Federal Supply Schedule Request for Proposals for solar energy systems, call Vicki Moore at 817-978-8632.

The renewable energy industry itself — including equipment suppliers and green power marketers — should play a much greater role in the educational process, especially since electricity restructuring means that many governments may have more liberty to choose their energy sources. Most government officials interviewed for this report had never been visited by a representative of the renewable energy industry or an individual firm.

Yet contact between the industry and the government promotes purchases. For example, a PV contractor recently listed on the Federal Supply Schedule paid an informational visit to the GSA Tampa office. The visit, plus the easy purchasing system, convinced the office to request project funding from the GSA Regional Service Office for PV lighting on a federal courthouse, which was approved.[51]

Outreach and marketing efforts should recognize that different government officials play different roles in the procurement process. Policymakers (who set budgets and procurement policies), energy offices, government architects, and facility managers all influence what energy options are chosen. In municipal and small state governments, influenc-

[51] George Post, GSA Public Buildings Service, Tampa, FL, Field Office, personal communication, 14 July 1998.

Box 4: Portland Aggregates to Buy a Fuel Cell

When the city of Portland, Oregon, had to renegotiate its contract with its local utility, Portland General Electric (PGE), in August 1995, it combined its six largest electric accounts — two wastewater treatment plants, three water and sewer pump stations, and a downtown office building — totaling 42 million kWh annually. The aggregation qualified the facilities for PGE's low tariff for industrial facilities. Because of the savings due to the low tariffs in its new five-year contract with PGE, the city could afford to pay PGE a special three-year premium on top of the low tariff as long as PGE provided 5% of its power from new renewable resources, to be built by August 2000. The deal meant that the city would pay a premium of 2.27¢/kWh for the new renewables (originally thought to be 500 kW of wind power). And yet the city would still save $126,000 in the first year over what it would have paid if its facilities purchased power individually.

As it turned out, PGE (now owned by Enron) did not build the new renewable resource. Instead, the utility returned the total amount of the tariff ($248,000) to the city for a fuel cell that produces power using anerobic digester gas from the wastewater facility. The tariff, combined with grants from the federal Fuel Cell Climate Change Program (now run by DOE) and the Oregon State Energy Office, is funding a 200-kilowatt plant that will produce 1.5 million kWh of electricity a year for the next 15–20 years, enough to power the wastewater treatment plant cleanly at a cost of 6.5–8.5¢ per kWh. The plant, due to start running in summer 1999, will reduce the treatment plant's electricity bills by $102,000 annually, and will pay for itself in less than eight years.

Source: David Tooze, City of Portland Energy Office, personal communication, March 2, 1999.

ing the political leadership can be especially effective, since their proximity to and influence with government administrators is relatively high compared with the situation in larger governments.

Particularly promising outreach activities include renewable energy project site visits for government officials, training for government service staffs, presentation of data demonstrating declining life-cycle costs, and performance testing results. Presentations to government officials should also address a top interest of state and local governments — the local economic development potential of renewables. Industries must explain to governments that procurement and greater tax revenues can go hand in hand.

The Public

The failure of government officials to buy renewable energy is based largely on their belief that American voters would not approve the additional costs associated with renewable energy technology. An effective public education program targeting energy service professionals and the public can create positive peer pressure on governments and even specific government facilities.

Public education efforts should have two goals. First, they should aim to create general support for renewable energy in order to cultivate "passive pressure" on the government. For government procurement, the most important precedent is recycled paper. Extensive educational efforts by environmental groups, which targeted children and adults alike, made government use of virgin paper a questionable practice that starkly contrasted with public sentiment supporting recycling.

The second goal should be to use public campaigns and lobbying to develop direct pressure on government to purchase renewables. Advocates of renewable energy should have information on the government procurement process, the location of local government facilities, and the government officials to lobby. They should also understand what tools are available to purchase renewables, including financial tools and political action tools, such as referenda to dedicate funding for renewable energy purchases.[52] They should know that public institutions are responsible for heeding public demands for environmental quality, and that barriers to government procurement can be overcome.

