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DSIRE SOLAR POLICY GUIDE:

A Resource for State Policymakers

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DSIRESOLAR™

Database of State Incentives for Renewables & Efficiency

NORTH CAROLINA Solar Center

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Introduction

The DSIRE Solar Policy Guide describes policy options adopted by state and local governments to encourage solar deployment, discusses status and trends of individual policies, provides examples of specific programs, and links to additional sources of information.

This guide is meant to serve as a living document and will be updated quarterly to reflect new solar policy initiatives, trends, and resources.

- This guide was developed in conjunction with the U.S. Department of Energy's (DOE) "Solar Powering Your Community: A Guide for Local Governments". The DOE guide focuses on policies and program options that are important to the development of a local market for solar. These two guides were designed to be complementary and address policy options relevant to both local and state governments.

Introduction (continued)

Given the surge in interest in "going solar" and the rapid evolution of solar policy at all levels of government, the *Solar Policy Guide* was created to provide context for the array of solar programs featured on the DSIRE website. Serving as a resource for policy makers and other interested stakeholders, it highlights key policies necessary to facilitate mainstream solar adoption—from reducing upfront equipment costs and streamlining connection to the grid, to cultivating the solar industry and ensuring quality installations.

For each policy option, the guide provides the following information:

- Description: Describes the policy and its role in stimulating the deployment of solar projects.
- Status & Trends: Summarizes the current status of the policy's adoption in the U.S. and discusses key policy elements, trends, and in some cases, best practices. This section includes summary maps as well as policy comparison tables for some topics to illustrate status, trends, and program variations.
- Examples: Provides specific examples of state and local programs with links to detailed summaries, contacts, and policy documents on the DSIRE website.
- Resources: Offers links to reports, presentations, and websites for further information, if available, about the policy topic. Links throughout this report are noted by red text.

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Financial Incentives

Financial incentives help reduce the cost of installing a solar system.

Financial incentives help reduce the cost of installing a solar system. Financial incentives that are available upfront in the form of direct cash incentives help reduce the initial cost of a system. These incentives can also can help finance investments in solar with loans, power purchase agreements, or PACE financing. Alternatively, financial incentives can come into play after an investment in a solar system has taken place in the form of tax credits. Direct cash incentives - like rebates, grants, and performance-based incentives - and tax credits are the two most common types of state financial incentives. Other financial incentives will not drive solar development on their own, but complement other incentives and can help aid the development of a solar market.

Financial Incentives (continued)

The sections in this category include:

- Direct Cash Incentives
- Tax Credits
- Loan Programs
- PACE Financing
- Property Tax Incentives
- Sales Tax Incentives
- Industry Recruitment & Support
- Permitting Incentives

Description

Direct cash incentives for solar may take a variety of forms, including rebates, buydowns, grants, and performance-based incentives.

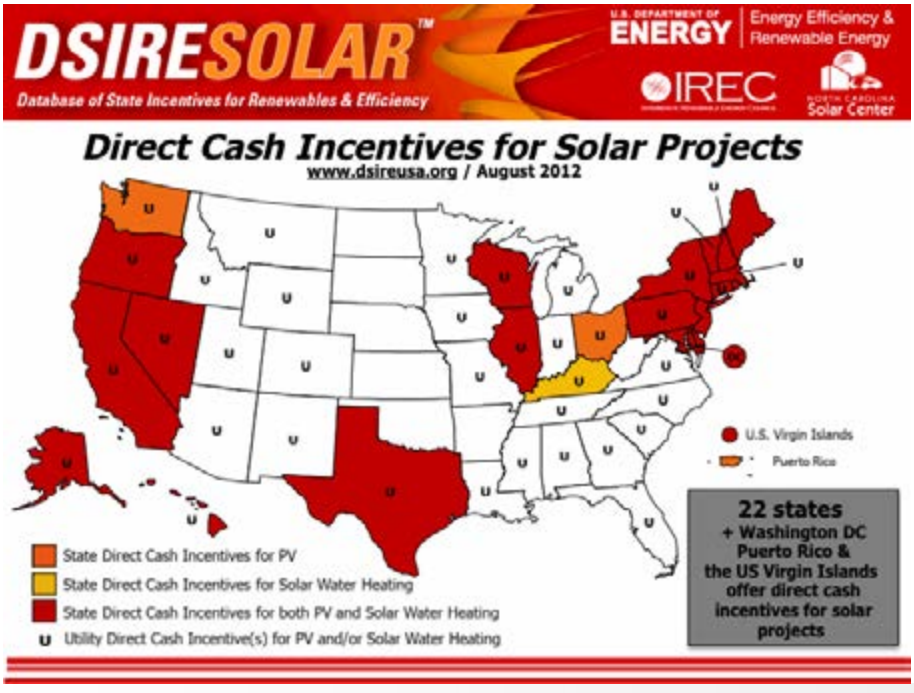
A rebate is an incentive payment issued to a purchaser after the system has been installed, while buydown refers to reductions in the bottom-line cost to purchasers. Grants generally involve more detailed, competitive applications for larger projects. In practice, solar program administrators often use these three terms interchangeably. These incentives can be based on system capacity, percentage of capital costs, or expected performance (estimated annual kilowatt-hour generation). Some programs require verification of expected performance at pre-determined intervals, as well. Performance-based incentives (also known as production-based incentives), on the other hand, are based on the actual energy output of a solar energy system -- to encourage optimal system design and installation -- and are disbursed over a specified number of years. Feed-in tariffs and Renewable Energy Credit (REC) purchase programs are two types of performance-based incentives. Direct cash incentive programs may be administered at the state, local, and utility level.

Upfront incentives—rebates, buydowns, and grants—encourage solar installations by reducing the initial equipment costs, which are high relative to using conventional energy sources. Although performance-based incentives do not reduce upfront costs, these incentives provide a revenue stream that can help secure financing and offset financing costs. The rationale for using direct cash incentives is that they can stimulate deployment while prices are high in the earlier stages of technology development, thereby encouraging manufacturers and distributors to accelerate investment. Ideally, this raises

Description (continued)

production levels, which in turn decreases prices and expands markets to the point where subsidies are no longer necessary.

Direct incentives offer an advantage over tax credits in that they can apply to a broad range of participants, as opposed to only those with a tax appetite. In particular, direct cash incentives are available to non-taxpaying entities that cannot always take advantage of tax credits. However, direct incentive policies are often less politically viable than tax incentives because an explicit funding mechanism is required. Furthermore, once appropriated, such funds may be easy targets to raid in times of state budget shortfalls. Several states have raided their public benefits funds—the source of many solar direct cash incentive programs—to fill budget gaps in past years. Finally, applications for state incentives frequently outpace program budgets, leading to an unstable start-stop cycle that may disrupt progress achieved by the program and weaken the local solar industry. [1],[2]



Status & Trends

More than 20 states and 200 utilities offer direct incentives for photovoltaics (PV) and/or solar thermal systems. These incentives, which typically cover 20% to 50% of project costs and range from a few hundred dollars to millions of dollars, have played a significant role in encouraging solar installations in the United States. Although the vast majority of direct cash incentives for solar projects are implemented at the state level and by individual utilities, a few local governments (without municipal utilities), non-profits and private organizations offer direct cash incentives as well.

State incentives for PV emerged in the late 1990s and were supported by new public benefits funds (PBFs) established as part of electric utility restructuring. Currently, state incentives for PV are supported by funding from PBFs, legislative appropriations, and, most recently, federal funding from the American Recovery and Reinvestment Act of 2009 (ARRA). In several states, funding for rebate programs or PBFs has run out or been taken by the state legislature or governor for other uses, creating funding gaps. ARRA funding was used to temporarily fill funding gaps in some state programs, but the majority of ARRA funding has been used.

In recent years, performance-based incentives, and feed-in tariffs in particular have been increasingly discussed in and enacted by legislatures and through regulatory proceedings. A feed-in tariff requires energy suppliers to buy electricity produced from renewable resources at a fixed price per kilowatt-hour, usually over a long-term, fixed time period. In this sense, it is similar to a performance-based incentive, but it is a payment for both electricity and the associated environmental attributes or renewable energy credits (RECs) rather than a subsidy and is seen as a way for states to meet

Status & Trends (continued)

renewable energy targets. Payment rates can be differentiated by technology, size and application so that a broad array of projects can be profitably developed. Feed-in tariff policies have driven rapid renewable energy development in Europe, but have not been widely adopted in North America to date.

Prior to the 2009 legislative session, California was the only state with a (limited) feed-in tariff. In 2009, more than a half-dozen U.S. states introduced feed-in tariff legislation, Oregon and Vermont passed feed-in tariff legislation, Hawaii enacted a feed-in tariff through regulation, and a federal feed-in tariff proposal was developed.[6],[7] At the local level, Gainesville Regional Utilities was the first municipal utility in the country to adopt a solar feed-in tariff (see details below). Since Gainesville adopted the feed-in tariff, several other municipalities, like Austin and San Antonio, have also created feed-in tariff programs. In October 2009, Vermont's feed-in tariff program, the Vermont Standard Offer for Qualifying SPEED Resources, opened up and was quickly fully subscribed. In June 2011, the technology sub-caps were removed, allowing additional solar and wind project capacity development to take place. Project selection for this additional development will take place from the waiting list. Oregon's legislation creating a solar feed-in tariff required the Public Utilities Commission to develop rules. During rule making process, FERC jurisdictional concerns about the ability of the state to set rates for the feed-in tariff led to the pilot program changing into a performance-based incentive structured after net metering; the current pilot program differs from a typical "feed-in tariff". Oregon's "super net metering" performance-based incentive is part of a developing trend to model performance-based incentives after net metering. Vermont created a similar program in June 2011 and the Tennessee Valley Authority has had a small-scale program of a similar

Status & Trends (continued)

nature running for several years. In June 2011, Rhode Island enacted legislation creating a feed-in tariff.

Initially, direct incentives were awarded in the form of rebates based on a system's capacity rating (i.e., dollars per watt). Early programs often offered the same incentive rate for all sectors, although the maximum incentive for commercial projects was typically higher than the maximum incentive for residential projects. Since then, most state programs have evolved and adopted more complex incentive structures to incorporate and address four primary issues that emerged as solar markets developed:

- The different tax treatment of residential, commercial and non-profit sectors. About a third of the state PV programs and several state solar water heating programs provide larger incentives to the government/non-profit sector because these entities are not able to take advantage of state and federal tax credits.

- The need to reward system performance rather than system capacity. Performance-based incentives, which provide project owners with cash payments based on electricity production on a dollar per kilowatt-hour ($/kWh) basis over a specified duration, have gained increasing attention. So, too, have hybrid approaches—upfront rebates based on expected performance. These incentives are based on system capacity but may be adjusted after taking into consideration certain other factors, including system rating, location, tilt and orientation and shading. Payments based on performance or expected performance rather than capital investment are gaining prominence among program administrators as a way to incentivize proper system design and installation.

- Other mechanisms to protect consumers and guarantee adequate performance. Ensuring that solar energy systems will perform as expected is critical to engender consumer confidence and guarantee that the state is making wise investments. Beyond tying incentive payments to actual performance, states have developed quality assurance mechanisms that include one or more of the following provisions: equipment and installation standards; warranty requirements; installer requirements, assessments, and voluntary training; design standards and administrative design review; post-installation site inspections and acceptance testing; performance monitoring and assessment; and maintenance requirements and services. The best approach will ultimately depend on the performance issues of greatest concern and will differ depending on each program's particular objectives and constraints.[3]

Status & Trends (continued)

- Interest in rewarding high-value or emerging applications. Providing bonus incentives for desirable applications is becoming increasingly common among state programs. Examples include increased incentives for affordable housing, use of in-state manufactured components, use of building-integrated PV, use of certified installers, and installations in certified green buildings, Energy Star homes, new construction and public buildings.

Experience with state incentive programs has revealed a suite of best practices and implementation issues to consider:[4],[5]

- Offer a generous initial incentive level based on market conditions with stable, long-term funding that decreases over time as the market matures.
- When program is set to step-down over time, make step-down process transparent so that system installers and owners can finance and plan installations based on different scenarios.
- Set incentive levels in line with overall program budget, to ensure that funding does not run out early. Many states are still plagued with uncertain funding streams and inadequate budgets.
- Establish a consistent but cost-effective quality-assurance mechanism to protect consumers and guarantee adequate system performance.
- Advance workforce development by supporting installer training and certification programs to meet the demand for trained technicians.

