ELEMENTS OF A SUSTAINABLE SOLAR CITY

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INTRODUCTION

The goal of the Solar America Initiative is to make energy from solar photovoltaics (PV) cost-competitive with conventional electric power by 2015. Policymakers play a key role in reaching that goal and creating a sustainable environment for the solar industry. The objective of this document is to serve as a guide or template for Solar America Cities to create a comprehensive, city-wide solar plan for their community that facilitates mainstream adoption of solar and serves as a model for other cities to follow.

This guide is broken into discrete areas that the U.S. Department of Energy (DOE) has determined to be important components in the constitution of a sustainable solar infrastructure. The guide is a work in progress. It will be revised and improved over the next few years as cities and DOE develop new strategies for mainstreaming solar energy.

Each section in this plan is organized in the following manner:

- **Description**: A short description of the incentive, policy, or guideline
- **Providers**: Best-positioned entities to act upon or provide this incentive or policy
- **Examples and Best Practices**: Describes how different cities and states have actually implemented these policies and incentives to stimulate the marketplace

RULES, REGULATIONS, AND POLICIES

Net Metering & Interconnection Policies

Description

For customers who generate their own electricity, *net metering* allows for the flow of electricity both to and from the customer, typically through a single, bi-directional meter. With net metering, during times when a customer's generation exceeds the customer's use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time. In effect, the customer uses excess generation to offset electricity that the customer otherwise would have to purchase from the utility at the utility's retail rate. Net metering is required in 39 U.S. states and the District of Columbia, although some of these laws and regulations only apply to investor-owned utilities – not to electric cooperatives and municipal utilities. Roughly two dozen utilities (mostly municipal utilities) and five states offer net metering voluntarily.

The term *interconnection* refers to the technical and procedural process by which a customer connects an electric-generating system to the grid. In general, interconnection standards specify the technical terms, contractual terms, timelines and fees that system owners and utilities must abide by.

Providers

Standards for net metering and interconnection are most commonly adopted at the state level, through state legislatures or public utilities commissions. Although many of these laws and regulations do not apply to municipal utilities, cities served by municipal utilities may implement net metering voluntarily. Several cities have done so, including Orlando, FL; Tallahassee, FL; Farmington, NM; Austin, TX; and Murray City, UT. Most municipal utilities that have implemented net metering voluntarily have also developed interconnection standards for net-metered systems.

Best Practices and Examples

The most successful state-level standards for net metering include the following provisions:

- The maximum individual system capacity should be at least 2 MW.
- All utilities – including municipal utilities and electric cooperatives – should be required to offer net metering.
- All customer classes should be eligible.
- The limit on the aggregate capacity of all net-metered systems in a utility's service territory should be at least 5% of the utility's annual peak load.

- Any customer net excess generation (NEG) at the end of a billing cycle should be credited to the customer's next bill at the utility's full retail rate and carried forward to the customer's next bill until the customer leaves the utility's system.
- Fair, safe and reasonable interconnection standards should be adopted to accompany net-metered systems.
- Utilities should not be permitted to charge application fees for net metering.
- Utilities should not be permitted to impose any special charges or fees for customers who net meter, and utilities should not be permitted to require customers to switch to a different tariff.
- Customers should retain ownership of all renewable-energy credits (RECs) associated with the customer's generation.
- The aggregation of meters serving different facilities owned by the same person or entity should be permitted.

New Jersey's standard for net metering is still widely considered to be the best in the United States. New Jersey's rules incorporate most of the best practices listed above, with one notable exception – the rules generally do *not* apply to municipal utilities or electric cooperatives.[1] In combination with an aggressive renewable portfolio standard (RPS) and solar set-aside, generous financial incentives, excellent interconnection standards and a favorable regulatory climate, New Jersey's net-metering rules have contributed to the deployment of more than 3,300 photovoltaic (PV) systems since 2004. Many states are following New Jersey's lead, commonly by expanding existing standards through legislative action. As of September 2008, 15 states allow net metering for certain renewable-energy systems up to 1 MW (or larger). Other states with strong standards for net metering include California, Colorado, Maryland and Pennsylvania.

In July 2008, Massachusetts enacted legislation that significantly expanded net metering in the state. In addition to raising the limit of net metering to 2 MW (for certain systems), the new law allows "neighborhood net metering" for neighborhood-based facilities owned by (or serving the energy needs of) a group of 10 or more residential customers in a single neighborhood and served by a single utility.

Of the municipal utilities that offer net metering voluntarily, the Orlando Utilities Commission (OUC) has adopted one of the best programs. OUC allows net metering for non-residential customers with PV systems up to 1 MW in capacity and to residential customers with PV systems up to 20 kW in capacity.[2] Most other municipal utilities that voluntarily offer net metering limit individual system capacity to 10 kW. A handful of electric cooperatives voluntarily offer net metering; these programs typically limit net metering to systems 10 kW or less in capacity.

