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Update on the Million Solar Roofs Initiative

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Update on the Million Solar Roofs Initiative

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Abstract. The Million Solar Roofs Initiative, announced by the President in June of 1997, spans a period of twelve years and intends to increase domestic deployment of solar technologies. This paper presents an overview of the development of the initiative and significant activities to date.

INTRODUCTION

The energy utility industry is making the transition from being a regulated monopoly to working in a competitive environment. As a result, responsibility for energy-related public services is shifting to state legislative policy and to community (regional or municipal) programs. The Million Solar Roofs (MSR) Initiative provides high-value solutions, such as distributed generation, for community-based energy infrastructure, environmental protection, and economic development planning.

The gradual national implementation and community participation in the MSR Initiative is planned to result in one million installations by 2010 and seeks to achieve the national goals of:

- Reducing greenhouse gas and other emissions (over 3.5 million tons of CO_2 annually by 2010, equivalent to 850,000 automobiles)
- Create high-tech jobs (over 70,000 by 2010)
- Keep the U.S. solar industry competitive.

These million installations, amounting to over 3,000 megawatts (MW) of solar capacity (PV and thermal), should also help communities meet goals similar to the national goals. At the state and community levels, comprehensive plans include infrastructure elements such as parks and recreation, land use, air quality, water quality, and transportation. Integrating renewable energy with existing elements and as additional infrastructure elements can aid communities in meeting the growth and action targets of comprehensive plans.

The Million Solar Roofs Initiative will be coordinated with federal and local enterprise and empowerment programs. The technology's modularity should entice

continued solar-related business development in the new energy industry. The initiative also targets utility involvement, with certain aspects modeled after the Sacramento Municipal Utility District (SMUD) "PV Pioneer" program.

BACKGROUND

The premises for the initiative are strongly based on results and impacts developed in the U.S. Department of Energy commercialization project PV:COMPACT (Photovoltaic Collaborative Market Project to Accelerate Commercial Technology). The multiple facets of PV:COMPACT have addressed the transitioning utility industry, the PV manufacturing industry, market value, barrier analysis, and community policy development and valuation.

The Utility Photovoltaic Group (UPVG) has developed utility partnerships and experience[1] through the TEAM-UP program—Technology Experience to Accelerate Markets in Utility Photovoltaics. Codes and standards, required for building construction integration and financing, have evolved. The PV industry has also recently integrated PV into commonly used building products such as PV shingles, PV-surfaced insulated flattop roof tiles, solar facades, and PV curtain walls. Photovoltaic module shipments have steadily increased by 15% over the past 12 years. Figure 1 shows a conservative projection for future manufacturing capacity resulting from an annual growth range between 10% and 15%. Though international markets will continue to demand most of this capacity, the Million Solar Roofs Initiative will ensure that a portion of this clean energy resource remains in the United States.

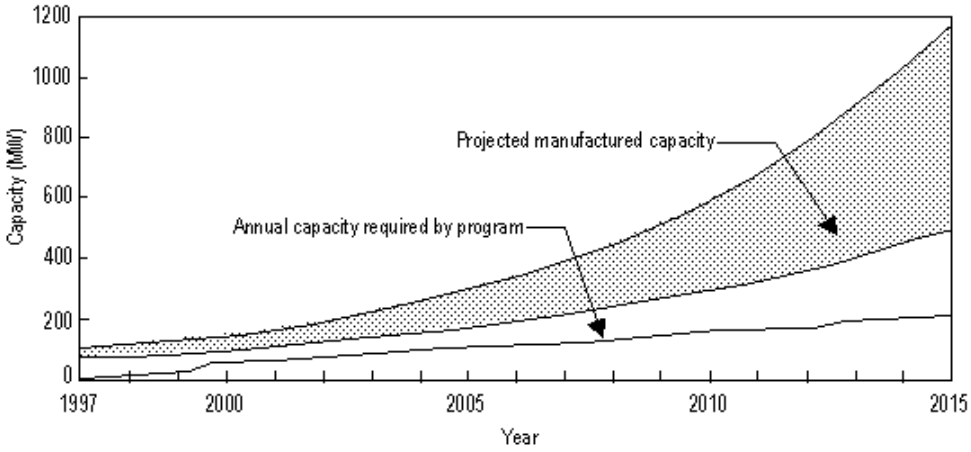

Figure 1. Manufacturing Capacity vs. MSRI Roofs Annual Requirement
The shaded envelope is bounded by annual growth of 10% (lower bound) and of 15% (upper bound).