Status & Trends (continued)

- Design an easy and concise application process.
- Allow flexibility for program modifications.
- Promote commitments by local and state governments to install solar on public buildings.
- Track the details of program use, costs, and energy savings/production to enable program evaluation and improvement.
- Develop a coordinated package of policies to complement direct incentives, including net metering, low-interest financing, standardized permitting processes and fair permit fees, solar access laws, 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.

Examples

- The California Solar Initiative was launched in 2007 to provide around $3.5 billion in incentives for solar-energy projects with the objective of installing 3,000 megawatts (MW) of solar capacity by 2016. Incentive levels are automatically 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. Incentives for systems greater than 30 kW are structured as performance-based incentives, whereas incentives for smaller systems are provided upfront based on expected performance, though smaller systems can opt out of the upfront incentive to take a performance-based incentive instead.
- Massachusetts Commonwealth Solar and Massachusetts Commonwealth Solar II offer rebates to PV systems. Commonwealth Solar was a $68 million, four-year program designed to promote the deployment of an estimated 27 MW of solar PV in Massachusetts. The effort combined $40 million from the Massachusetts Renewable Energy Trust and $28 million from the Alternative Compliance Payment funds that the Massachusetts Department of Energy

Examples (continued)

Resources has collected under the state's RPS program. Commonwealth Solar met program goals of incentivizing 27 MW of PV two years ahead of schedule and closed in October 2009. Commonwealth Solar II opened in January 2010 and has a budget of $4 million per year. Bonus incentives are given to customers who use components from a Massachusetts company, and to those with moderate home value or moderate incomes.

- The City and County of San Francisco provides rebates to residents and businesses who install PV systems on their properties. There are four distinct funding levels for residential installations. First, basic installations are eligible for a flat rebate of $2,000. Residential systems installed by a local installer qualify for a bonus incentive of $750. Installations in lower income and racially diverse neighborhoods considered "environmental justice districts" (because of their proximity to industrial sites and major highways) are eligible for an even higher rebate of $3,000. Low income applications are eligible for a rebate of up to $7,000. Commercial, non-profit and industrial installations may receive a capacity-based rebate of $1,500 per kW, with a maximum award of $10,000 for commercial installations $120,000 for non-profit installations. Multi-unit residential buildings that are operated by a non-profit may receive up to $3,500 per kW (depending on the number of units) up to a maximum of $60,000. This program was initially funded with $3 million from a renewable energy fund derived from the sale of power generated by the Hetch Hetchy dam.

- Gainesville Regional Utilities (GRU), a municipal utility in Florida, initiated a feed-in tariff (FIT) in March 2009 for solar PV systems. Modeled after Germany's FIT, GRU purchases energy from qualified PV systems via a standard offer contract at fixed rates for a period of 20 years. Residential and commercial generators are eligible. The fixed rate for the life of the contract starts at $0.24/kWh for systems 10 kW or less and $0.22/kWh for building- or pavement-mounted systems sized between 10-300 kW. The incentive rates will decrease over time. The rate for ground-mounted PV systems sized 10-25 kW is $0.22/kWh and the rate for ground-mounted PV systems sized 25-1,000 kW is $0.19/kWh.

Resources

- A Policymaker's Guide to Feed-in Tariff Policy Design, Toby Couture, Karlynn Cory, Claire Kreycik, Emily Williams, National Renewable Energy Laboratory, July 2010.

Resources (continued)

- Renewable Energy Prices in State-Level Feed-in Tariffs: Federal Law Constraints and Possible Solutions, Scott Hempling, Carolyn Elefant, Karlynn Cory, Kevin Porter, National Renewable Energy Laboratory, January 2010.
- Designing PV Incentive Programs to Promote Performance - A Review of Current Practice, Galen Barbose, Ryan Wiser, and Mark Bolinger, Lawrence Berkeley National Laboratory, October 2006.
- Clean Energy State Program Guide: Mainstreaming Solar Electricity: Strategies for States to Build Local Markets, Clean Energy Group and Peregrine Energy Group, April 2008.
- Feed-in Tariffs and Renewable Energy in the USA – a Policy Update, Wilson Rickerson, Florian Bennhold, and James Bradbury, May 2008.
- Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy, Susan Gouchoe, Valerie Everette, and Rusty Haynes (NC Solar Center). National Renewable Energy Laboratory, NREL/SR-620-32819. 2002.

Footnotes

[1] Beyond Rebates: State Solar Market Transitions, Seven Lacey, RenewableEnergyWorld.Com, January 27, 2009.
[2] State Solar Incentives – News from DSIRE, Susan Gouchoe, in 2006: IREC Updates & Trends, Interstate Renewable Energy Council, October 2006.
[3] Designing PV Incentive Programs to Promote Performance - A Review of Current Practice, Galen Barbose, Ryan Wiser, and Mark Bolinger. Lawrence Berkeley National Laboratory, October 2006.
[4] Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy, Susan Gouchoe, Valerie Everette, and Rusty Haynes (NC Solar Center). Prepared for the National Renewable Energy Laboratory, NREL/SR-620-32819. 2002.
[5] Clean Energy State Program Guide: Mainstreaming Solar Electricity: Strategies for States to Build Local Markets, Clean Energy Group and Peregrine Energy Group, April 2008.
[6] Feed-in Tariffs: The Good, the Bad and What Utilities Need to Know, Wilson Rickerson, Solar Electric Power Association Webinar, February 12, 2009.
[7] State Clean Energy Policies Analysis (SCEPA) Project: An Analysis of Renewable Energy Feed-in Tariffs in the United States, Toby Couture and Karlynn Cory, National Renewable E

Description

An investment tax credit provides a direct reduction in a taxpayer's tax liability for a portion of the cost of purchasing and installing a solar energy system.

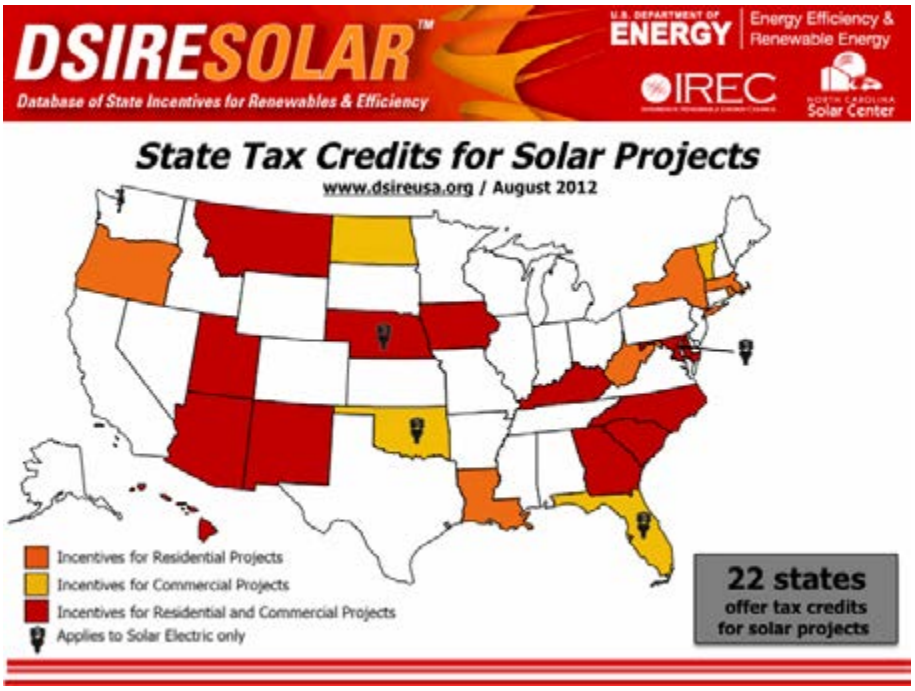
Historically, federal and state governments have used tax credits as one of the predominant tools to encourage renewable energy development. Although solar tax credits are typically federal- and state-level policies, municipal governments that impose income, franchise or other similar taxes can consider credits or exemptions to encourage solar adoption.

Tax credits are fairly easy to administer compared with other financial incentives and may be more politically viable than cash payments because they do not require an annual appropriation. If tax credits are successful in expanding markets, they can ultimately result in a net gain in public revenue. One of the weaknesses often attributed to tax incentive policies is that entities without tax liability, such as government agencies, non-profits and schools, are not eligible for the incentive despite their increasing interest in utilizing solar technologies. In addition, system owners or investors with limited state tax burdens may not be able to take full advantage of state tax credits. In recent years, third-party system ownership combined with power-purchase agreements[1] and other financing models have helped mitigate these obstacles.

Although state tax credits may not be the primary motivating factor influencing purchasing decisions, they may help "seal the deal". This policy option can be especially helpful in states where public benefits funds or other direct funding sources are not available.[2] A few states also offer small production tax credits for solar, though these credits are

Description (continued)

typically very modest and are not major drivers of solar development.



Status & Trends

Around twenty states offer personal and/or corporate investment tax credits to help offset the expense of purchasing and installing solar energy equipment. Tax credits generally range from 10% to 50% of project costs, though some states allow up to a 100% tax credit. Maximum credit limits range from $500 to $35,000 for residential systems and from $25,000 to $60 million for commercial systems. State solar tax credits typically apply to both solar electric and solar thermal equipment, and in a few cases, passive solar as well.

In recent years, tax credit eligibility requirements have begun to mirror rebate

Status & Trends (continued)

requirements in some respects. For example, Arizona, Georgia, New Mexico, and Rhode Island require applications and pre-approval to receive a tax credit. Furthermore, several states have minimum thresholds for system warranties, equipment and installer qualifications, and orientation and shading. In Utah, equipment must be new and listed on the California Solar Initiative's list of eligible equipment or meet equivalent standards. Kentucky mandates that PV installers are NABCEP-certified and that equipment carry a manufacturer's warranty of five years or more. In Louisiana, those claiming a credit must submit, among other things, a copy of the modeled PV array output report using the PV Watts Solar System Performance Calculator and a copy of a solar site shading analysis demonstrating the suitability of the site for a solar installation.

State-by-state comparisons of photovoltaic (PV) and solar water heating tax credits in terms of incentive amounts and eligibility, budgets, and quality assurance mechanisms are available at these links:

- Policy Comparison Table: State Tax Credits for Solar PV Projects
- Policy Comparison Table: State Tax Credits for Solar Water Heating Projects

The best practices described for direct cash incentives are generally applicable to tax credit programs as well. In addition, a couple of states have created provisions to extend tax credit benefits to non-taxed entities. Arizona's non-residential solar tax credit allows

Status & Trends (continued)

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. 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, is increasingly common. Extending tax benefits to applications on public buildings can benefit municipalities seeking to install solar on their own facilities. Some states have also started explicitly allowing third-party owners to take advantage of tax benefits, as this ownership structure has grown in popularity in recent years. In Arizona, Georgia, Hawaii, Iowa, Louisiana, New York, North Carolina, North Dakota, Oklahoma, Oregon and Rhode Island, third-party owners or leasing companies are allowed to take the state tax credit for installing a solar system.

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 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.

Examples

- Louisiana provides a 50% tax credit the first $25,000 of the cost of solar electric and solar thermal systems for residential use. The credit may be applied to personal, corporate or franchise taxes, depending on the entity which owns the property, but the system must be installed at either a residence or a residential rental apartment complex to be eligible. Unique among state tax credits, Louisiana's credit provides that any credit amount which

Examples (continued)

exceeds the taxpayer's liabilities for that year is treated as an overpayment, and the Louisiana Department of Revenue will issue a refund for the remaining amount. Other state credits allow carryover of unused credits rather than refunding the excess amount. The tax credit rules specify equipment requirements, including SRCC certification for solar thermal equipment. Furthermore, installations must be performed by a licensed contractor, the owner of the residence, or by a person who has received certification by a technical college in the installation of such systems. And, as noted above, applicants must provide documentation of the suitability of their site for a solar installation.

Resources

- DSIRE: Summary of Personal Tax Incentives in the U.S.
- DSIRE: Summary of Corporate Tax Incentives in the U.S.
- Policy Comparison Table: State Tax Credits for Solar PV Projects
- Policy Comparison Table: State Tax Credits for Solar Water Heating Projects
- Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy, Susan Gouchoe, Valerie Everette, and Rusty Haynes (NC Solar Center). National Renewable Energy Laboratory, NREL/SR-620-32819. 2002.
- Clean Energy State Program Guide: Mainstreaming Solar Electricity: Strategies for States to Build Local Markets, Clean Energy Group and Peregrine Energy Group, April 2008.