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[1] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NJ03R&state=NJ&CurrentPageID=1

[2] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=FL13R&state=FL&CurrentPageID=1&RE=1&EE=1

To view a U.S. map of state-level standards for net metering, see: www.dsireusa.org/documents/SummaryMaps/Net_Metering_Map.ppt

The most successful state-level interconnection standards include the following provisions:

- The maximum individual system capacity should be at least 10 MW.
- Standards should include three or four separate levels of review to accommodate systems based on system capacity, complexity and level of certification. Smaller, certified systems should be processed as quickly as possible, while larger, uncertified systems should require closer review. Larger systems that do not export electricity should require a less rigorous review process than larger systems that do export electricity.
- Application costs should be kept to a minimum, particularly for smaller systems.
- Reasonable, punctual procedural timelines should be adopted and enforced.
- A standard form agreement should be used.
- Utilities should not be permitted to require customers to install or pay for an external disconnect switch for smaller, inverter-based systems.
- Clear, transparent technical screens should be established.
- Interconnection to area networks should generally be permitted, with reasonable limitations where appropriate.
- Utilities should not be permitted to require customers to purchase additional liability insurance.
- Utilities should not be permitted to require customers to indemnify utilities unless a reciprocal provision is included.

Approximately three dozen states have adopted interconnection standards, although some of these standards apply only to systems that are net-metered. Colorado's interconnection standards, which are similar to the FERC's interconnection standards for small generators, incorporate most of the provisions listed above. New Jersey's interconnection standards also are among the best in the United States, although New Jersey's standards only apply to systems with a maximum capacity of 2 MW and do *not* apply to municipal utilities or electric cooperatives. At the local level, other than the municipal utilities and electric cooperative that have adopted interconnection standards to accompany net metering, few municipal utilities and electric cooperatives have voluntarily developed interconnection standards.

For more detailed information about interconnection and net metering issues, refer to the *Connecting to the Grid* guide, published by the North Carolina Solar Center and the Interstate Renewable Energy Council (http://www.dsireusa.org/documents/PolicyPublications/IC_Guide.pdf).

Public Benefits Funds

Description

Public benefits funds (PBFs), sometimes referred to as clean energy funds, are typically state-level programs developed to assure continued support for renewable energy, energy efficiency, and low-income programs. Several such funds were established through the electric utility restructuring processes of the late 1990s.

Providers

PBFs are usually supported by a small surcharge on electricity consumption by customers (e.g., 0.2 cents/kWh), but a few have been established as a result of utility merger settlements or in return for storing nuclear waste. Currently, there are 17 state-level PBFs that support renewables. Annual funding levels range from less than $1 million in Montana to over $300 million in California.

Best Practices and Examples

PBFs are used to provide direct incentives and financing for renewable energy projects, business development activities, research and development, and education programs. These funds have been instrumental in spurring the growth of solar markets in recent years.

The State of Rhode Island recently introduced legislation that would establish a $1 million Municipal Renewable Energy Fund to provide grants to cities and towns for innovative renewable energy projects. This bill, enacted into law in July 2008, requires the Rhode Island Economic Development Corporation to create the Municipal Renewable Energy Investment Program, using the lesser of 50% or $1 million collected annually from the 0.3 mill per kWh surcharge for renewable-energy programs. Representative Amy Rice, who introduced the bill, says this fund would be created using existing public benefit funds that are already collected from ratepayers by National Grid. [3]

Municipalities that have authority over their electric utility might consider establishing a PBF via a dedicated surcharge or flat monthly fee to support solar programs. Municipal utilities in California, for example, have been administering solar programs supported by PBFs, as directed by state policy, for a number of years.

To view a U.S. map of state-level PBFs, see:
www.dsireusa.org/documents/SummaryMaps/PBF_Map.ppt

[3] http://www.rilin.state.ri.us/News/pr1.asp?prid=4742

Solar Access Laws

Description

Despite the growing support for renewable energy development at the state and local levels, many consumers still face local ordinances or homeowner association rules that prohibit, restrict, or drastically increase the cost of installing a solar energy system. Meanwhile, owners of existing systems face potential challenges when growing trees or new structures on neighboring property shade their solar collectors. Solar access laws, which may be implemented at both the state and local levels, are designed to protect a consumer's right to install and operate solar energy systems on a home or business, including the access to sunlight.

Providers

A right to solar access is commonly established at the state level, through legislation. However, local governments may adopt ordinances to ensure solar access.

Best Practices and Examples

The most common type of solar access law at the state level is the solar easement. A solar easement allows the owner of a solar energy system to secure rights to continued access to sunlight from a neighboring party whose property could be developed in such a way as to restrict the system's access to sunlight. Such agreements must be in writing and are subject to the same recording and indexing requirements as other instruments affecting the title to real property. Solar energy system owners may need to compensate a neighboring party in order to secure solar access rights, although such easements are typically transferred with the property title and do not terminate unless specified by conditions of the easement.

The creation of solar easements is authorized in more than half of the states in the United States. The majority of these solar easement statutes stipulate that any instrument creating such an agreement must contain the following elements:

- The vertical and horizontal angles, expressed in degrees, at which the solar easement extends over the real property subject to the solar easement. Some states allow for any other description which defines the three-dimensional space, or the place and time of day in which an obstruction to direct sunlight is prohibited or limited.
- Any terms or conditions, or both, under which the solar easement is granted or will be terminated.
- Any provisions for compensation of the owner of the property benefiting from the solar easement in the event of interference with the enjoyment of the solar easement or compensation of the owner of the property subject to the solar easement for maintaining the solar easement.