[1] These partnerships include the SMUD program and diffusion of this program to other municipal utilities.

Solar technologies have a higher price relative to central-station fossil-fuel generation. MSR provides an alternative, higher-value market arena at the state, community, and consumer level. The solar-technology attributes of consumer preference, environmental impact mitigation, distributed resource, and building integration can combine at the state and local level to result in deployment value.

The basic elements of the Million Solar Roofs Initiative were developed as a result of analytic support of the myriad regulatory actions and energy policies evolving across the nation. Hence, it is flexible and easily adapted to most community-based policy. The initiative provides high return value for the full range of solar-related policies: capital buy-downs, restructuring policies (set-asides or portfolio standard), state tax credits, utility tax exemptions, net metering, low-interest loans, property tax exemptions, manufacturing grant incentives, utility infrastructure reserves, and energy production incentives. The initiative both enhances and complements implementation value, but does not depend on the availability of all policies for a community to successfully participate.

The President announced the MSR initiative in June of 1997, and within a few months, nine communities came forward with deployment plans and letters of commitment totaling over half of the targeted million installations. These communities and their stated commitments are listed below:

• New England Electric Service	100,000
• Maryland Energy Administration	20,000
• State of Colorado	1,000
• Salt River Project	20,000
• Tucson Electric Power Company	400
• Hawaii Electric Light Company	20,000
• Washington State Solar Energy Industry Association	20,000
• Sacramento Municipal Utility District	
Within service territory	25,000
Throughout California	20,000
• Los Angeles Department of Water and Power	100,000
• Federal Commitment	20,000

The deployment teams involve one or more stakeholders, noted in Figure 2. A lead stakeholder from each community team coordinates value identification, infrastructure development, and education activities. Even though most of these communities are areas of high PV market value, PV still has a higher cost than conventional utility grid electricity. In 2010, installation of one million solar roofs will be less than one-percent saturation, according to the U.S. Census Bureau projection of total households. The Initiative's goal to deploy this relatively new, energy-producing, "solar roof" consumer

product requires community teams to identify and couple stakeholder values to overcome the cost barrier. Figure 2 associates a dollar-per-watt range of values for each

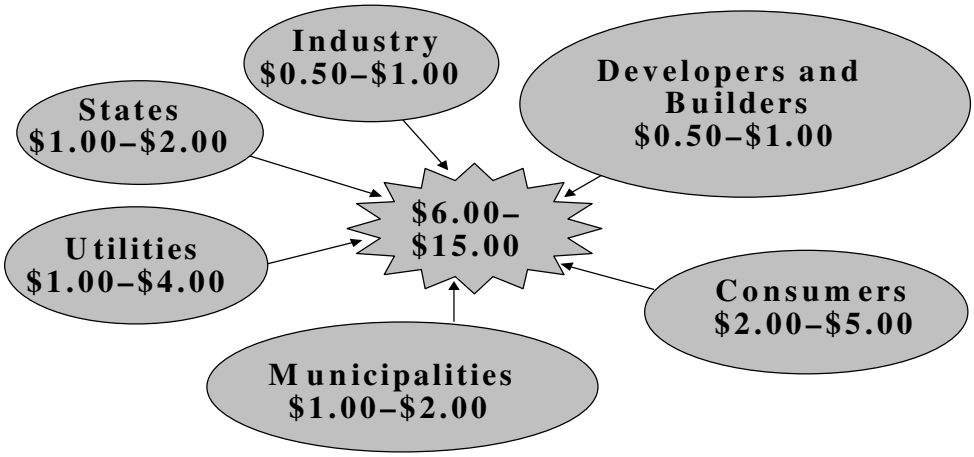

Figure 2. Community team stakeholders and and ranges of dollar-per-watt capital value.

stakeholder category within the community team. Though not all of the values have been realized in actual deployment, support analysis is available. The following subsections will describe analysis and activities that support the community team values.