Footnotes

[1] A third-party business or investor installs and owns a solar system on a host customer's property and sells the power produced by the system to the host customer for a set period. The third-party investor utilizes the tax credits and benefits available for the solar system (e.g. tax credits, rebates). These power-purchase agreements are often used by entities that cannot utilize the tax credits, entities that prefer not to own and maintain a system , or entities that lack financial capital to purchase equipment.
[2] Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy, Susan Gouchoe, Valerie Everette, and Rusty Haynes (NC Solar Center). National Renewable Energy Laboratory, NREL/SR-620-32819. 2002.

Description

Loan programs may be used to encourage the installation of renewable energy technologies by helping customers overcome the financial barrier associated with high up-front equipment costs.

While loans do not reduce the price tag, they can help make purchases more affordable by spreading the cost of the system over time. States, utilities, and local governments can use low-interest loans to encourage the adoption of renewable energy technologies. These programs may also provide lower interest rates, more favorable terms, and lower transaction costs relative to private lending arrangements. Government agencies and utilities may administer the financing program directly or leverage funds by partnering with private lenders.

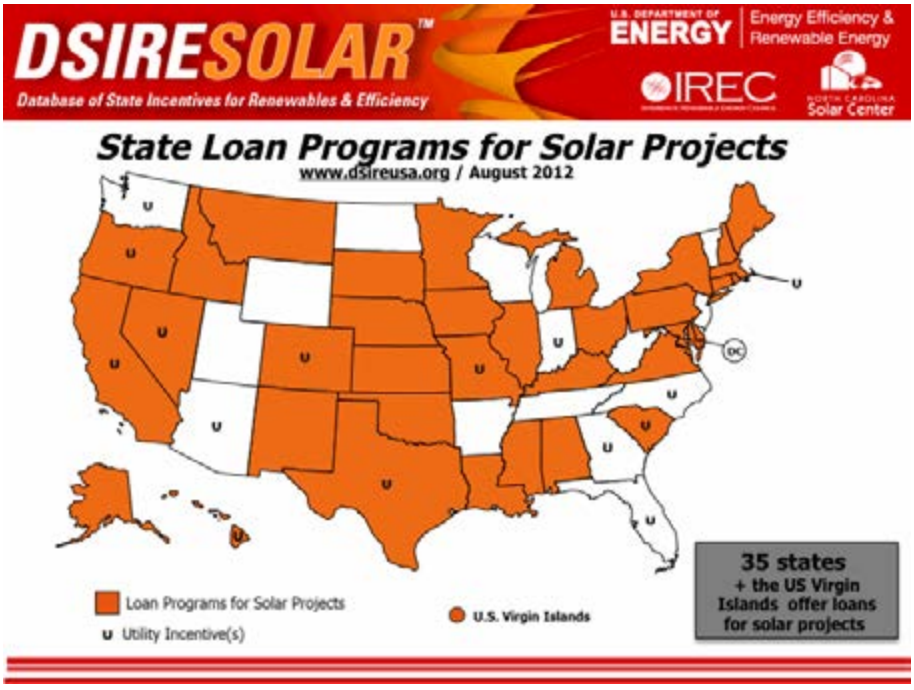
Many design and implementation options exist; loan programs can be fashioned to achieve a specific goal, target a specific sector, or to operate under various constraints. Funding for loan programs can originate from a variety of sources, including annual appropriations, public benefits funds, renewable portfolio standard (RPS) alternative compliance payments, environmental non-compliance penalties, or the sale of bonds. These programs may be more politically viable than cash incentives, and they can even become self-sustaining through a revolving loan fund mechanism.

Historically, government and utility loan programs have not resulted in large enough cost savings to spur significant solar development in-and-of themselves.[1],[2] One explanation may be that until several years ago,[3] the federal 30% solar tax credit law stipulated that subsidized energy financing—financing provided under a federal, state, or local program that typically offers a reduced interest rate to projects designed

Description (continued)

to conserve or produce energy—was to be excluded from eligible project expenditures before calculating the credit. This means that any amount of the installed cost financed under a government loan program was not be eligible for the federal tax credit. Now that the restriction has been lifted and acquiring financing via private credit markets may be more difficult, government-subsidized loans may become a more important policy tool for supporting solar development.

It is noteworthy that over the past few years, a number of creative private-sector financing options have emerged for both non-residential systems (including non-taxed entities) and residential systems, such as leasing structures and third-party power purchase agreements (PPAs).[4]



Status & Trends

More than thirty states offer loans that may be applicable to solar projects. The majority of these programs are intended primarily for energy efficiency improvements, but solar may also be eligible. Funding for loan programs originates from a variety of sources. In New York and Rhode Island, for example, the state's public benefits fund supports the loan program. Maryland uses oil overcharge funds,[5] and Montana uses air quality penalties collected by the state's Department of Environmental Quality to create revolving loan programs. Oregon's program relies on the sale of bonds to finance small-scale energy projects.

About a third of the programs target the non-profit and/or public sector, including local government buildings and schools. Of the handful of state loan programs targeting renewables or distributed generation, many are exclusively intended for non-residential sectors, with Iowa's loan program being a notable exception. For these renewable energy programs, maximum loan amounts tend to be in the $1 million range or determined on a case-by-case basis. The interest rate and repayment terms usually vary by project.

The residential sector is eligible for nearly half of the state programs. For the half-dozen or so states with programs specifically for residents, the emphasis is on efficiency and conservation projects. For these programs, states partner with private lenders in administering the program. The maximum loan is generally in the $10,000 to $30,000 range, with interest rates varying widely and repayment terms ranging from three to 20 years.

In contrast to state programs, utility loan programs usually target the residential sector

Status & Trends (continued)

and are designed specifically for solar installations. There are about 30 utilities—nearly all municipal utilities or public utility districts—that offer such loans. These programs are concentrated in Oregon, Washington and Florida. Repayment schedules vary and are usually determined on an individual project basis, but some offer a repayment term of up to 10 years. 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.

Experience with state loan programs for renewable energy projects suggests that key features of effective loan programs include:

- A low interest rate, long repayment term (at least 10 years), and minimal fees;
- An easy and concise application process without compromising quality assurance;
- A coordinated package of additional incentives;
- Coordination with other state programs and relevant stakeholder groups to educate the public about solar technologies and to market the incentive program; and
- A mechanism for tracking the details of program use, costs, and energy savings or production to enable program evaluation and improvement.[2]

A recent trend on the local level is to create a Property Assessed Clean Energy (PACE) financing program to help consumers pay for solar energy systems through a long-term assessment on the customer's property tax bill or another local bill. More information about this policy mechanism is found in the PACE Financing section of the *DSIRE Solar Policy Guide*. Other types of on-bill financing programs are also emerging, but are not yet available for solar projects.

Examples

- The Orlando Utilities Commission, a municipal utility in Florida, partners with the Orlando Federal Credit Union to provide its customers with low-interest loans for solar installations. Customers may borrow up to $7,500 for a solar water heating system, with an interest rate of 0% to 4%, depending on the repayment term, which ranges from three to seven years. Customers may borrow up $20,000 for a PV system with an interest rate of 2% to 5.5% over a term ranging from three years to 10 years. Loans are repaid over time as fixed payments on customers' monthly utility bills. This program complements the utility's performance-based incentive program for PV and solar water heating.

Resources

- DSIRE: Summary of Loan Programs for Renewables in the U.S.
- DSIRE: Summary of Property Assessed Clean Energy (PACE) Financing Authorization in the U.S.
- Policy Framework for PACE Financing Programs, The White House, Office of the Vice President, October 2009.
- Financing Non-Residential Photovoltaic Projects: Options and Implications, Mark Bolinger, Lawrence Berkeley National Laboratory, January 2009.
- Property Tax Assessments as a Finance Vehicle for Residential PV Installations, Lawrence Berkeley National Laboratory and Clean Energy States Alliance, 2008.

Footnotes

[1] Case Studies of State Support for Renewable Energy: Renewable Energy Loan Programs, Mark Bolinger and Kevin Porter, Lawrence Berkeley National Laboratory and the Clean Energy Group, September 2002.
[2] State Financial Incentives for Renewable Energy: Case Studies on Program Effectiveness, Susan Gouchoe, Valerie Everette, and Rusty Haynes, North Carolina Solar Center, September 2002.
[3] The American Recovery and Reinvestment Act of 2009 repealed a previous limitation on the use of the credit for eligible projects also supported by "subsidized energy financing." For projects placed in service after December 31, 2008, this limitation no longer applies.
[4] Financing Non-Residential Photovoltaic Projects: Options and Implications, Mark Bolinger, Lawrence Berkeley National Laboratory, January 2009.
[5] Oil overcharge funds, also known as petroleum violation escrow funds, came from fines paid by oil companies that violated federal oil price caps in place from 1973-1981. The U.S. Department of Energy identified violations and recovered overcharges for states and other parties.

Description

Property Assessed Clean Energy (PACE) financing is a type of financing that is an alternative to a loan.

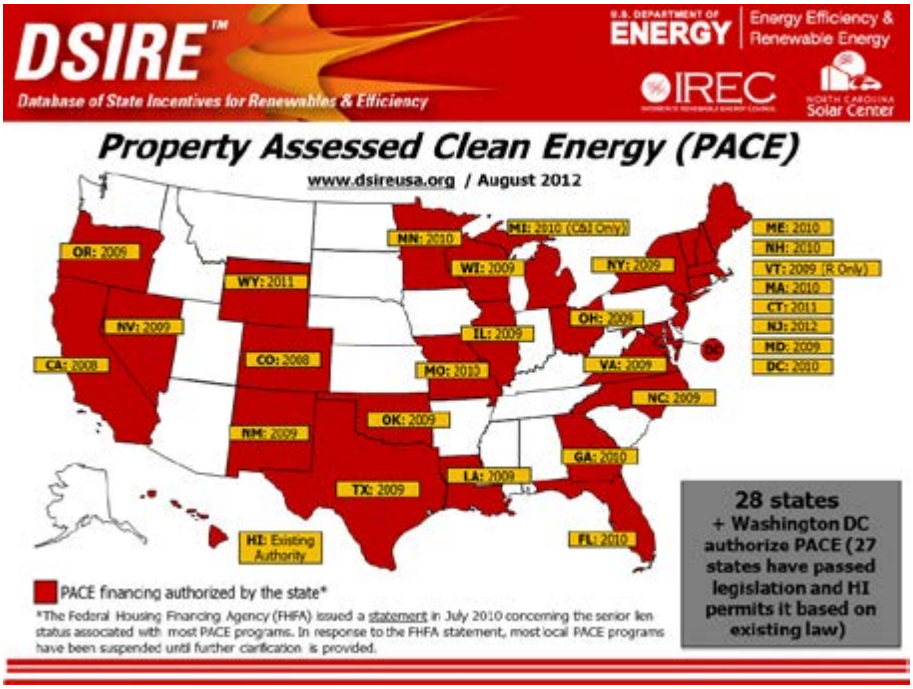
This financing method may be used to encourage the installation of renewable energy and energy efficiency technologies by helping customers overcome the financial barrier associated with high up-front equipment costs. Some states are also allowing water conservation and other improvements to be financed using this mechanism. This financing mechanism is similar in some regards to a loan program. While it does not reduce the price tag of solar systems, it can help make purchases more affordable by spreading the cost of the system over time.

PACE financing effectively allows property owners to borrow money from a local government to pay for renewable energy and/or energy-efficiency improvements. The amount borrowed is typically repaid via a special assessment on property taxes, or another locally-collected tax or bill, such as utility bills, or water or sewer bills. Only the property owners within the local jurisdiction that opt into the PACE program will be subject to this special assessment. In addition to reducing the upfront costs of renewable energy and/or energy efficiency improvements, PACE financing allows the cost of home improvements to be linked to the property. If a property owner participating in a PACE program sells the property, then the repayment obligation will legally transfer with the property. This approach has a number of appealing features, including: long-term, fixed-cost financing; loans that are tied to the tax capacity of the property rather than to the owner's credit standing; a repayment obligation that legally transfers along with the sale of the property; and a potential ability to deduct the repayment obligation from federal

Description (continued)

taxable income, as part of the local property tax deduction.[1]

In most states, the legislature must authorize cities or counties to issue special assessments on select customers' property taxes to finance solar energy systems. Certain local jurisdictions, like charter cities or local jurisdictions in home rule states, may not need state authorization to develop a PACE program. Cities or counties can use their bonding authority to finance programs. PACE programs typically do not impact state or local budgets or general funds, as the administrative costs are covered by bond issuance and interest paid by property owners that participate in the program.