Other common components include:

- A description of the property subject to the easement (servient property) and a description of the property benefitting from the solar easement (dominant property).
- Definitions of the solar energy devices, systems, or structural design features whose access to sunlight is covered under the solar easement law.

  Specifying the types of solar energy devices the statute is designed to promote is essential. For example, are clotheslines considered a solar energy device? Are passive solar buildings protected or only active solar electric and solar thermal collectors? Only about 10 states provide a definition of solar energy device, collector or system.

Examples of states that have adopted solar easement laws with these basics elements include New Hampshire[4], Minnesota[5], and Utah[6]. New Mexico[7] employs a more aggressive approach whereby the owner of a solar collector may claim a "solar right" by filing a declaration with the county clerk. After being notified of the declaration, affected parties have 60 days to contest the solar right; otherwise, the right to an unobstructed access from the solar collector to the sun becomes an enforceable right.

While allowing for the creation of voluntary agreements offers some protection for consumers, this approach does not address potential barriers imposed by local governments or homeowner associations on installing solar energy systems in the first place.

Prohibiting unreasonable restrictions by homeowner associations and local governments

About a dozen states have passed laws that limit the restrictions that neighborhood covenants and/or local ordinances can impose on the installation of solar equipment.

Some of the key elements to include in these types of solar access laws include:

- Defining the type of solar energy equipment protected by the law, i.e., solar electric, solar thermal, passive solar construction, etc. [Example: New Mexico[8]]
- Providing a clear and quantifiable standard for what constitutes an unreasonable restriction on solar energy systems (i.e., changes for aesthetic reasons cannot increase installation costs by more than 10%) [Example: Hawaii[9]]
- Defining the types of structures covered by the law, i.e., residential, commercial. [Example: California[10]]
- Awarding costs and reasonable attorneys' fees to the prevailing party in any civil action arising from disputes with homeowners associations. [Example: Arizona[11]]

[4] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NH02R&state=NH&CurrentPageID=1&RE=1&EE=1
[5] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MN02R&state=MN&CurrentPageID=1&RE=1&EE=1
[6] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=UT01R&state=UT&CurrentPageID=1&RE=1&EE=1
[7] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NM02R&state=NM&CurrentPageID=1&RE=1&EE=1
[8] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NM02R&state=NM&CurrentPageID=1&RE=1&EE=1
[9] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=HI02R&state=HI&CurrentPageID=1&RE=1&EE=1
[10] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA45R&state=CA&CurrentPageID=1&RE=1&EE=1

California's Solar Rights Act[12], Solar Shade Control Act[13] and other California solar access provisions combine elements of solar easements and protections against government and neighborhood restrictions.

The Solar ABCs Solar Access Model Code and Recommendations at www.solarabcs.org/index.php?option=com_docman&task=cat_view&gid=63&&Itemid=72

Building Energy Standards

Description

State and local governments may adopt building standards that exceed national codes and meet more aggressive energy efficiency standards, such as those contained in IECC 2006 and ASHRAE 90.1 2006. Government entities can also lead by example by committing to green building standards for public facilities. If authorized by the state, a city may choose to go one step further and incorporate solar energy mandates into local building codes and standards.

To view a U.S. map of the status of commercial and residential state energy codes, see: www.bcap-energy.org/node/5

To see a list of state and local energy standards for public buildings as well as private construction, see: www.dsireusa.org/library/includes/type.cfm?Type=Constr&Back=regtab&CurrentPageID=7&EE=1&RE=1&Search=TableType.

Providers

State governments, city governments, and county governments may have the authority to require such standards.

Best Practices and Examples

A growing number of local and state governments have adopted sustainable building standards for new public facilities and additions to existing facilities[14]. The standards usually entail achieving a certain level of certification from a nationally-recognized green building rating program. Solar energy systems can be used to help meet green building certification requirements. Although a handful of policies specifically target solar

[11] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ07R&state=AZ&CurrentPageID=1&RE=1&EE=1
[12] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA45R&state=CA&CurrentPageID=1&RE=1&EE=1
[13] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA03R&state=CA&CurrentPageID=1&RE=1&EE=1
[14] http://www.dsireusa.org/library/includes/type.cfm?Type=Constr&Back=regtab&CurrentPageID=7&EE=1&RE=1&Search=TableType

installations, these policies generally only require "consideration" of solar. In general, policies that merely encourage integrating solar into new public buildings are not as effective as specific capacity or investment requirements.

Oregon, for example, requires that all new state public building projects and major renovations beginning in 2008 invest in solar technologies at a level of at least 1.5% of the total contract price.[15] California's law requiring that solar energy equipment to be installed on all state buildings and state parking facilities by 2009, where feasible, as well as a more recent *Green Building Initiative* to reduce grid-based energy use by 20% at major state-owned facilities, have led to the development of four megawatts of solar capacity on state buildings.[16] Key elements of the law include requiring that the state's Department of General Services establish a schedule designating when solar energy equipment will be installed on each building and facility, defining the term "feasible", and specifying solar energy equipment standards. As a local example, San Francisco established a solar-specific capacity objective of 50 MW on public buildings by 2012.