Tap Into Incentives Available to the Private Market

When government facilities have access to incentives to encourage renewable energy use among private consumers, the economics of government procurement can be more attractive. For example, the Department of the Navy plans to install up to 849 solar water heaters (SWHs) on houses within the Moanalua Terrace Navy Family Housing project using

[52] Note that Alaska, Massachusetts, Missouri, Montana, Nevada, North Dakota, and Wyoming limit or prohibit referenda that include appropriation measures. Alaska, Massachusetts, and Montana prohibit referenda on local legislation and laws. Visit the National Council of State Legislatures at <http:/www.ncsl.org> for more information.

[53] DOE, Million Solar Roofs web site, <http://www.millionsolarroofs.org>. Accessed 12 December 1998. For more information, contact Ted Arakaki, Naval Housing, at 808-471-9630, ex. 304.

rebates for new construction and energy-efficient water heating offered by Hawaii Electric Company, the local utility. Rebates total $1,500 per system, allowing the Navy to install 136 SWHs in the project's second phase for $235,000, saving more than $500,000 in energy costs over the next 15 years.[53]

Electricity restructuring may present many states with new sources of incentives, such as net metering and system benefits charge funds. Net metering, available in approximately half the states, allows users of distributed energy technologies to pay for power purchased off the grid while selling excess power generated by the distributed energy technology back to the grid, thereby improving the technology's economics.[54] System benefits charges can involve a government, either state or federal, adding a charge for each unit of power consumed. The charges can be pooled to fund a variety of energy programs, including renewable energy. In California, system benefits charges are funding a Renewable Resources Trust Fund that includes subsidies to purchasers and lessees of qualifying renewable energy systems.[55] Federal, state, and local government facilities should be able to take advantage of the program to spur procurement of renewables.

PART V: POTENTIAL PROBLEMS

While the government can help renewable energy firms through purchasing, it can also derail them if several potential pitfalls are not recognized and addressed. The problems all relate to the fact that government purchasing must help renewables succeed in the large private market. Experience shows that the government has not always based its purchasing programs on considerations of private market dynamics.

Technology Choice

The government does not necessarily demand the products that will ultimately succeed in the private market. At least two studies of federal government R&D in the wind industry in the 1980s found that the federal government's choice of large-scale, multi-megawatt turbines and their manufacturers (aerospace firms already ensconced in the government procurement system through defense and space program contracting) went against the tastes of both wind energy suppliers and consumers in the private market.[56] In this case, the technology selected by the government was not adopted partially due to high cost and poor performance. Instead, a private market — spurred by multiyear incentives fashioned by federal and state governments — became a stage on which different turbine designs competed for market share, with smaller wind turbines (less than 1 megawatt) predominating on U.S. windfarms and ultimately adopted by the private market.

Part of the explanation of the federal government's selection of a doomed turbine design lay in the institutional bent of the managing agency, the National Aeronautics and Space Administration, and its subcontractors, who were used to designing costly equipment that would be paid for by a Congress sympathetic to the space program. Government efforts to design commercially successful renewables were partly influenced by non-market considerations unique to the government market — considerations that were based on practices that were insulated from the cost- and quality-conscious private market.

Idiosyncratic Requirements

Another problem with direct government involvement in market demand is that it can siphon off contractors' valuable marketing and production resources. Governments can demand that contractors design their products in accordance with specific government standards. With a tangle of procurement regulations and administrative fiats hanging over their heads, procurement officials can demand extensive paperwork from the contractor to show that the purchase meets a myriad of government cost, quality, and social demands. The result is that contractors spend more time earning a dollar from the government than they would from a private consumer.

At least one major survey of government contractors found that by requiring idiosyncratic marketing, accounting, and administrative efforts from firms, the government has not helped companies hone products and services to the needs of the private market. (See Box 5 on Page 18.)

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[54] For more information on net metering, see Thomas Starrs, *Net Metering: New Opportunities for Home Power*, Renewable Energy Policy Project Issue Brief No. 2 (Washington, DC: September 1996), and Thomas Starrs and Howard Wenger, "Policies to Support a Distributed Energy System," *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998).

[55] The California Renewable Resources Trust Fund will allocate up to $500 million on renewable energy. For more information on the Fund, see Thomas J. Starrs and Vincent Schwent, "Government Buy-Downs for the Residential Market," in *Expanding Markets for Photovoltaics* (Washington, DC: Renewable Energy Policy Project, 1998).