Status & Trends

From 2008 to 2010, PACE financing took off and was discussed in legislatures across the United States. In the past year, this trend has cooled, but some states and local jurisdictions still have programs open and are still addressing this policy through legislation. More than two dozen states have authorized local governments to create PACE financing programs, and a handful of local governments have created these programs. Programs are currently operating in 10 states - California, Florida, Maine, Michigan, Minnesota, Missouri, New York, Ohio, Vermont, Wisconsin - as well as the District of Columbia. In addition, PACE programs are under development in Connecticut, Georgia, Louisiana, Massachusetts, New Jersey, New Mexico and Virginia. In other states, many residential programs are currently on hold due to challenges created by the Federal Housing Finance Authority's (FHFA) stance on these programs. Some states, such as Florida and Hawaii,[2] already had a structure in place to allow local governments to finance solar energy systems in this manner. In general, local governments (such as cities and counties) that choose to offer PACE financing must be authorized to do so by state law, though some exceptions exist. State policies that give PACE liens the senior lien on a property have encountered a challenge by the Federal Housing Finance Agency. This issue affects residential PACE programs and makes most residential PACE programs that give the senior lien to PACE impossible to implement. In response to the FHFA restrictions, some states have passed legislation in the past year that explicitly removes senior lien provisions in PACE programs, and grants PACE a subordinate lien.

Prior to 2009, only two states - California and Colorado - had passed legislation authorizing property tax financing. In 2009, more than a dozen states passed legislation

Status & Trends (continued)

authorizing property tax financing. In 2010, six additional states and the District of Columbia passed PACE-authorizing legislation and several clarified existing laws. In 2011, two states - Oklahoma and Vermont - passed legislation clarifying their existing PACE laws and downgrading the senior lien status to a junior lien. Connecticut, Michigan, and Wyoming also passed PACE legislation in 2011. In 2012, New Jersey enacted legislation to enable PACE and several other states have proposed legislation related to PACE.

Berkeley and Palm Desert, municipalities in California, were the first to implement property tax assessment financing, with numerous other cities taking steps to do the same. A Vote Solar Initiative paper on municipal property tax assessment financing chronicles Berkeley's experience and provides a policy primer on how to replicate the model in other counties and cities.[3]

Examples

- Vermont initially passed PACE authorizing legislation in May 2009 (HB 446). In May 2011, Vermont amended their PCE legislation with HB 56, making several important improvements. The 2011 legislation specifies that PACE liens are subordinate to existing liens and first mortgages but superior to any other liens on the property recorded after the PACE lien is recorded (except for municipal liens, which also take precedence over the PACE lien). This was done in direct response to the FHFA statement concerning the senior lien status, which was previously in place in Vermont. In addition, the legislation creates the state PACE reserve fund, in addition to a reserve fund supported by participating property owners. An amount equal to 5% of the assessment (not to exceed $1 million) will be transferred from Regional Greenhouse Gas Initiative/Forward Capacity Market funds to an escrow account maintained by the State Treasurer. This account will provide funds to cover 90% of losses due to defaults of participating properties not covered by the reserve account. The main purpose of the state PACE reserve fund is to reduce risk for potential investors interested in investing in a municipality to finance a PACE district.

Examples (continued)

- Maine passed PACE legislation in April 2010 (LD 1717) that allows the financing of renewable energy and energy efficiency improvements via a special assessment on property taxes. The legislation stipulates that PACE assessments will be considered subordinate liens, secondary to mortgages. Municipalities will be able to use federal grants or other "funds available for this purpose" to establish PACE programs. Maine received $30 million through the U.S. Department of Energy's Better Buildings Program to help support the implementation of PACE program statewide. As of April 4, 2011, this program is open and accepting applications. Around 60 municipalities are participating in the PACE program. The enabling legislation does not restrict municipalities from determining what type of property owners would be eligible, but in practice the program being supported at the state level is for residential property owners.

Resources

- DSIRE: Summary of PACE Financing in the U.S.
- Notice of Proposed Rulemaking, Federal Housing Financing Agency, June 2012.
- Policy Brief - Property Assessed Clean Energy (PACE) Financing: Update on Commercial Programs, Ken Hejmanowski, Scott Henderson and Mark Zimring, Renewable Funding, Clinton Climate Initiative, Lawrence Berkeley National Laboratory, March 2011.
- FHFA Statement on Certain Energy Retrofit Loan Programs, Federal Housing Finance Agency, July 2010.
- The Constitutionality of Property Assessed Clean Energy (PACE) Programs Under Federal and California Law, Sanjay Ranchod, Jill E.C. Yung, and Gordon E. Hart, Paul, Hastings, Janofsky & Walker LLP, prepared for the Vote Solar Initiative, May 2010.
- Guidelines for Pilot PACE Financing Programs, U.S. Department of Energy, May 2010.
- Transferring PACE Assessments Upon Home Sale, Jason Coughlin, Merrian Fuller, and Mark Zimring, Lawrence Berkeley National Laboratory, National Renewable Energy Laboratory, Solar

Resources (continued)

America Cities, April 2010.

- Policy Framework for PACE Financing Programs, The White House, Office of the Vice President, October 2009.
- Guide to Energy Efficiency & Renewable Energy Financing Districts for Local Governments, Merrian Fuller, Cathy Kunkel and Daniel Kammen, Renewable and Appropriate Energy Laboratory (RAEL), University of California - Berkeley, September 2009.
- Property Tax Assessments as a Finance Vehicle for Residential PV Installations, Lawrence Berkeley National Laboratory and Clean Energy States Alliance, 2008.
- Municipal Property Tax Assessment Financing: Removing Key Barriers to Residential Solar, Claudia Eyzaguirre and Annie Carmichael, Vote Solar Initiative, October 2008.

Footnotes

[1] Property Tax Assessments as a Finance Vehicle for Residential PV Installations, Lawrence Berkeley National Laboratory and Clean Energy States Alliance, 2008.
[2] Authority to Implement Policies Similar to Berkeley-FIRST in Key States, Sheridan Pauker, Wilson Sonsini Goodrich & Rosati, prepared for the Vote Solar Initiative, August 2008.
[3] Municipal Property Tax Assessment Financing: Removing Key Barriers to Residential Solar, Claudia Eyzaguirre and Annie Carmichael, Vote Solar Initiative, October 2008.

Description

Property tax incentives come in many forms and provide exemptions, abatements, credits, or special assessments that mitigate or eliminate the increase in assessed value of a property (for tax purposes) attributable to a solar energy system installation.

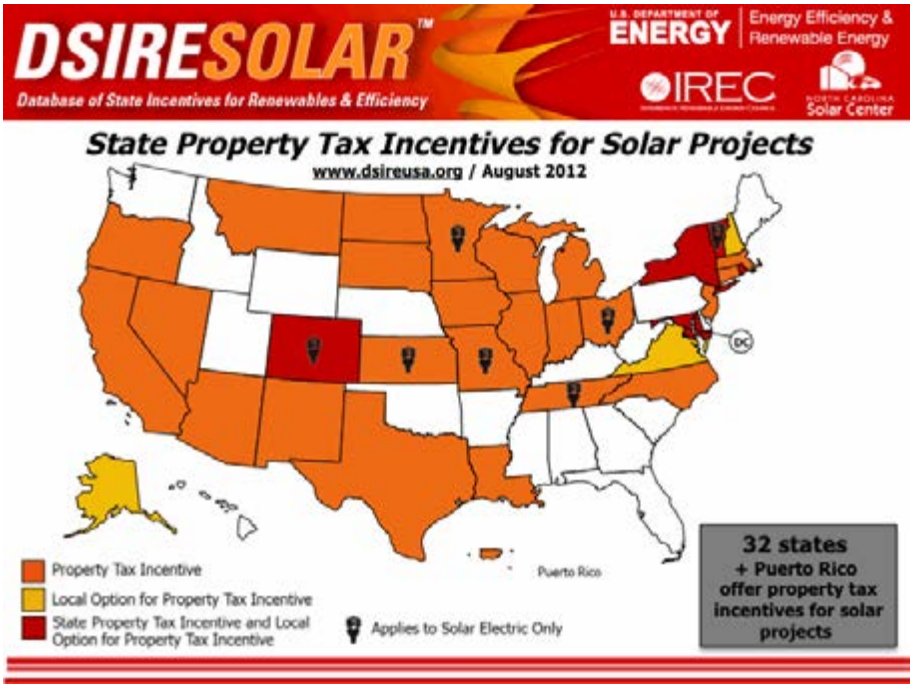
Although the solar resource is free, the capital costs for these systems are high relative to conventional technologies, resulting in a significantly higher property tax burden. Thus, the goal of property tax incentives is to bring the cost of owning a solar energy system in line with using conventional heating and cooling systems, or drawing electricity from the utility grid.

Although property tax may be levied in some form at every level of government— state, county, municipal, township, school district, and special district— nearly all tax dollars are collected at the local level.[1] While taxes are typically levied at the local level, state legislatures set overall property tax policy and processes. In states where local governments have the authority to offer property tax incentives, a city or county may use this authority to insulate residents and businesses that install solar energy systems from higher property taxes.

Property taxes vary widely by county and state and are usually calculated as a percentage of the assessed value of the property. Texas, New Jersey, and New Hampshire have the highest median tax rates—exceeding 1.8% of median home value. At the other end of the spectrum are Alabama, Hawaii, and Louisiana, with median tax rates of 0.33%, 0.26%, and 0.18%, respectively.[2]

Description (continued)

Property tax incentives reduce the cost of solar system ownership, but these savings alone are not likely to stimulate significant solar development. At the same time, high property tax rates and policies may hinder solar development. This policy option is especially valuable where property tax rates are high (which may be the case in states that have no income and/or sales tax) and where other complementary policies (e.g., rebates, solar access laws, net metering) are already in place.



Status & Trends

More than thirty U.S. states (and Puerto Rico) offer some form of property tax incentive for solar installations. In the majority of these states, the incentive follows a simple model that excludes the added value of solar energy equipment in the valuation of the property

Status & Trends (continued)

for taxation purposes. Although the duration of most property tax incentives is indefinite, a handful of states allow the tax break only for a limited period, ranging from five years in Iowa and North Dakota to 25 years in Hawaii. With a few exceptions, these policies apply to all sectors, and to both solar thermal and solar electric applications, and in some cases, passive solar as well. Some states specify that the systems must produce energy for on-site use.

In addition, about a half-dozen states authorize, but do not require, local governments to provide property tax incentives for solar. New Hampshire, for example, permits cities and towns to offer exemptions from local property taxes for certain renewables. The state's Office of Energy and Planning web site lists 83 municipalities that have opted to offer the exemption for one or more renewable energy technologies. New York's exemption, on the other hand, is valid unless a local government opts out of the exemption, as opposed to the more common practice of requiring governments to opt in to grant an exemption. Other states with a "local option" policy include Alaska, Colorado, Rhode Island, Vermont, and Virginia. Maryland, in addition to having a required solar property tax exemption, allows counties to offer a property tax credit for solar installations for up to three years. Several counties now offer such credits. (See Harford County example below.)

Given the recent growth in large-scale solar and other renewable electricity generating facilities, a few states have developed separate policies for utility-scale renewables to preserve at least a portion of property tax revenue for local governments or to assess them at a value comparable to a non-renewable energy facility. Arizona, Colorado, Montana and Nevada provide a partial abatement of property tax attributable to the solar

Status & Trends (continued)

facility using various assessment methods. Customer-sited installations, on the other hand, qualify for a full exemption in Arizona, Montana and Nevada, and, if authorized by the local government, in Colorado. North Carolina has had a property tax incentive since 1977 requiring that solar heating and cooling systems not be assessed at more than the value of a conventional system. In 2008, legislation in North Carolina created a new exemption for solar electric systems that exempts 80% of the appraised value of the system from property tax.