A handful of local governments, including Boulder (CO), Marin County (CA), Austin (TX), and Epping (NH), and San Francisco, have taken building codes a step farther to require that certain *private* commercial and/or residential construction meet sustainable building standards.[17]

Examples of green building or solar standards on the state level are just now emerging:

- As part of its statewide solar initiative, California enacted a mandate to commence in 2011 requiring homebuilders of housing developments over 50 units in size offer solar energy projects as an "option" on new homes.[18] Furthermore, in July 2008, California became the first state to establish a set of green building standards that apply to commercial and residential construction in addition to state-owned buildings. The standards will take effect on a voluntary basis in 2009, and will likely be adopted as mandatory standards by 2012.[19]

- In June 2008, Hawaii enacted legislation mandating that all new homes be outfitted with solar water heating systems. The law prohibits the issuing of building permits for single-family homes that do not have solar water heaters

15 http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR23R&state=OR&CurrentPageID=1&RE=1&EE=1

16 http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA49R&state=CA&CurrentPageID=1&RE=1&EE=1, http://www.energy.ca.gov/greenbuilding/index.html

17 http://www.dsireusa.org/library/includes/type.cfm?Type=Constr&Back=regtab&CurrentPageID=7&EE=1&RE=1&Search=TableType

18 http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_0001-0050/sb_1_bill_20060821_chaptered.pdf

19 http://www.documents.dgs.ca.gov/bsc/prpsd_stds/2007/combined_approved_green_code_pt11.pdf

starting January 1, 2010. However, there are numerous escape hatches included in the new law, and its future impact is difficult to gauge.[20]

Solar Set-Asides in Renewables Portfolio Standards Policies

Description

Renewables portfolio standards (RPS) require that a certain percentage of a utility's retail energy sales or new generating capacity be derived from renewable resources (e.g., 20% of electric sales must be from renewable energy by 2020). A state or municipality implementing an RPS may choose to require a certain percentage of the standard to be met specifically with solar energy. Such a requirement is commonly known as a solar carve-out.

Providers

Because RPS policies are typically established by states, city governments might consider working with state governments to encourage states to adopt such a policy. However, cities that have authority over their electric utility might choose to adopt their own RPS policies to promote renewables and local jobs.

Best Practices and Examples

Twenty-six states and the District of Columbia have established an RPS. An additional six states have adopted non-mandatory renewable energy goals. Although wind, biomass and hydropower are the predominant resources used to satisfy RPS obligations, a growing number of states are incorporating a “carve-out” or "set-aside" within the RPS, stipulating that a portion of the required renewable energy percentage or overall retail sales be derived from *solar* resources. For example, New Jersey, Maryland, and Delaware have each set aggressive targets for 2% of the state’s electricity mix to be generated from solar resources, which together are projected to result in more than 3,000 MW of solar capacity over the next 15 years. Twelve states and the District of Columbia have adopted solar or distributed generation carve-outs as part of their RPS policies.[21]

Best practices for promoting solar through RPS policies involve:

- Establishing an explicit solar set-aside in the RPS that ramps up over time.
- Developing a mechanism for tracking, verifying and trading solar renewable energy certificates (SRECs).
- Imposing a monetary penalty or include an alternative compliance payment provision for electricity suppliers that do not meet solar generation requirements.

[20] http://www.bcap-energy.org/node/229

[21] http://www.dsireusa.org/library/includes/topic.cfm?TopicCategoryID=6&CurrentPageID=10&EE=1&RE=1

- Requiring long-term power-purchases or contracts for solar RECs (SRECs) to ensure project developers can access financing.
- Encouraging small-scale, distributed systems.

Colorado's RPS exemplifies some of these key elements. For investor-owned utilities (IOUs), the requirement begins at 3% of retail electricity sales in 2007, rising incrementally to 20% by 2020. At least 4% of the renewable energy must be generated by solar-electric technologies and at least one-half of the solar share must be generated by solar-electric systems located on-site at customers' facilities. SRECs are tradable. IOUs must offer a solar rebate of at least $2 per watt for systems up to 100 kW and may offer an up-front payment for SRECs. Utilities must develop standardized SREC contracts with a minimum term of 20 years. Electric cooperatives and municipal utilities are subject to a lower renewables standard, and there is no solar carve-out for these utilities. However, solar electricity generated by a facility that begins operation before July 1, 2015, receives 300% credit for RPS-compliance purposes. [22]

Municipalities that have authority over their electric utilities may also choose to adopt an RPS policy to promote renewable energy development. Cities leading the way in this regard include Columbia (MO), Austin (TX), and Fort Collins (CO). For example, the Austin City Council adopted a resolution for its municipal utility, Austin Energy, to meet 30% of all energy needs through the use of renewables by 2020, including at least 100 MW of solar power.[23]