States

As states set up mechanisms to transition their utilities to the more competitive restructured arena, many opportunities arise that are favorable to renewables and, in many cases, specifically solar. System benefit charges and renewable portfolio standards are two common policies resulting in funding or investment in renewables.

The system benefit charge (SBC) is a mechanism for the state to collect a percent of the electricity rate, based on use to fund public benefits lost without regulatory protection. In California, the SBC included funding for R&D, efficiency, low-income, and renewables programs. The California SBC value to the solar consumer is $3 per watt.[2] Though the SBC is typically only 5% of the total restructuring funding going to stranded debt,[3] these funds are substantial for the solar industry, as noted in Table 1.

[2] The California program provides a consumer buy-down of about $3/W (declining over the 4-year period) up to 50% for grid-connected systems.
[3] In California, the SBC portion of the total competitive transition charge of over $30 billion will amount to about 1.3 billion.

Table 1

SBC in 1998	Future SBC
California - $10.5 million ($54 million over 4 years)	Illinois - $5 million annually (10 years)
New York - $5 to $7 million	Massachusetts - $20 to 26 million (5 years)
Rhode Island - $0.25 to 0.7 million	Montana - $1 million (all renewables)
Wisconsin – $0.035 million	Connecticut - $14 million, (2000) and $70 million (2001-2004)
	Pennsylvania – $12 million (PECO)

The renewable portfolio standards require the energy service providers in the state to have a portion of the energy sold to be provided by renewables. The energy providers may choose to purchase the energy or invest in the renewable generation, but the end product is solar technology deployment. Arizona is a state that has instituted a solar portfolio standard. Analytic support for developing the standard indicated the benefits to the state noted in Table 2 below.

Table 2

Initial Arizona Solar Portfolio Standard Analysis	
Jobs created by 2010	600 jobs
Wage, salary, and state income tax revenue (1998-2020)	$200 million
Global warming, CO_2, emissions avoided (by 2020)	12 million tons $120 million
Acid rain, S_{ox} emissions avoided (by 2020)	32,000 tons $85 million
SMOG, N_{ox} emissions avoided (by 2020)	38,000 tons $40 million

Municipalities

In addition to the environmental and economic development values realized by the states, municipalities can take advantage of disaster mitigation values and aggregated services with solar policy. Cities are accustomed to funding high-capital-cost infrastructure such as roads, sewers, and water supplies. Mechanisms such as

infrastructure reserve funds,[4] management districts,[5] development impact fees, and short-term sales tax increases, all collect funds for high-capital expenditures. Municipalities can also act as an aggregated customer, with service requirements through the utility franchise agreement. Many municipalities have high electricity rates that, when coupled with solar policies, result in cost-effective applications. Table 3 below shows 20 cities with high energy costs and the impact on the consumer's monthly cash flow of a buy-down and low-interest financing.

When multiple commercial and political interests team together, the overall value of solar technologies increases. The community partnership team is the current approach for the Million Solar Roofs Initiative. Though only nine communities have documented deployment plans, these plans represent over half of the goal, and there are more than 30 other communities developing teams and action plans. In addition to the two community team values detailed in this paper, Table 4 below indicates value areas to other community team partners in the initiative.

The MSR Initiative will initially depend on restructuring policy funding. However, as the energy service providers complete the transition to a semi-regulated business environment, communities will be the sustaining force to couple stakeholder values and deploy solar technologies.

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REFERENCES

1. Wenger, H. and others, "Policy Options to Accelerate Grid-Connected Markets," presented at the American Solar Energy Society's Solar '97 conference, Washington, D. C., April 1997.

[4] A water-supply infrastructure reserve fund would collect a fee based on use from consumers to fund future capital infrastructure expenditures. Germany's and Switzerland's rate-based incentives are examples of a renewable-energy infrastructure mechanism.

[5] San Diego has recently set up a regional energy office with the intent of being an energy management district.