Examples

- Oregon's property tax incentive follows a common model whereby the added value to any property from the installation of a qualifying renewable energy system may not be included in the assessment of the property's value for property tax purposes. In this case, the incentive is available for a wide range of renewables—but only for those that are net metered or primarily designed to offset on-site electricity use. The incentive is slated to expire for tax years after July 1, 2018.

- Arizona has separate property tax incentive provisions for renewable energy systems depending on whether or not a system is designed for on-site energy use. Arizona's property tax exemption applies to "equipment that is used to produce energy primarily for on-site consumption from renewable resources." For property tax assessment purposes, these devices are considered to add no value to the property. Arizona's property tax assessment for renewable energy property, on the other hand, applies to electric generation facilities that use energy or fuel derived from solar, wind or other non-petroleum renewable sources not intended for on-site consumption. These facilities are assessed at 20% of their depreciated cost for the purpose of determining property tax.

- New York City allows building owners to deduct from their total real property taxes 2.5-5% of solar photovoltaic (PV) installation expenditures annually for four years, with a total tax benefit of up to 20% of the installed system cost. The maximum abatement during a year is the lesser of $62,500 or the amount of real property taxes owed during the year. 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. This

Examples (continued)

incentive is only available in New York City and is separate from the state-wide property tax exemption that local governments are required to offer unless they opt out. This exemption expires at the end of 2014.

- Harford County, Maryland offers a credit against real property taxes imposed on residential or non-residential buildings or other structures that use solar or geothermal devices for heating, cooling, or generating electricity for on-site consumption. The credit amount is equal to one year of total real property taxes or $2,500 per device (or $5,000 per property), whichever is less. A one-time application must be submitted to the Harford County Director of Administration on or before October 1 prior to the taxable year for which the credit is sought.

- Ohio has two property tax exemptions - a property tax exemption for systems that are 250 kilowatts (kW) or less and a payment in lieu of property tax for qualified systems greater than 250 kW. In June 2010, Ohio passed legislation that grants these exemptions from public utility tangible and real property taxes. Prior to the passage of legislation granting this exemption, property taxes were cited as a major barrier for renewable energy deployment in Ohio, as a renewable energy facility that sold electricity to a third-party was considered a "public utility" for tax purposes.

Resources

- DSIRE: Summary of Property Tax Incentive Policies in the U.S.

- The Cost of Value: PV and Property Taxes, Justin Barnes, Amy Heinemann, and Brian Lips, North Carolina Solar Center, May 2012.

Footnotes

[1] http://www.taxpolicycenter.org/briefing-book/state-local/specific/property.cfm
[2] Property Taxes on Owner-Occupied Housing by State, 2004-2008. The Tax Foundation. The data represent property taxes paid by households on owner-occupied housing. As a result, they exclude property taxes paid by businesses, renters, and others.

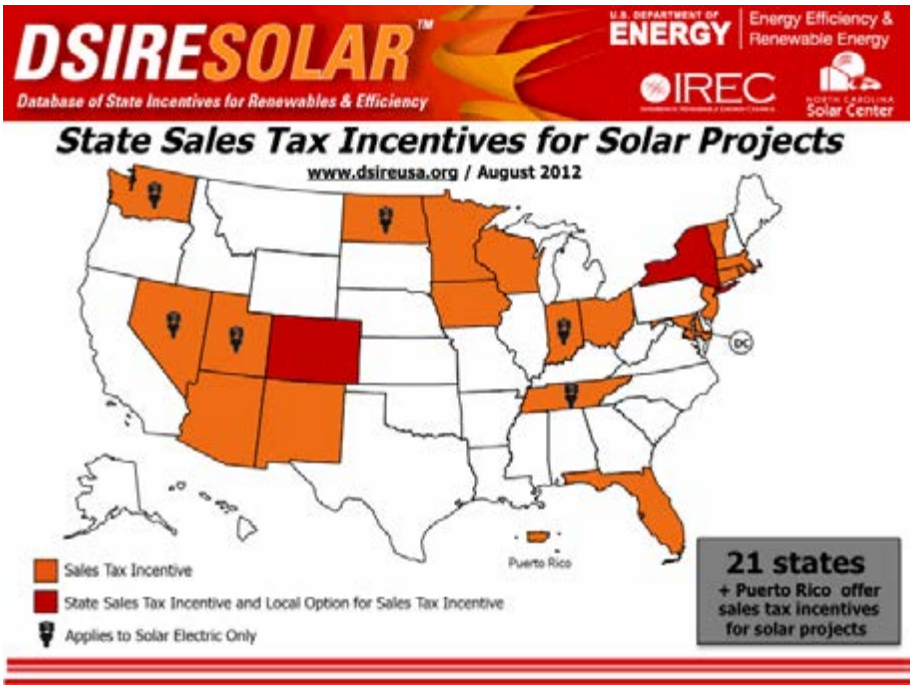
Description

Sales tax incentives provide an exemption from, or refund of, sales tax for the purchase and installation of solar energy components and systems.

The goal of these policies is to reduce the investment costs of acquiring a solar energy system. Although solar "fuel" is free, the capital costs for solar energy systems are high relative to traditional energy sources. Fossil fuel inputs are typically exempt from sales taxes, resulting in a relatively higher sales tax burden on solar investments. While state legislatures have the authority to implement state sales tax policy, local governments also control a portion of sales taxes in some cases.

Sales tax rates vary by state and locality. For 2012 state sales tax rates range from 2.9% in Colorado to 7% in Indiana, Mississippi, New Jersey, Rhode Island, Tennessee, with most state rates in the 4% to 6% range. Five states do not have a sales tax (AK, DE, MT, NH, OR). New Mexico does not have a sales tax, but has a gross receipts tax in which businesses are taxed on the gross amount of their business receipts each year. This essentially functions in the same manner as a sales tax for businesses. Thirty-six states also allow sales tax at the county, municipal, or special district level, adding as little as <1% to as much as 8% in sales tax.[1],[2]

Although sales tax relief reduces the cost of solar energy systems, these savings alone are not likely to stimulate significant solar development. This policy option can encourage individuals to invest in solar where sales tax rates are high and where other complementary policies (e.g., rebates, solar access laws, net metering) are in place.



Status & Trends

State sales tax incentives for solar projects, currently in effect in about 20 states, usually take the form of a full exemption from the state portion of the sales tax on the cost of solar energy equipment. The purchaser typically presents a certificate of exemption to the seller that documents the exemption that the purchaser is claiming. The seller retains the form to verify to the state that the sale was exempt from taxation. Idaho was one exception where the incentive was a refund of sales tax paid as opposed to an up-front exemption, though this incentive expired as of July 1, 2011.

State sales tax incentives for solar are usually directed at renewables in general, but only electricity-producing renewable energy technologies are eligible in a few states, including Utah and Washington. Several states – Ohio, Utah, and Wyoming – restrict the exemption to the commercial sector or to systems that meet certain minimum size requirements. Massachusetts, on the other hand, only offers the incentive for residential systems.

Status & Trends (continued)

Ideally, such exemptions would apply to all solar energy installations.

While states provide at least a brief description of the solar technologies exempt from sales tax, Florida and Arizona take it a step further by issuing a detailed list of the solar energy devices and equipment that qualify for the exemption.

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. In 2007, Colorado authorized counties and municipalities to offer local sales tax rebates or credits to residential and commercial property owners who install renewable energy systems on their property.

Examples

- Florida exempts solar energy systems and components from state sales tax. The original 1997 law was scheduled to expire in 2002, but was extended three additional years to 2005, at which time it was made permanent. The Florida Solar Energy Center certifies a list of equipment and hardware eligible for the incentive, including solar components related to space heating and cooling, domestic water and pool heating, and photovoltaics (PV). The Department of Revenue provides a sample form to be completed by the purchaser and presented to the seller to help sellers document exempt sales as required by law.

- New York provides an exemption from the 4% state sales and use taxes and the 0.375% sales and use taxes imposed by the state in the Metropolitan Commuter Transportation District (MCTD), for receipts from the retail sale and installation of residential solar energy equipment. A residence means a dwelling, whether owned or rented, and may include a single-family house or a multi-family building, including apartments and condominiums. In addition, the state authorizes cities and counties, including New York City, to grant this exemption from their local

Examples (continued)

sales and use taxes. Around 20 local taxing jurisdictions in New York offer a local sales tax exemption for solar projects. The New York Department of Taxation and Finance publishes a variety of sales tax reports detailing local tax rates and exemptions, including those for solar energy equipment (Publication 718-S). Beginning January 1, 2013, this exemption will also apply to non-residential systems.

- In 2006, the City of Boulder established a solar sales and use tax rebate for PV and solar water heating installations. System owners may receive a rebate (essentially a tax refund) drawn from the unrestricted tax revenues collected from solar installation sales. Approximately 55% of solar sales and use tax revenues go to restricted funds. Of the unrestricted revenues, 35% percent is refunded to the solar system owner, resulting in a refund of about 15% of the city sales tax paid. Interestingly, the remaining 65% of the unrestricted revenues are directed to Boulder's Solar Grant Program, which funds solar installations on affordable housing developments and site-based non-profit organizations.

Resources

- DSIRE: Summary of Sales Tax Incentive Policies in the U.S.

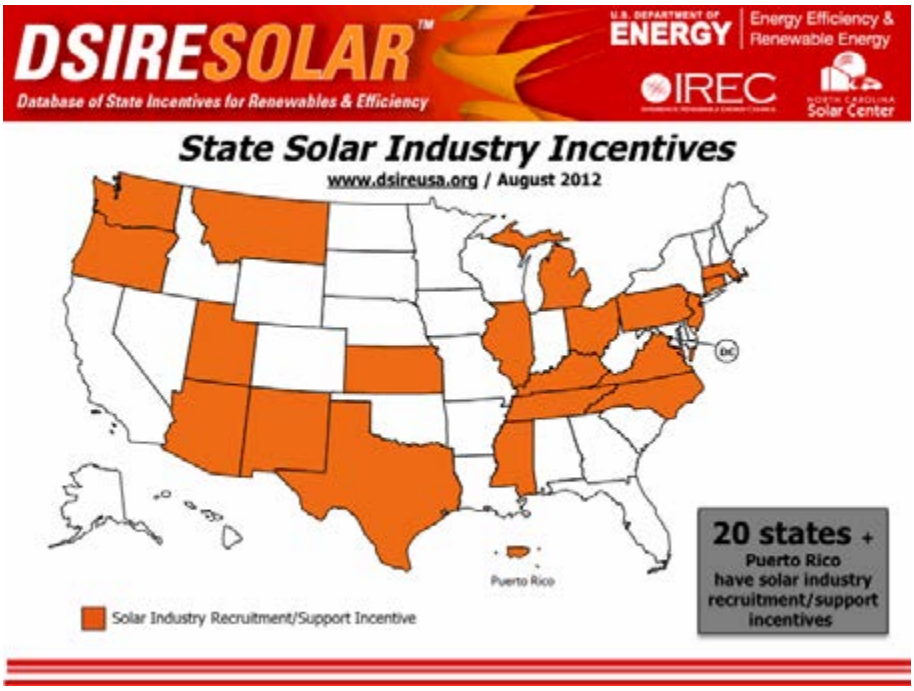
Footnotes

[1] http://www.salestaxinstitute.com/rates.html
[2] http://www.taxpolicycenter.org/briefing-book/state-local/specific/sales.cfm

Description

State and local governments can use a variety of financial incentives to encourage clean energy businesses to locate or expand within their boundaries as a way to spur economic development and create jobs, provide consumers with greater access to renewable energy products, and support climate change initiatives.

These incentives, which typically take the form of tax incentives, loans and grants, may be designed not only to promote the establishment or expansion of manufacturing operations, but also to support research, development and commercialization efforts; partnerships with private venture capital funds to invest in clean energy companies; and marketing and business development activities for distributors and installers.



Status & Trends

Twenty states offer incentives targeting the recruitment and/or development of the renewable energy industry. Ten years ago, solar industry incentives consisted primarily of tax credits for new manufacturing facilities and have since evolved to include a wider range of industry players through grants, loans, property tax abatements, marketing support, corporate tax exemptions and tax credits, as well as bonus incentives for consumers who purchase in-state manufactured solar equipment. Many of the loan and grant programs are supported by state public benefits funds.