To view a U.S. map of state-level RPS policies, see:
www.dsireusa.org/documents/SummaryMaps/RPS_Map.ppt

To view a U.S. map of solar carve-outs within state-level RPS policies, see:
www.dsireusa.org/documents/SummaryMaps/Solar_DG_RPS_Map.ppt

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[22] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CO24R&state=CO&CurrentPageID=1&RE=1&EE=1

[23] http://dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=TX11R&Search=Type&type=RPS&CurrentPageID=2&EE=0&RE=1

FINANCIAL INCENTIVES

Direct Incentives

Description

Direct incentives are used to "buy down" the cost of solar systems and come in several forms, including grants, rebates, and performance-based incentives. These incentives, which typically cover 20% to 60% of project costs and range from a few hundred dollars to millions of dollars, have played a significant role in encouraging solar installations. Rebates are typically disbursed to customers once the project is up and running and are typically awarded on a $/watt (W) basis. Performance-based incentives, on the other hand, provide project owners with cash payments based on electricity production on a $/kilowatt-hour (kWh) basis over a specified duration. Hybrid approaches – upfront rebates based on *expected* performance – have also been developed; these incentives are based on capacity ($/W) but take into consideration system rating, location, tilt and orientation, and shading to adjust the incentive. Payments based on performance or expected performance rather than capital investments are gaining prominence among program administrators as a way to maximize system design and installation.

Providers

The majority of direct incentives for solar projects are implemented at the state level and by IOUs. However, some cities that own their own electric utilities also offer direct incentives.

Best Practices and Examples

- Offer a generous incentive level with stable, long-term funding that decreases over time as the market matures. A good example is the California Solar Initiative – a 10-year, $3+ billion program that provides incentives for solar installations in all sectors. Incentive levels will automatically be reduced over the duration of the program in 10 steps based on the aggregate capacity of solar installed. In this way, incentive reductions are linked to levels of solar demand rather than an arbitrary timetable. [24]
- Establish a consistent but cost-effective quality-assurance mechanism to protect consumers and guarantee adequate system performance. Many state programs employ one or more of the following provisions: equipment requirements, design guidelines, pre-approved or certified installers, or incentives based on actual or expected performance. Although the state of Wisconsin does not have specific regulations for contractors who work with renewable energy, the City of Madison

[24] http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA134F&state=CA&CurrentPageID=1&RE=1&EE=1

has adopted rules for contractor licensing and equipment standards. Madison's installation standards for solar thermal equipment cover the orientation of the collector, shading of solar collectors, mounting and roof support, material corrosion, sensors, piping and insulation, fluids, storage, and monitoring. [25]

- Consider establishing a feed-in tariff (FIT) that supports solar at either the city or state level. While FITs have been responsible for the whopping growth of the PV industry in several European countries, only a handful of U.S. states (e.g., CA, WA) and utilities have experimented with FITs. Several utilities have established solar FITs in order to meet RPS requirements or to supply solar power for green power programs.
- Incorporate an installer training and development strategy into incentive programs. The New York State Energy Research and Development Authority's (NYSERDA) efforts in solar workforce development are exemplary. In 2008, New York initiated a $6 million clean energy workforce training initiative. As part of this investment NYSERDA will invest more than $4 million in a range of clean energy sectors, including PV, small wind and biogas. An additional $2 million has been dedicated to developing the solar workforce through programs at community colleges across New York. [26]
- Consider offering higher incentive levels for high-value solar applications. Under Massachusetts's Commonwealth Solar program, for example, bonus rebates are awarded for systems that use components manufactured in-state, and installations for affordable housing developments or public buildings.[27] Minnesota offers a higher rebate for solar equipment installed by contractors with a specialized solar credential – certification by the North American Board of Certified Energy Practitioners (NABCEP).[28]
- Design an easy and concise application process.
- Allow flexibility for program modifications.
- Develop a coordinated package of policies to complement direct incentives, including net metering, low-interest financing, and tax incentives.
- Foster utility support and cooperation to ensure a quick and easy interconnection process for PV systems.
- Work with other state agencies and relevant stakeholder groups to educate the public about renewable energy technologies and to market the incentive program.
- Track the details of program use, costs, and energy savings/production to enable program evaluation and improvement.

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[25] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=WI09R&state=WI&CurrentPageID=1&RE=1&EE=1

[26] http://www.nyserda.org/publications/Strategic%20Plan-complete-web.pdf

[27] http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MA22F&state=MA&CurrentPageID=1&RE=1&EE=0

[28] http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MN09F&state=MN&CurrentPageID=1&RE=1&EE=0

Low-Interest Loan Programs

Description

Low-interest financing for the purchase of solar energy equipment is a mechanism used to reduce the burden of high, up-front costs of solar equipment by providing consumers loans at a low interest rate. Repayment schedules vary and are usually determined on an individual project basis, but some offer a repayment term of up to 10 years.

Providers

States, utilities, and municipalities have used low-interest loans to encourage the installation of solar. Around two dozen states offer low-interest loans to support solar, primarily targeting non-residential projects. In contrast, utility and local loan programs typically target the residential sector. Municipal or county programs might consider partnering with a local bank or community economic development organization to secure favorable terms or to structure interest rate buy-downs provided by the municipality.