Table 3

Ranking	Target City	State	Retail rate ($/kWh)	PV Capacity Factor	Buy-Down or Rebate ($/kW)	Net Meter-ing?	State Tax Credit	**Net monthly savings at 4% loan (cost)**	Monthly loan payment on net capital cost	Monthly PV Energy Savings	Monthly Tax Savings from loan interest
1	Hilo, HI	HI	0.190	0.225	$3,000	no	$1,400	**$20**	($14.48)	$31	$4
2	Honolulu, HI	HI	0.144	0.210	$3,000	no	$1,400	**$11**	($14.48)	$22	$4
3	Long island, NY	NY	0.172	0.171	$3,000	no		**$7**	($19.10)	$21	$5
4	San Jose, CA	CA	0.134	0.210	$3,000	yes		**$6**	($19.10)	$21	$5
5	Los Angeles, CA	CA	0.132	0.207	$3,000	yes		**$6**	($19.10)	$20	$5
6	New York, NY	NY	0.156	0.170	$3,000	no		**$5**	($19.10)	$19	$5
7	New Bedford, MA	MA	0.141	0.173	$3,000	yes	$600	**$5**	($17.12)	$18	$4
8	Middletown, NY	NY	0.148	0.171	$3,000	no		**$4**	($19.10)	$18	$5
9	Phoenix, AZ	AZ	0.096	0.228	$3,000	yes	$1,000	**$4**	($15.80)	$16	$4
10	Bridgeport, CT	CT	0.135	0.171	$3,000	yes		**$2**	($19.10)	$17	$5
11	Boston, MA	MA	0.128	0.164	$3,000	yes	$600	**$2**	($17.12)	$15	$4
12	Atlantic City, NJ	NJ	0.133	0.171	$3,000	no		**$2**	($19.10)	$17	$5
13	Manchester, NH	NH	0.147	0.150	$3,000	yes		**$2**	($19.10)	$16	$5
14	San Diego, CA	CA	0.104	0.210	$3,000	yes		**$2**	($19.10)	$16	$5
15	Santa Fe, NM	NM	0.092	0.228	$3,000	no		**$1**	($19.10)	$15	$5
16	Raleigh, NC	NC	0.086	0.176	$3,000	no	$1,500	**$0**	($14.16)	$11	$3
17	Oklahoma City, OK	OK	0.085	0.190	$3,000	yes	$1,200	**$0**	($15.14)	$12	$4
18	Sacramento, CA	CA	0.100	0.200	$3,000	yes		**$0**	($19.10)	$15	$5
19	Little Rock, AR	AR	0.11	0.181	$3,000	no		**$0**	($19.10)	$15	$5
20	Austin, TX	TX	0.09	0.188	$3,000	yes		**($2)**	($19.10)	$12	$5

reference (1)

NOTES
- 1-kW residential PV system
- PV system cost of $4,000/kW (after applying a $3,000/kW rebate)
- 30-year, 100% debt, loans with tax-deductible interest
- Location-specific solar tax credits, electric rates, and PV production
- See Niche Markets paper for solar tax credit details (example: 35% TC in Hawaii, maximum of $1,750)
- 35% effective tax rate (31% federal, 6% state)

Table 4

Team Member Category	Justification Values
Utility-IOU, municipal, REA, CO-OP, PA, ESCO	Distributed resource Customer retention Financial risk mitigation Developing competitive business opportunity Effective load carrying capacity
Municipality	Economic development Constituent support Franchise mechanisms Growth management infrastructure goals Environmental mitigation Policy potential (low-interest financing, capital offset, production incentive - funded through infrastructure reserves, bonds, impact fees)
State	Economic development Constituent support Growth management infrastructure goals Fuel diversity Environmental mitigation Policy potential (mechanized through portfolio standards, system benefits charge, growth management bonds, state trusts)
Developer/Builder-residential, commercial, industrial, chain account	Product or image differential Consumer preference value O&M costs
Consumer - residential, commercial, industrial, chain/key account (FEMP)	Energy Financial benefits Environmental stewardship/consumer preference

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