[56] See Tom Starrs, "Legislative Incentives and Energy Technologies: Government's Role in the Development of the California Wind Energy Industry," *Ecology Law Quarterly* (1988), pp. 103–58, and Adam Serchuk, *Federal Giants and Wind Energy Entrepreneurs: Utility Windpower in America 1970–1990*, PhD. Thesis, accepted by Virginia Polytechnic Institute and State University, Science and Technology Studies program.

Box 5: Are the Government Market and the Private Market Well Integrated?

In 1993, the Center for Strategic and International Studies surveyed 212 Department of Defense contractors (including those with less than $500,00 in sales to DoD)to examine how to integrate DoD's purchasing practices with those of the private market. The results show that DoD's policies had little to do with the private market.

Contractors segregated their operations. The study found that 86% of government purchases came from companies that segregate some portion of their operations between private and government consumers, or that set up a separate data management system for government. Only 12% of the contractors surveyed "do business in both the federal and commercial markets using the same facilities and business operations." The difference was even more pronounced for "commercial companies" (firms where federal sales were less than 30% of total sales), among whom 93% of sales came from firms that segregate their operations. The study found that businesses established a segregated office to deal with the government because of its unique contracting process rather than unique technology requirements or lack of demand in the private market.

Contractors spent more time earning the government's dollar. For the contractors that segregated their operations, a majority found that preparing and submitting a proposal to the federal government required at least twice as much labor. A majority believed that overall administrative labor costs (for contracts, finance, legal, and inspection) as a percentage of sales were at least three times higher for government sales.

Contractors supported melding the government market with private markets. When asked what measures would allow their commercial segments to pursue the government market more actively, 79% of the contractors suggested use of the Uniform Commercial Code instead of government acquisition rules, and exemption from unique government contracting requirements. Also, 72% called for "reconciliation of commercial and federal specifications and standards," and 89% said that production and management processes were "substantially similar" or that products "could be coproduced."*

* The Federal Acquisition Streamlining Act of 1994 (FASA) attempts to address a couple of issues raised by the study. FASA requires contracting officers to seek uncertified price information rather than detailed cost and pricing data unique to the government's information requirements. It also specified a preference for commercial items in developing contractual requirements.

Source: Debra van Opstal, *Integrating Civilian and Military Technologies* (Washington, DC: Center for Strategic and International Studies, 1993).

Thus government procurement may not encourage business practices that are in line with private market requirements, and instead may distract a firm's resources into an insulated, idiosyncratic purchasing system. This is particularly harmful to the small, underfinanced, and understaffed renewable energy industry. The efforts of the industry will not lead to benefits that can be multiplied through increased sales in the private market, and government procurement will do little to commercialize renewables products.

It is also harmful to future procurement opportunities, for commercialization would help expand and refine renewables' technical and business infrastructure and would thus make future government purchases relatively easier. In the future, for example, it would be easier for governments to purchase small wind turbines if there were more suppliers and servicers nationwide.

Political Risk

Finally, government procurement can introduce or at least amplify the importance of political risk in the renewables market. Government spending depends largely on annual appropriations determined by legislators with strong political motivations. Procurement decisions from year to year can vary not just because of the price and quality of a product, but also due to political developments. Political volatility is not easily predicted by the industry and its financiers.

The most well known example of government unpredictability hurting renewable energy concerns Luz International. Luz built a central-station solar thermal power plant in California's Mojave Desert. The plant's financing relied heavily on Congress extending solar energy tax credits to the end of each calendar year, so that annual plant upgrades lasting until the end of the year could be covered under the exemption. In 1989, however, Congress decided to extend the credit only

[57] John J. Berger, *Charging Ahead: The Business of Renewable Energy and What It Means For America* (Berkeley: University of California, 1997).

until September 30. This forced Luz to compress its construction schedule and incur crippling cost overruns. Politically based delays of a state property tax exemption dampened private investment for plant expansion the following year, and Luz went out of business.[57]

Unpredictability is especially harmful if firms are making significant sunk investments based on future government markets. If government demand evaporates in a given year, it can saddle an industry with unrecoverable investments. This can bring a dependent industry toward bankruptcy, even if it was financially sound before the government became a prime source of demand. As such, government procurement may not encourage more investment in the renewables industry, nor may it result in expanded production of renewables and attendant economies of scale. Thus, unlike a dollar from a private consumer, a dollar from the government may not hold as much value for the continued maturation of the renewables industry.