Best Practices and Examples

- Aspen, Colorado's Community Office for Resource Efficiency (CORE), for example, has partnered with the Community Bank of Colorado to provide financing for PV and solar hot water systems. The typical loan term is five years. CORE pays the interest rate, resulting in a zero-interest loan for consumers.[29]

- The City of Ashland's (OR) Conservation Division offers a solar water heating program to residential electric customers who use an electric water heater. Under "The Bright Way to Heat Water Program," qualified home owners may take advantage of the Ashland's zero-interest loan program or a cash rebate. Participating customers repay the loan as part of their monthly utility bill. Interested customers are provided with site evaluations, education resources, information about available solar systems, and names of qualified contractors.[30]

Income/Investment Tax Credits

Description

Tax credits for solar directly reduce the amount of tax owed by the system's owner. They typically range from 10% to 50% of project costs and can serve as an important

[29] http://www.aspencore.org/sitepages/pid77.php
[30] http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR10F&state=OR&CurrentPageID=1&RE=1&EE=0

driver to promote solar deployment in states where PBFs or other direct funding sources are not available.

Providers

Approximately 20 states offer personal and/or corporate tax credits to help offset the expense of purchasing and installing solar energy equipment.

Best Practices and Examples

One of the weaknesses often attributed to tax incentive policies is that entities without a tax liability, such as government facilities, non-profits and schools, are not eligible for the incentive despite their increasing interest in employing solar technologies. However, some states have developed provisions to extend tax credit benefits to non-taxed entities. Under Oregon's business energy tax credit "pass-through" option, for example, a project owner may transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon completion of the project.[31] This mechanism allows non-profit organizations, schools, governmental agencies, and other public entities and businesses with *or* without a tax liability to use the credit by transferring their tax credit to a partner with a tax liability.

Arizona's solar tax credit allows a third-party company that finances and installs a solar energy system on a tax-exempt organization's facility to claim the credit, which results in lower overall project costs for the organization.[32] This type of arrangement, in which a third party owns and operates a system on a public building and sells the electricity through a power-purchase agreement (PPA), is gaining in popularity. Extending tax benefits to applications on public buildings can benefit municipalities seeking to install solar on their own facilities.

States have broadened tax credit programs in other ways to encourage a greater level of solar adoption. For example, while most tax credit programs target project owners, a few states, including Oregon, Utah and Rhode Island, allow homebuilders who install solar energy systems to claim the credit in an effort to encourage the construction industry to integrate solar into new developments. Installing solar during building construction rather than as a retrofit improves the economics of such projects.

Although solar tax credits are typically state-level policies, municipal governments that impose income, franchise or other similar taxes can consider credits or exemptions to encourage solar adoption.

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31 http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR03F&state=OR&CurrentPageID=1&RE=1&EE=1

32 http://www.dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=AZ18F&Search=Type&type=Corporate&CurrentPageID=2&EE=0&RE=1

Property Tax Financing Districts

Description

While state and federal subsidies have made it more cost effective for many residential and commercial property owners to install PV and SHW systems, high up-front costs still present a barrier to more widespread solar adoption. Property tax financing for solar installations, as has been proposed by the City of Berkeley, could enable more property owners to install solar energy systems by allowing them to pay for the system through a long-term assessment on their property tax bill.

Best Practices and Examples

In September 2008, Berkeley approved a program to allow property owners (residential and commercial) to pay for energy efficiency improvements and solar system installations as a voluntary, long-term assessment on their individual property tax bill. Under the program, the city would provide the funding for the project from a bond or loan fund that it repays through assessments on participating property owners' tax bills for 20 years. The program is now being finalized while the city searches for a lender. Dozens of other cities around the United States have expressed interest in emulating this model, and at least one city – Palm Desert, CA – is already accepting applications for a program similar to the Berkeley program.

The special property tax district would solve many of the financial hurdles facing property owners. First, there would be little upfront cost to the property owner. Second, the upfront costs would be repaid through a voluntary tax on the property; therefore, funding approval would not be determined directly by a property owner's credit or the equity in the property. Third, the total cost of the solar system and energy improvements would be comparable to financing through a traditional equity line or mortgage refinancing because the well-secured bond would provide lower interest rates than are commercially available. Fourth, the tax assessment would be transferable between owners. If a property is sold prior to the end of the 20-year repayment period, the next owner would take over the assessment as part of the property tax bill.

Property Tax Incentives

Description

Property tax incentives for solar installations typically follow a simple model that excludes the added value of solar energy equipment in the valuation of the property for taxation purposes.

Providers

County and city governments may impose property taxes and offer incentives to offset them.