Programs may offer as little as a $10,000 grant to a small business with a promising pre-commercial technology, or as much as $25 million in tax credits to a company that builds a new manufacturing facility. Most grants and loans are on the order of $1 million or so, while tax credits for solar equipment manufacturers range from 5% to 50% of construction or other eligible costs. Some tax credits may be worth up to 100% of corporate taxes or new state tax revenues. Sometimes these tax credits are limited to the first few years of the facility's operations.

States incorporate various provisions into funding agreements or tax credit eligibility rules to encourage project success and to protect their investment in new or expanding business ventures. For example, programs may contain minimum thresholds for job creation, product output, and investment. Or, incentives may be based on product sales from the manufacturing facility. Some programs disburse incentives in a phased approach based on milestones the company reaches. In addition, loan and grant programs typically require substantial cost share. In some cases, failure to meet project goals and terms may result in repayment of the incentive, whereas achieving specific job creation or

Status & Trends (continued)

economic development targets may result in more favorable loan terms in others.

Several states created industry recruitment and support programs during the 2009 or 2010 legislative session, including Arizona, Kansas, North Carolina, Tennessee, and Utah. In the more recently enacted programs, incentive levels are influenced by the number of jobs created or the amount a company invests in a state. Most of the newly-created programs offer tax credits and use federal funding awarded as part of the American Recovery and Reinvestment Act of 2009 (ARRA). Other states with existing programs also used ARRA funding to increase the amount available for industry recruitment and support incentives.

While states typically establish industry development programs for solar technologies, local governments may have the authority to do the same. Municipal and county governments without the financial resources to develop programs solely for the solar industry can include solar as one of the targeted sectors for economic development efforts. Miami-Dade County, Florida, for example, provides financial incentives for specific industries wishing to relocate or expand within the county, including solar companies.

Furthermore, committing to purchase a specified amount of solar equipment from manufacturers locating in the city can also serve as a recruitment tool. Municipalities that operate their own local electric utilities have additional options to draw solar businesses to the area. For example, Columbia, Missouri established a solar portfolio goal—a target to produce a portion of the municipal utility's electrical load with PV generation. Austin

Status & Trends (continued)

Energy and the Los Angeles Department of Water & Power offer higher incentives for installing locally-manufactured solar equipment as part of their solar incentive programs.

Examples

- Washington State's Tax Abatement for Solar Manufacturers and Renewable Energy Production Incentives are designed to draw equipment and component manufacturers to the state. The tax abatement allows for a 43% reduction in the business and occupation tax rate for in-state manufacturers and wholesale marketers of photovoltaic (PV) modules or silicon components of those systems. Businesses claiming the credit under this program are required to file annual reports with the Washington Department of Revenue detailing employment, wages, and health and retirement benefits. The state's production incentive program, which offers a base rate of $0.15/kWh, or $0.30/kWh for community solar projects, favors in-state manufacturers by awarding solar PV system owners a higher incentive if the modules are manufactured in Washington state or if the system uses an inverter manufactured in Washington state. These bonus incentives can increase the incentive for PV production to as much as $0.54/kWh, or $1.08/kWh for community solar projects.

- Oregon's Tax Credit for Renewable Energy Equipment Manufacturers, provides a tax credit of 50% of the construction costs of a new or expanded renewable energy manufacturing facility. The maximum credit amount is $20 million. The incentive is taken over the course of five years, at 10% of eligible costs each year. Established in 2007, the program has been successful in attracting several large manufacturers to Oregon and complements the long-standing business and residential energy tax credits available to those who install solar and other clean energy projects.

Resources

- DSIRE: Summary of Industry Recruitment and Support Incentives in the U.S.
- National Solar Jobs Census 2011: A Review of the U.S. Solar Workforce, The Solar Foundation, October 2011.
- "U.S. Solar Power Manufacturing Growing Dramatically," EERE Network News, October 29, 2008.
- U.S. Metro Economies: Green Jobs in U.S. Metro Area, Prepared by Global Insight for the U.S. Conference of Mayors and the Mayors Climate Protection Center, October 2008.
- Putting Renewables to Work: How Many Jobs can the Clean Energy Industry Generate?, Renewable and Appropriate Energy Laboratories, University of California, Berkeley, April 2004.

Description

Permitting incentives may take the form of reduced or waived local building permit fees, plan check fees, design review fees or other similar charges that consumers and businesses normally incur when installing a solar energy system.

Expedited permitting, which often translates into cash savings, may also serve as an incentive to developers and consumers. Permits are generally required to cover the costs of building inspectors who ensure that engineering and safety standards are met. A building permit ensures that the roof can support the solar system and meet wind-load requirements, for example. An electrical permit is typically required for photovoltaic (PV) installations to ensure that the system does not pose fire, electrocution or power surge hazards.[1] Permit fees are set locally, but states may establish standards for how permits are awarded and the fees that municipalities and counties are allowed to charge.

Surveys of, or experience with, local permit fees in several states, including California,[1],[2] Oregon,[3],[4] Nevada,[4] Colorado,[5] Arizona,[6],[4] and Pennsylvania [9] have revealed a wide disparity in the charges local jurisdictions impose—from $0 to more than $1,200. Cities typically set solar permit fees using a flat-fee method, a valuation method, or a combination of the two. Flat-fee assessments charge the same fee regardless of system size, while valuation-based assessment methods calculate fees based on the cost of the solar system. At the residential level, larger solar systems don't necessarily take longer to inspect than smaller ones, so those who invest in larger systems are essentially penalized by the valuation assessment method.[7]

Description (continued)

A review of 11 local building departments in Oregon revealed that jurisdictions assessing permit fees based on the valuation of the system were substantially costlier than those charging flat-fees or for electrical/plumbing permits only. In fact, the average commercial solar permit calculated using a valuation method was about 10 times costlier than the average flat-fee solar permit.[3] Although these fees usually make up only a small percentage of overall project cost, they could negate months or years of energy savings and increase the payback period beyond the tipping point of feasibility.

Slow permit processing times and excessive paperwork requirements may be equally discouraging. Permitting officials' unfamiliarity with solar technology is often at the root of this problem.[1] Once inspectors are brought up to speed with solar installations through training and standardized procedures, "top-of-the-stack" or "fast-track" permitting is another incentive local governments can provide to consumers or developers for installing solar.

By reducing or eliminating local permit fees and adopting fast-track permitting for solar projects, local governments can demonstrate their support for community investment in solar technologies and ensure that local policies are not barriers to achieving state-level solar goals. State governments can set guidelines for how cities and counties calculate solar permitting fees to ensure uniformity and fairness across the state. While permitting incentives alone will not drive solar development, they are an important local policy option that can complement other federal, state, local or utility policies encouraging solar development.

Status & Trends

Given that permitting incentives are typically implemented at the local level, it is difficult to assess the number of jurisdictions in the United States offer these incentives. However, a 2005 study conducted by a local chapter of the Sierra Club compared the permit fees charged for standardized residential PV systems in 42 cities across San Mateo, Santa Clara, and San Benito counties in California and found that permit fees ranges from $0 to $1,074, with an average cost of $652. Sierra Club publicized the results and followed up with a campaign to press local governments for more affordable fees. Two years later, the average permit fee was down to $252. As part of a 2005 California law prohibiting permitting authorities from restricting PV systems based on aesthetic considerations, the state legislature stated its intent for local agencies "to encourage the installation of solar energy systems by removing obstacles to, and minimizing costs of, permitting for such systems."[8]

A 2008 update of the Sierra Club study surveyed 131 municipalities in northern California and found that "the permit fees varied from $0 to $671, or 0% to 3.6% of the total post-rebate cost ($18,600) of a standard PV installation. Out of 131 jurisdictions, 102 had fees of $300 or less, seven had fees of $500 or more, and 21 charged nothing. The average fee was $214."[7]

As a growing number of California cities and counties are reducing permitting fees, other states have also taken action to ensure that solar permit fees are fair and reasonable. Both Arizona and Colorado passed laws in 2008 to compel local jurisdictions to charge solar permit fees in line with actual cost of issuing the permit. (See details below.)

Status & Trends (continued)

In 2010, data from Vote Solar's PROJECT: PERMIT revealed that average permit fees are $229 in Arizona, $277 in Nevada and $300 in Oregon. In Arizona, permit fees range from $25 in Sierra Vista to $1,000 in Dewey (Humbolt). Several cities or counties in Arizona have permit fees under $100 and issue permits in under one week, including Maricopa County, Pima County, Peoria, Lake Havasu, Sierra Vista, and Goodyear. In Nevada, permit fees range from $23 in Humbolt County to $553 in Storey County. In Oregon, permit fees range from $45 in Ashland to $700 in St. Helens. In addition, average permit fees in the Solar America Cities are $189. Of the Solar America Cities, Sacramento and San Francisco are at the high end with permit fees of $724 and $475, respectively and Houston and San Antonio are at the low end with permit fees of $0 and $50, respectively. [4] In a 2012 study done of Pennyslvania's permits, it was revealed that average permit fees are $450. [9]

In addition to streamlining and standardizing permitting processes, local agencies should consider the following guidelines for permitting incentives:

1. Institute a flat-fee method that reflects the actual costs of issuing the permit. The permit process should not be waived, as it serves as both a quality and safety check. Several organizations have issued recommended cost structures.

- In its Inspector Guidelines for PV Inspectors, Pace Law School suggests the following guidelines:

  - Small PV system (up to 4 kW): $75 - $200
  - Large PV system (up to 10 kW): $150 - $400
  - For systems above 10 kW, consider a permit cost of $15 - $40 per kW.

Status & Trends (continued)

- The Sierra Club recommends that all cities reduce their solar permit fees to $300 or less for residential PV systems that are flush-mounted to rooftops.
- The Utility Consumers' Action Network argues that fees should not exceed $100.
- The Vote Solar Initiative states that reasonable permit fees should be $250 or less.

2. Publicize the fee structure on the agency web site along with the permitting requirements and procedures.

3. Fast-track all solar permits or, at minimum, those from contractors with a reliable track record.

4. Allow residential systems to participate in an expedited permitting process and receive over-the-counter permits or apply for permits online.

Examples

- Arizona enacted a law in May 2008 establishing standards for how permits are awarded and the method municipalities and counties use to determine permit fees for solar installations in the state. Traditionally, counties and municipalities in Arizona have been free to adopt their own requirements and assign their own fees for a permit. These fees have generally been derived from a formula that takes into account the cost and size of the project along with the cost of conducting inspections. Now, any building or permit fee assessed by a county or municipality for solar construction must be directly attributable to and defray the expense of the service for which the fee is charged. Fees or charges may not exceed the actual cost of issuing a permit, and a written, itemized list of the individual costs associated with the permit fee must be provided at the request of the permitee. Further, before adopting a standard permit fee, the county or municipality must hold a public hearing with at least 15 days of public notice.

Examples (continued)

- Colorado also exacted a law in May 2008 to protect consumers and businesses from excessive solar permitting fees. As in Arizona, counties and municipalities in Colorado have been free to assign their own fees for solar installation permits, resulting in widely varying fees. The new law created a statewide cap for permit fees for active solar energy devices that are under 2 MW-DC. Counties and municipalities can charge no more than the lesser of the local government's actual cost to issue a permit, or $500 for a residential application and $1,000 for a nonresidential application. For systems 2 MW-DC or larger, the local government can charge no more than what it actual cost the government to issue the permit. City and county permits combined may be larger than these limits, but cannot separately exceed the limits.

Resources

- DSIRE: Summary of Solar Permitting Incentives
- PROJECT: PERMIT, Vote Solar Initiative.
- Sharing Success: Emegring Approaches to Efficient Rooftop Solar Permitting, Interstate Renewable Energy Council, May 2012.
- Expedited Permit Process for PV Systems: A Standardized Process for the Review of Small-Scale PV Systems, Solar America Board of Codes and Standards (Solar ABCs), July 2012.
- Taking the Red Tape out of Green Power: How to Overcome Permitting Obstacles to Small-Scale Distributed Renewable Energy, Network for New Energy Choices, September 2008.
- Commercial Solar Permit Fee Report, Sierra Club, October 2010.
- Solar Energy Permitting Fees in the San Diego Region--A Comparative Study with Recommendations, Utility Consumers' Action Network, November 2006.
- Inspector Guidelines for PV Systems, Prepared for: Renewable Energy Technology Analysis Project of the Pace University Law School Energy Project by Brooks Engineering, March 2006.
- Vote Solar White Paper: Solar Permit Fees, Vote Solar Initiative, 2007.