PART VI: HOW GOVERNMENT PROCUREMENT CAN HELP COMMERCIALIZE RENEWABLE ENERGY

If the government expands its purchases of renewables, it should incorporate several practices to ensure that procurement will help prepare the industry to compete in the mainstream private energy market.

Purchase Products That Meet Standards and Warranties

The Importance of Private Standards

The government can help industries gain greater market share by adhering to standards recognized by the private market. This helps guarantee that governments will purchase only products that are likely to be purchased by private consumers, thus avoiding the creation of a unique "government market" as firms create separate departments and product lines. Just as important, it helps governments purchase products that work, which will avoid renewables gaining a poor reputation among both government customers and private customers.

Adherence to standards also addresses the problem of centralized versus decentralized purchases within a government. Centralized purchases can stifle the ingenuity of facility managers and place central decisionmaking priorities high above the pragmatic imperatives of individual facilities. On the other hand, "hands-off" decentralized purchasing can seriously weaken the government's ability to pool significant market demand, and can complicate the task of private vendors to tailor their products to the government's needs. Instead, adherence to standards creates "uniform choices" among agencies without placing the particular imperatives of a central purchasing office above all other interests.[58]

Finally, private standards allow governments to assess the quality of products and vendors without a lengthy quality assurance evaluation starting from scratch. If, for example, a photovoltaic system meets recognized standards and the installer is certified through a labor union training program, governments can be assured that both the product and service is recognized by the private market for quality, and valuable administrative effort can be saved for both the government and the vendor. This is not a new concept — for example, the Energy Star label for energy-efficient appliances must be on every computer the federal government buys. This poses little problem for the vendor, who will find it worthwhile to get the label since it is recognized and valued by private consumers too.

Standards for Renewable Energy

For renewables, there are a number of standards that apply to distributed energy technologies as well as to green power. For the former, standards include those issued by Underwriters Laboratories for safety, by organizations such as the International Electrotechnical Commission and the International Electrical and Electronic Engineers on performance and reliability, and by state and federal legislatures on connecting distributed energy technologies into the power grid. Standards exist for both systems and components, though for technologies such as PVs, standards for entire systems are not as strong.

Green power "certification" seeks to verify that firms claiming to supply green power are actually doing so by drawing on electricity generated from renewable energy technologies. Substantial controversy exists over how to define "green power," but nevertheless governments should be aware that certification is available and undergoing refinement, and that green power purchasers should pay heed to what the Federal Trade Commission, the National Association of Attorneys General, state regulatory bodies, private consumers, and prominent third-party certification groups consider green power to be.[59]

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[58] For further discussion, see Nagy Hanna, Ken Guy, and Erik Arnold, *The Diffusion of Information Technology: Experience of Industrial Countries and Lessons for Developing Countries*, World Bank Discussion Paper No. 281 (Washington, DC: 1995).

[59] One example of green power certification is the Green-e label, developed by the Center for Resource Solutions (CRS). For more information, contact CRS at 1-888-63GREEN or visit <http://www.green-e.org>.

Within governments, a single office or person should be the repository of standards information and evaluation. When individual facilities have questions about renewable energy products, there should be an easy way to contact a government expert to assure facility managers that the product they want to purchase meets standards. Sandia National Laboratories has served such a role on PVs, not only for the federal government but for state and local governments as well. Federal and state governments, through supply schedules, can screen products based on standards and include comprehensive standards information for listed products. This sharing of knowledge between government agencies is an ideal way to address frequent problems of skepticism and caution among governments that lack expertise in renewable energy systems, and fear being cheated when purchasing a product.

Warranties

Warranties are another important element of government purchasing that expands private markets for renewables while ensuring that what the government buys works. It is important for vendors to assure governments that products will last as long as their "payback" period. It is legitimate for government purchasers to demand only products that meet minimum warranty periods, much like the California Energy Commission has done for products that qualify for subsidies under its new Emerging Technology program.[60]

Set Multiyear Purchasing Goals

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

Manufacturers and investors, in particular, require this information for planning purposes. If a renewable energy firm knows what governments will require, it can plan for expansion and raise adequate capital based on known quantities and terms. Investors can similarly incorporate established government goals into their assessment of the renewable energy industry, and not sharply discount the benefits of government purchasing due to unpredictability.