Best Practices and Examples

The majority of U.S. states either offer property tax incentives for solar or have authorized local governments to offer property tax incentives for solar.[33] In states where local governments have the authority to offer such exemptions, municipalities may use this authority to insulate residents and businesses that choose to install solar energy systems from higher property taxes. In August 2008, New York enacted legislation authorizing New York City to allow building owners to deduct from their total real property taxes a portion of the expenditures associated with installing a PV system on an eligible building. Qualifying systems are eligible for an abatement of 8.75% of eligible expenditures annually for four years, with a total tax benefit of up to 35% of the installed system cost. In effect, this incentive is similar to an investment tax credit; it differs because the tax benefits are recouped through reduced property taxes on the host building instead of through reduced income taxes.[34]

Sales Tax Incentives

Description

Sales tax incentives for solar projects, implemented in about 20 states, usually take the form of an exemption from the state sales tax for the cost of solar energy equipment.

Providers

While states typically establish sales tax exemptions for solar energy, local governments might be authorized to do the same.

Best Practices and Examples

In some states, the exemption is restricted to a particular sector (e.g., residential) or to systems that meet certain size requirements. Ideally, such exemptions would apply to all solar energy installations. As with property tax exemptions, local governments that have the authority to offer exemptions from local sales taxes may choose to offer this added benefit to residents and businesses that purchase and install solar energy systems.

[33] http://dsireusa.org/library/includes/type.cfm?EE=0&RE=1

[34] http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NY52F&state=NY&CurrentPageID=1&RE=1&EE=1

Expedited Permitting and Fee Waivers for Solar Projects

Description

Municipalities may consider other means of facilitating the installation of solar energy systems, such as waiving building permits, plan reviews or other fees consumers would normally face when installing a solar energy system. The amount of these fees can vary broadly across jurisdictions and in some cases, may be large enough to discourage solar installations. "Top-of-the-stack" or fast-track permitting, which often translates into savings, is another benefit local governments might provide to consumers or developers for installing solar.

Providers

Local governments are the primary provider of fast-track permitting programs and fee waivers. City governments and county governments may have the authority to require such standards.

Best Practices and Examples

Chicago's Green Permit Program provides developers and owners with an incentive to build green by streamlining the permit process timeline for projects designed to maximize indoor air quality and conserve energy and resources. Developers of eligible projects will receive a permit in less than 30 business days. Projects which meet more stringent sustainability guidelines may also qualify for a waiver of consultant code review fees.[35] Marin County, California, in addition to offering a small rebate for solar energy systems, also waives design reviews for most solar installations for existing buildings if flush-mounted and offers over-the-counter permits for most solar installations on existing buildings.[36]

Industry Development Incentives

Description

Incentives are used as a recruitment tool by cities and states to attract solar businesses to locate in a particular area. By providing these financial incentives, cities and states can attract the burgeoning solar industry to areas within the state where other forms of

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35 http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IL22F&CurrentPageID=1&RE=1&EE=1

36 http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA08F&state=CA&CurrentPageID=1&RE=1&EE=1

manufacturing may have once played a key role. This not only leads to job creation but also to positive public relations. These incentives are used not only to promote the establishment or expansion of manufacturing operations, but also to support research, development and commercialization activities; partnerships with private venture capital funds to invest in clean energy companies; and business development activities for distributors and installers.

The most common industry incentives for solar are loans, grants, tax abatements, tax credits and tax exemptions, or a commitment by the state to purchase a set amount of the product. Fourteen states currently offer incentive-based programs for industry development. Many of the loan and grant programs are supported by state-managed PBFs, some of which are receiving funding through state legislative appropriations.

Best Practices and Examples

- Illinois's Business Development Grant Program supports domestic renewable energy technologies through the development of renewable energy businesses and component manufacturers. The program targets products and companies that expand the renewable energy sector and supply chain, while also bringing new business development into the state. The program supports the development of business plans; engineering designs and drawings; advanced market studies and financial analyses; equipment purchases; information dissemination; and other unspecified business development activities. Maximum awards are generally limited to $1 million. Applications will be accepted until May 1, 2009, subject to funding availability.
- New Mexico's Alternative Energy Product Manufacturers Tax Credit may be claimed by companies that manufacture eligible products and components, including renewable energy systems, fuel cell systems, and electric and hybrid-electric vehicles. Alternative energy components include parts, assembly of parts, materials, ingredients or supplies that are incorporated directly into end products.[37]
- Massachusetts's Business Expansion Initiative offers loans to support renewable energy companies entering or expanding the manufacturing stage of commercial development. Loan amounts range from $500,000 to $3 million, and are available for up to 50% of capital expenses and related spending over a two-year period.[38]
- New York's Renewable, Clean Energy and Energy Efficient Product Manufacturing and Incentive Program, which is funded by the state's PBF, seeks to increase the production of renewable, clean and energy-efficient products by providing funds to businesses that wish to develop or expand facilities to manufacture eligible products. Funding is provided in milestone phases with the

[37] http://dsireusa.org/library/includes/tabsrch.cfm?state=NM&type=Recruitment&back=fintab&Sector=S&CurrentPageID=7&EE=1&RE=1