Footnotes

[1] Taking the Red Tape out of Green Power: How to Overcome Permitting Obstacles to Small-Scale Distributed Renewable Energy, Network for New Energy Choices, September 2008.
[2] Solar Energy Permitting Fees in the San Diego Region--A Comparative Study with Recommendations, Utility Consumers' Action Network, November 2006.
[3] Renewable Energy System Permit Fees in Oregon, Energy Trust of Oregon, July 20, 2006.
[4] Unpublished data from the Vote Solar Initiative's PROJECT: PERMIT, September 14, 2010.
[5] "Proposed law would cap fees for solar permits," Boulder County Business Report, March 28, 2008.
[6] Arizona: Regulatory Maze Creates Green Business Gridlock, Network for New Energy Choices press release, October 6, 2008.
[7] Solar Electric Permit Fees in Northern California, A Comparative Study, Sierra Club originally published in 2006, updated 2008.
[8] California Government Code § 65850.
[9] Survey of Solar Permitting Practices in Pennsylvania Municipalities, Vote Solar Initiative, July 2012.

Photo credit: Dennis Schroeder, photo courtesy of DOE/NREL

Rules, Regulations & Policies

Rules, regulations and policies cover a wide array of standards and procedures related to investment in solar. Regulatory policies govern the investment in renewable energy at the state level and also outline the terms for utility investment in solar and utility processes related to solar installation. Regulatory policies dictate investment in solar by utilities using policies like solar set-asides or multipliers in renewables portfolio standards. Public investment in solar may be mentioned within state building codes or with energy standards for public buildings. The process of connecting to the grid, issues related to customer-sited generation, technical and safety standards, and issues related to zoning and planning are addressed by rules, regulations and policies.

Rules, Regulations & Policies (continued)

The sections in this category include:

- Solar Set-Asides in Renewables Portfolio Standards
- Interconnection Standards
- Net Metering
- Public Benefits Funds
- Solar Access Laws
- Energy Standards for Public Buildings
- Contractor Licensing & Certification

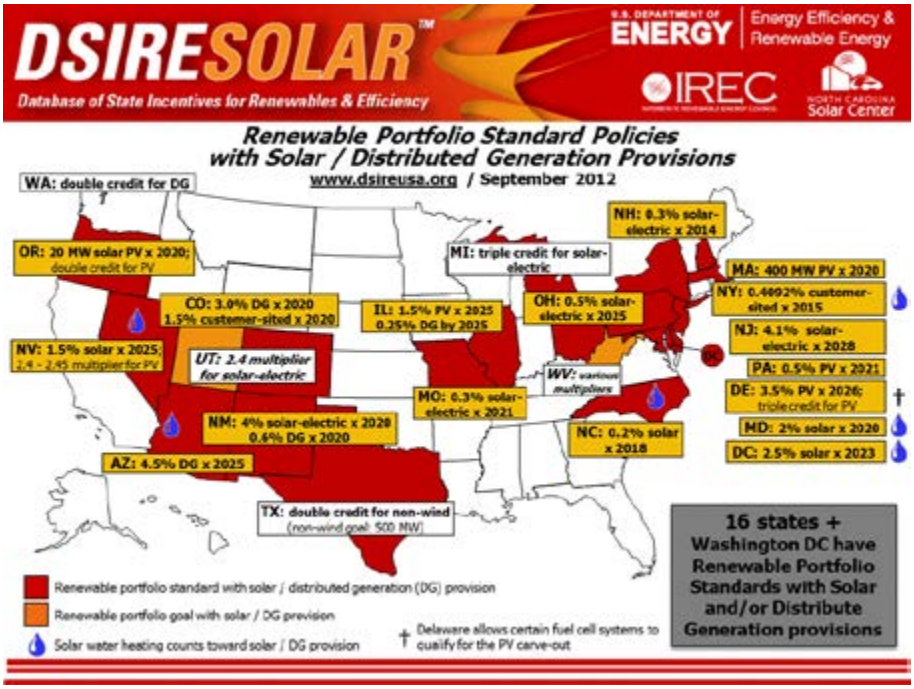
These sections will describe different types of regulatory incentives and policies, illustrate the current status of policies across the US with solar maps, discuss trends in solar policies, provide examples of best practices at the state and local level, and give you resources to reference for more information.

Description

Renewables portfolio standards (RPS) require that a certain percentage of a retail electricity supplier's sales or new generating capacity be derived from renewable resources (e.g., 30% of electric sales must be from renewable energy by 2020).

Energy security and diversity, economic development, and environmental protection are the primary drivers of RPS policies. Given that this type of policy is likely to favor least-cost projects when all renewables compete, states or municipalities may choose to support higher-cost technologies or applications such as solar and distributed generation using credit multipliers or set-asides. A credit multiplier for solar offers additional credit toward compliance for energy derived from solar resources. A solar set-aside requires that a certain percentage of the RPS be met specifically with solar energy. Solar technologies eligible for compliance may vary depending on the goals of the policy.

Cities that have authority over their electric utility might choose to adopt their own RPS policies to promote renewables and local jobs. If a city does not have this authority, they can consider working with state governments to encourage states to adopt an RPS policy, as RPS policies are typically established by states.



Status & Trends

Twenty-nine states and the District of Columbia, the Northern Mariana Islands, and Puerto Rico have established an RPS. An additional eight states and two territories 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 solar set-aside into the RPS, stipulating that a portion of the required renewable energy percentage or overall retail sales be derived from solar resources. For example, New Mexico, Arizona, Maryland, Colorado, the District of Columbia, and Delaware have each set aggressive targets for 2% or greater of the state's electricity mix to be generated from solar or distributed generation resources, which together are projected to result in approximately 3,096 MW (AC) of solar capacity additions by 2025. [1] Sixteen states and the District of Columbia have adopted solar or broader distributed generation set-asides or multipliers as part of their RPS policies. Of these states, five states and D.C. allow solar water heating to count towards meeting the

Status & Trends (continued)

solar carve-out.

The projected installed solar capacity, assuming electricity suppliers achieve full compliance with all state solar requirements, is projected to be 3,432 MW (AC) by 2015, 10,584 MW (AC) by 2025, and 12,271 MW (AC) by 2035. [1]

Several states employ credit multipliers for solar or distributed generation. In addition, Nevada, Oregon, and Delaware have both a solar set-aside and a credit multiplier. Credit multipliers have not been as effective in stimulating solar deployment as a specific solar requirement. [2], [3] In fact, New Mexico and Maryland removed their initial solar multiplier provisions in favor of solar set-asides.

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 and enforcing a monetary penalty or including an alternative compliance payment provision for electricity suppliers that do not meet solar generation requirements;
- Requiring long-term power-purchases or contracts for SRECs, or establishing other mechanisms that improve price certainty, to ensure project developers can access financing; and
- Encouraging systems of all sizes, including small-scale, distributed generation systems and customer-sited systems.

Municipalities that have authority over their electric utilities may also choose to adopt

Status & Trends (continued)

an RPS policy to promote renewable energy development. Cities leading the way in this regard include Columbia (MO) and Austin (TX). The Austin City Council adopted a resolution for its municipal utility, Austin Energy, to meet 35% of all energy needs through the use of renewables by 2020, including at least 200 MW of solar power.

Examples

- Colorado's RPS exemplifies some of the key elements described above. For investor-owned utilities (IOUs), the requirement began at 3% of retail electricity sales in 2007, and will rise incrementally to 30% by 2020. At least 3% of the renewable energy must be generated by distributed generation facilities, half of which must come from "retail distributed generation" serving on-site load. Electric cooperatives and municipal utilities are subject to a lower renewables standard of 10% by 2020, 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 a 300% credit for RPS-compliance purposes.

- New Jersey's solar carve-out is among the most ambitious in the nation and now comprises the primary government support mechanism for solar facilities in New Jersey. New Jersey has a colar carve-out of 4.1% by 2028. New Jersey currently uses an 8-year rolling Solar Alternative Compliance Payment (SACP) schedule with an EY2012 SACP of $658/MWh, the highest in the nation. In an effort to create more price certainty in solar renewable energy certificate (SREC) markets, most electric distribution utilities in New Jersey are required to enter into long-term contracts with solar system owners for 40-60% of the expected SREC obligation from sales within their service territories.

Resources

- DSIRE: Summary of RPS Policies in the U.S.
- Supporting Solar Power in Renewables Portfolio Standards: Experience from the United States, Ryan Wiser, Galen Barbose, and Ed Holt, Lawrence Berkeley National Laboratory, October 2010.
- Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions, Karlynn Cory, Toby Couture and Claire Kreycik, National Renewable Energy Laboratory, March 2009.
- Recommended Principles and Best Practices for State Renewable Portfolio Standards, prepared by the State-Federal RPS Collaborative, January 26, 2009.
- CESA State RPS Policy Report: Increasing Coordination and Uniformity Among State Renewable Portfolio Standards, Ed Holt, prepared for the Clean Energy States Alliance, December 2008.
- State Clean Energy Practices: Renewable Portfolio Standards, David Hurlbut, National Renewable Energy Laboratory, July 2008.
- Renewable Portfolio Standards: An Opportunity for Expanding State Solar Markets, Ryan Wiser, Berkeley National Laboratory, State PV Peer Network Conference Call Presentation, July 11, 2008.
- Renewables Portfolio Standards in the United States — A Status Report with Data Through 2007, Ryan Wiser and Galen Barbose, Berkeley National Laboratory, April 2008.
- Renewable Electricity Standards Toolkit, Union of Concerned Scientists.
- The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards, Edward Holt and Ryan Wiser, published by Berkeley National Laboratory, April 2007.

Footnotes

[1] Unpublished data from Galen Barbose, Lawrence Berkeley National Laboratory, Debember 2011.
[2] Supporting Solar Power in Renewables Portfolio Standards: Experience from the United States, Ryan Wiser, Galen Barbose, and Ed Holt, Lawrence Berkeley National Laboratory, October 2010.
[3] Renewables Portfolio Standards in the United States — A Status Report with Data Through 2007, Ryan Wiser and Galen Barbose, Berkeley National Laboratory, April 2008.

Description

Interconnection standards specify the technical, legal and procedural requirements that customers and utilities must abide by when a customer wishes to connect a solar energy system (or other customer-sited system) to the grid.

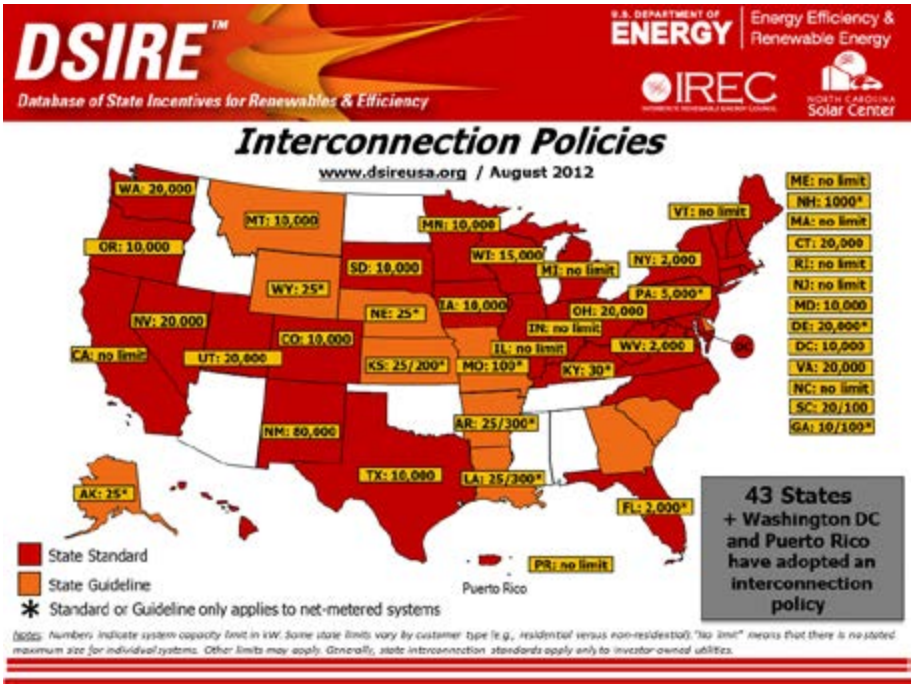
In states without comprehensive interconnection standards in place, it is often more difficult, more burdensome and more expensive for customers to connect a system to the grid. In general, states have the authority to regulate the interconnection of customer-sited systems to distribution systems. The federal government, through the Federal Energy Regulatory Commission (FERC), generally regulates the interconnection of customer-sited systems to transmission lines.