Sudden spikes in government demand can lead to higher prices if renewable energy suppliers cannot adjust quickly by expanding manufacturing and installation. To address this, goals can shape a gradual increase in government purchasing of renewables to avoid sharp demand spikes, to develop the government's learning of renewable energy systems, and possibly to reduce renewable energy costs gradually. As the government sees renewable energy purchases as a simple process and as the cost of such purchases declines, it is hoped that political will to buy renewables will grow. Gradual increases in the target can also minimize the impact on industry of an early termination of a purchase order.

Finally, goals — and subsequent monitoring — permit government and nongovernmental leaders to evaluate the progress of the procurement program and to adjust its demands to better conform to industry's capacity to deliver.

There are a few problems with goals, of course. One difficulty is that goals often become program ceilings instead of the floors they are intended to be. Goals can also lead to narrow technology choice. This may be fine for a local government nestled in a vibrant industry focusing on a certain technology and in an area with an abundance of a particular renewable resource. It is potentially hazardous if done merely to appease different interests. Goal setting should allow for flexibility — for example, governments should make goals contingent on product quality and product value, allowing individual facilities to choose what renewables products are best for them. Governments should also be able to adjust goals based on dramatic changes in technology that can make previous commitments self-defeating and outdated.

If technology bands are required at all, they should most likely be for central-station and distributed renewables. This permits sufficient choice, and recognizes that the latter are increasingly valuable in a clean energy infrastructure though they face many regulatory and cultural hurdles in the private market.[61]

[60] For more information, see Starrs and Schwent, op. cit. note 55.

[61] For a discussion of goal-setting options that the federal government can consider for purchasing PVs and green power, see Stronberg and Singh, op. cit. note 40.

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Lessons Learned from the Colorado Green Marketing Experience, by Rudd Mayer, Eric Blank and Blair Swezey. The authors describe a community-based approach for aggregating demand for renewable energy that was developed in Colorado by The Law and Water Fund of the Rockies and Public Service Company of Colorado. The authors also investigate the potential for transferring the model to other regions.

The Green Power Finance Initiative, by Robert Means. This paper presents the concept of a state-Federal-private effort that can provide green power marketers with insurance against revenue shortfall due to uncertain customer demand, thus encouraging financing for new renewable energy installations.

Renewable Energy, Insurance and an Integrated Consumer Financial Product, by Joel Gordes. Under electric restructuring many believe the bundling of services to be innovative. This paper examines bundling property-casualty insurance, a retirement annuity and electrical service into a single billing wherein any savings from reduced electricity bills pay for a PV system. This could spur investment in PV production and other market-driven climate change mitigation strategies.

Project Siting: Comparative Case Studies and Lessons Learned, by Robert Kahn and John Grattan. This paper examines case studies of renewable energy project siting, and provides lessons for project planners, renewables advocates, local environmental advocates, and local planners who need to balance access to good renewable resources with local environmental and aesthetic concerns.

Making Technology Happen: Case Studies of the Government's Role in Innovation, by Adam Serchuk and Bernard Moore. This paper explores the role of the Federal government in promoting diverse consumer technologies, including the fax machine and recycled paper, to supply background for a discussion of an appropriate Federal role in developing renewable energy technologies.

Reducing Emissions: Getting the Most Out of Renewable Energy, coordinated by Anne Polansky. Two Special Reports will identify ways to make renewables an integral strategy to reduce multiple air pollutants. One report will identify promising "cap and trade" emissions trading policies that can encourage renewable energy use. Another report will examine ways to monitor and verify emissions reductions from renewable energy use - a key issue for air quality regulators and the regulated community.

Issue Briefs

Renewable Energy Policies in Europe and Japan, by Curtis Moore. This paper surveys policy mechanisms used by Japan and selected European countries to promote renewable energy technology, both domestically and as an export product.

* Provisional Titles

The Renewable Energy Policy Project (REPP) supports the advancement of renewable energy technology through policy research. We seek to define growth strategies for renewables that respond to competitive energy markets and environmental needs. Since its inception in 1995, REPP has investigated the relationship among policy, markets and public demand in accelerating the deployment of renewable energy technologies, which include biomass, hydropower, geothermal, photovoltaic, solar thermal, wind and renewable hydrogen. The organization offers a platform from which experts in the field can examine issues of medium- to long-term importance to policymakers, green-energy entrepreneurs, and environmental advocates.

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