[38] http://dsireusa.org/library/includes/summtabsrch.cfm?Incentive_Code=MA70F&Back=fintab&state=MA&type=Recruitment&CurrentPageID=7&EE=1&RE=1

limit of $1.5 million per project. Phase I provides money, up $75,000 with a cost share of 50% required, for facility and site characterization activities. Phase II covers pre-production development funding, no more than 20% of the total fund and up to a maximum of $300,000. This phase also requires a 50% cost share. Phase III is a production incentive payment based on the sale of clean energy products produced. The remaining 75% of total funding is available for this phase, subject to a 75% cost share and a total funding limit of $1.5 million per project.[39]

[39] http://www.nyserda.org/funding/funding.asp?i=2

TECHNICAL TRAINING

Training for Installers and Code Officials

Description

As markets develop within cities, the need for experienced solar installers becomes vital. Solar installers serve an essential role in ensuring quality and maintaining the legitimacy of cities' solar programs, particularly in nascent solar markets where the acceptance of solar is not necessarily prevalent. Even when using the best equipment and system designs, solar energy systems can still fail if they are improperly installed. Equally important are qualified code inspectors who can ensure that all solar energy systems are installed in a safe manner.

Providers

Many different organizations could provide technical training if they have the expertise and facilities to provide it adequately. Training has been offered in the past by a variety of organizations, including community colleges, universities, non-profit organizations and trade organizations.

Best Practices and Examples

- NYSERDA's efforts in solar workforce development are exemplary. NYSERDA provides numerous training and marketing assistance opportunities for solar installers, and has invested nearly $1 million in developing seven accredited solar training centers and continuing education programs across the state.[40]
- Codes and standards are the backbone of the success of the Solar America Initiative (SAI). DOE has selected New Mexico State University and several partners to lead the Solar America Board for Codes and Standards (Solar ABCs), This body addresses code development and outreach activities in areas of critical importance to solar market penetration, such as interconnection procedures, net metering, product safety, and international standards coordination. This five-year effort, initiated in 2007, will create a major improvement in the responsiveness, effectiveness, and accessibility of codes and standards to U.S. solar stakeholders at all levels, including cities.
- The North American Board of Certified Energy Practitioners (NABCEP) offers PV and solar thermal installer certification programs.[41]
- The Florida Solar Energy Center, the North Carolina Solar Center, and New Mexico State University have developed courses for installers and code officials to serve both state and national needs for training.[42]

[40] http://www.powernaturally.org
[41] http://www.nabcep.org/pv_installer.cfm
[42] http://www.fsec.ucf.edu/en/education/cont_ed/pv/igcpvs/installers.php, http://www.ncsc.ncsu.edu, http://www.nmsu.edu/%7Etdi/Photovoltaics/Codes-Stds/Codes-Stds.html

- The Interstate Renewable Energy Council (IREC) issued a report in September 2008 encompassing best practices for renewable energy training. The report includes recommended guidelines and criteria, assessment tools, task analyses, credentialing programs, and other related resources to assist those offering or planning renewable energy training courses. [43]

[43] http://www.irecusa.org/fileadmin/user_upload/WorkforceDevelopmentDocs/Training-BestPractices_Sept_2008_FINAL.pdf

OUTREACH

Outreach

Description

In order for solar energy to maximize its potential share of the energy market, the public must be educated on the benefits and challenges associated with its development and deployment. Solar outreach efforts can be tailored to target a number of audiences, including consumers (homeowners and businesses), utilities, financial institutions, educators and students, policy makers and regulators, skilled labor force, and potential retailers of solar technologies (e.g. big box retailers).

Lack of communication, information dissemination, and consumer awareness will limit solar's potential in our energy market. Outreach efforts in the form of media campaigns, education and training programs, and high-visibility events, competitions, and demonstration projects are just a few examples of outreach activities that can be implemented at the city level.

Providers

Potential providers of solar outreach include state and local governments, community organizations, colleges and universities, non-profit organizations, utilities, and industry associations.

Best Practices and Examples

A number of cities and states have solar outreach programs in place. These include:

- Portland, Oregon's *Solar Now!* campaign[44] is a comprehensive effort to connect Oregonians with the resources and assistance they need to choose solar energy. Within its first year, the project aims to get 100 systems installed in Portland in high-visibility locations and by high-visibility businesses and community members. The campaign is produced by the City of Portland Office of Sustainable Development in collaboration with Energy Trust of Oregon, Oregon Department of Energy, and Solar Oregon.
- The MadiSUN Solar Agent program[45] (Madison's Solar America City initiative) provides resources and information uniquely tailored to meet the needs of Wisconsin's solar energy community. As part of its outreach efforts, the MadiSUN Solar Agent performs individual site assessments, offers detailed financial information, and connects homeowners and businesses with solar installers in the area.

[44] http://www.portlandonline.com/osd/index.cfm?c=43478&
[45] http://www.ci.madison.wi.us/Sustainability/City/madiSUN/agent.cfm

- Pacific Gas & Electric's (PG&E) Solar Schools Program[46] is teaching the value of alternative energy by turning school buildings in California into hands-on science experiments. This award-winning program is making science fun and teaching students how their everyday actions can impact the environment. This year, PG&E will donate up to $2.5 million to support bright ideas grants, demonstration solar installations and training courses for teachers.

[46] http://www.pge.com/solarschools/