Some states have adopted comprehensive interconnection standards that apply to all types of customer-sited systems, whether large or small – and regardless of whether or not the system is net-metered. Other states have adopted interconnection standards that apply only to smaller systems that are net-metered. Other states have adopted interconnection guidelines that typically have vague language and do not constitute standards. Some states have not adopted interconnection standards for any customer-sited systems. Comprehensive interconnection standards are developed by state public utility commissions, which are authorized (or required) by state legislatures to do so.

The technical issues related to interconnection are addressed by the IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems, adopted in 2003. All states with comprehensive interconnection standards require compliance with

Description (continued)

the IEEE 1547 technical standard. The policy issues related to interconnection are more complex and vary by state. While some states' interconnection standards apply to customers of all types of utilities (e.g., investor-owned utilities, municipal utilities and electric cooperatives), others apply only to customers of investor-owned utilities. In addition, state interconnection standards vary widely by several other key criteria, including: individual system capacity limit, interconnection fees, use of a standard form agreement, insurance requirements, use of an external disconnect switch, and provisions for interconnection to area networks (i.e., complex grids that serve certain dense, urban areas).



Status & Trends

States have become increasingly aware that comprehensive interconnection standards are a critical component of the development of in-state renewable energy markets. More than 30 states (including D.C. and Puerto Rico) have now adopted comprehensive interconnection standards that apply to customer-sited systems (both large and small), regardless of whether the system is net-metered. Approximately 11 other states, including Arkansas and Georgia, have adopted standards or guidelines that only apply to smaller, net-metered systems. In general, not many new interconnection standards are being enacted, though some states are improving existing interconnection standards. From 2009 to 2011, six new states created some form of interconnection rules. In 2009, only one state had an "A" grade in Freeing the Grid. In 2010, four states received an "A", and five states received an "A" for interconnection in Freeing the Grid 2011. Currently, eight states have an "A" in Freeing the Grid.

Most states with comprehensive standards have established multiple levels of review based on system capacity, complexity and level of certification. In these states, applications for small, certified systems are processed quickly, while larger systems and uncertified systems require closer review. By establishing multiple levels of review, states ensure that the owner of a 5-kW solar-electric system may interconnect the system quickly, safely and inexpensively, without having to endure a process more suitable to a 10-MW combined heat and power (CHP) system. In several states, there has been a recent trend of developing separate interconnection requirements for net metered systems and non-net metered systems. Notably, some states have determined that larger systems that do not export electricity should require a less rigorous review process than larger systems that export electricity.

Status & Trends (continued)

With respect to smaller solar-electric systems and certain other systems, public utilities commissions in several states, such as Maine, Oregon and North Carolina, have concluded that an external disconnect switch is not necessary for these systems and have prohibited utilities from requiring customers to install such a switch. (Several larger electric utilities, including PG&E and SMUD, have voluntarily reached the same conclusion and abandoned previous requirements for an external disconnect switch for smaller solar-electric systems.) Similarly, public utilities commissions generally do not require customers to purchase liability insurance beyond the amount included in a typical homeowner's policy or business owner's policy.

The Interstate Renewable Energy Council (IREC) has established the following best practices for interconnection standards:

- All utilities (including municipal utilities and electric cooperatives) should be subject to the state policy.
- All customer classes should be eligible.
- There should be three or four separate levels of review to accommodate systems based on system capacity, complexity and level of certification.
- There should be no individual system capacity limit. The state standard should apply to all state-jurisdictional interconnections.
- Application costs should be kept to a minimum, especially for smaller systems.
- Reasonable, punctual procedural timelines should be adopted and enforced.
- A standard form agreement that is easy to understand and free of burdensome terms should be

Status & Trends (continued)

used.

- Clear, transparent technical screens should be established.
- Utilities should not be permitted to require an external disconnect switch for smaller, inverter-based systems.
- Utilities should not be permitted to require customers to purchase liability insurance (in addition to the coverage provided by a typical insurance policy), and utilities should not be permitted to require customers to add the utility as an additional insured.
- Interconnection to area networks should generally be permitted, with reasonable limitations where appropriate.
- There should be a dispute resolution process.

Examples

- Virginia's interconnection standards, enacted in 1999 and subsequently amended, with the most recent amendments being adopted by Virginia's State Corporation Commission (SCC) in May 2009, are currently one of the best in the United States. [1] Virginia has adopted two separate sets of interconnection standards - one for net-metered systems, and one for systems that are not net-metered. The interconnection standards for net-metered systems apply to residential systems up to 10 kW and commercial systems up to 500 kW. Virginia's standards for systems that are not net-metered are based on the FERC Small Generator Interconnection Procedures and have three tiers of review for systems up to 20 MW. Fees, review procedures, and insurance requirements vary by system size and tier. A unique aspect of Virginia's interconnection standard is the dispute resolution process that allows complaints to be handled by the SCC.
- Maine's interconnection standards, adopted by the Maine Public Utility Commission in January 2010, are considered to be some of the best in the United States.[1] Maine's standards incorporate the IEEE 1547 and IEEE 929 technical standards and provide for four levels of review for systems of all sizes, based on system capacity, complexity and certification. The first level of review allows expedited interconnection for certified, inverter-based systems (including solar-electric systems) up to 10 kW in capacity. A standard agreement is used, and an external disconnect switch is not required. Utilities may not require customers to purchase

Examples (continued)

additional liability insurance for most systems. Maine's standards are based on IREC's model interconnection standards.

- Utah's interconnection standards, adopted by the Utah Public Service Commission in April 2010, are also widely regarded to be among the best in the country.[1] Utah's standards embrace the IEEE 1547 technical standard and provide for three levels of review for customer-sited systems up to 20 MW, based on system capacity, complexity and certification. The first level of review allows expedited interconnection for certified, inverter-based systems that are 10 kW or less in capacity. A standard agreement is used for each of the three levels. No external disconnect switch is required for systems 10 kW or smaller.

Resources

- DSIRE: Summary of Interconnection Standards in the U.S.
- Freeing the Grid, Vote Solar, et al., 2012.
- Model Interconnection Standards, Interstate Renewable Energy Council, 2009.
- Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues, Laurel Varnado and Mike Sheehan, Interstate Renewable Energy Council, 6th Edition, October 2009.
- Utility-Interconnected Photovoltaic Systems: Evaluating the Rationale for the Utility-Accessible External Disconnect Switch, National Renewable Energy Laboratory, January 2008.
- IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems, IEEE, 2004.

Footnotes

[1] Freeing the Grid 2011, Network for New Energy Choices, et al., October 2011.

Description

Net metering is a popular and administratively simple policy option for U.S. states. Net metering allows electric customers who generate their own electricity using solar energy (or other forms of renewable energy) to bank excess electricity on the grid, usually in the form of kilowatt-hour (kWh) credits.

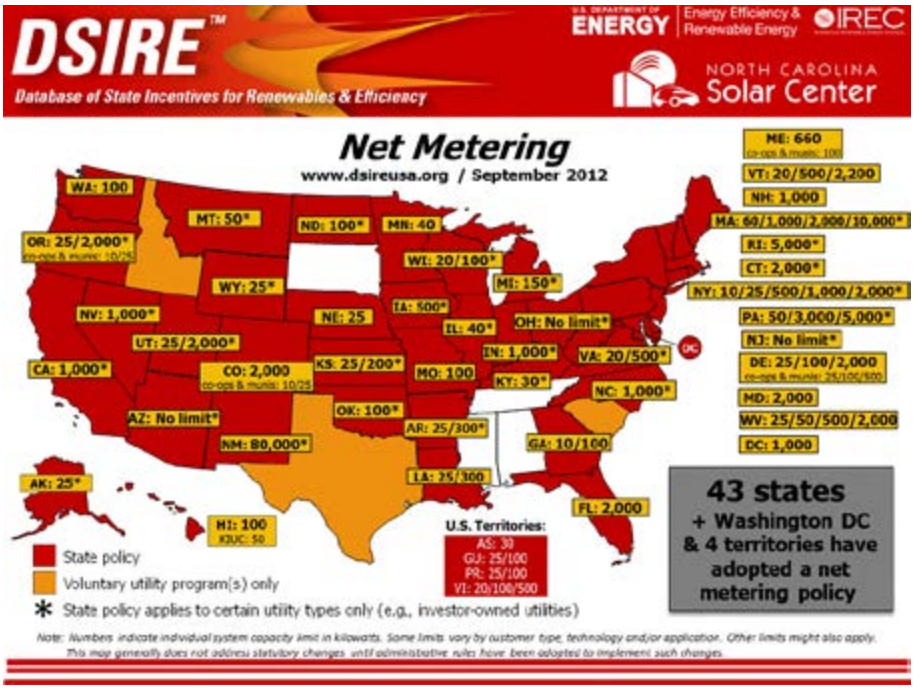
These credits are used to offset electricity consumed by the customer at a different time during the same billing period (i.e., when the customer's solar energy system is not generating enough electricity to meet the customer's needs). In effect, the customer uses excess generation credits to offset electricity that the customer otherwise would have to purchase at the utility's full retail rate. Net metering is typically accomplished through the use of a single, conventional, bi-directional meter.

There is no federal requirement for net metering, and there has been little federal policy guidance on this issue. Thus far, policy experience with net metering lies squarely in the domain of states. Most states' net metering policies were established through legislation. State laws commonly require the state public utilities commission to adopt administrative rules to implement net metering.

While some states' net metering policies apply to customers of all types of utilities (e.g., investor-owned utilities, municipal utilities and electric cooperatives), others apply only to customers of investor-owned utilities. In addition, state policies vary widely by several other key criteria, including: individual system capacity limit, aggregate system capacity limit, eligible customer types, eligible system types, treatment of net excess generation (at the end of a billing period), and ownership of renewable energy credits (RECs)

Description (continued)

associated with customer generation.



Status & Trends

More than 40 U.S. states (plus the District of Columbia and four territories) have established net metering policies, and many have subsequently expanded their policies to accommodate expanding solar markets. As with interconnection standards, the number of states that have created a new net metering policy recently is small. Since 2009, only Alaska has created a new net metering policy (in 2010). Nonetheless, states continue to make improvements to existing policies: in 2009, 11 states received an "A" in Freeing the Grid; in 2010, 15 states received an "A" in Freeing the Grid; and in 2011, 16 states received an "A" in Freeing the Grid. Significantly, many states have raised the capacity limit for individual systems. Currently, 19 states (plus the District of Columbia and Puerto

Status & Trends (continued)

Rico) expressly allow net metering for certain systems one megawatt (MW) or greater in capacity. At the upper end of the spectrum, Massachusetts allows net metering for certain systems up to 10 MW and New Mexico allows net metering for certain systems up to 80 MW. In Arizona, Colorado, New Jersey and Ohio, there is no stated capacity limit. In many cases, states limit systems to a certain percentage (e.g., 125%) of the customer's load, so that customers do not intentionally oversize their systems. Furthermore, some states have established individual system capacity limits that vary by utility type, system type or customer type.

Some states, such as California and Utah, have increased the aggregate capacity limit for net metering due to the rapidly growing popularity of grid-tied solar. Others, such as Pennsylvania, have either clarified or enhanced provisions governing the treatment of net excess generation at the end of a billing period. Many states now allow customers to carry net excess generation credits forward to the following billing period at the full retail value of a kWh, either indefinitely or during a 12-month period.

Notably, all state net metering policies include solar as an eligible technology. In recent years, states have commonly extended net metering to other kinds of renewable energy systems as well. Almost all states that have addressed REC ownership for net-metered systems, including Arkansas, Colorado and Florida, have concluded that RECs belong to customers. The issue of REC ownership has become increasingly important as utilities seek to meet renewable portfolio standard (RPS) obligations. In some locations, RECs may be sold as a valuable commodity.

Status & Trends (continued)

Several states, including Nevada and New Mexico, allow net metering for electric customers on a time-of-use (TOU) tariff. However, while this option could be economically beneficial for owners of solar energy systems in many situations, it has proven difficult to design TOU tariffs that actively promote solar generation. In some cases, the demand charges built into a TOU tariff are excessively high.

More recently, a handful of states have expanded net metering by allowing meter aggregation for multiple systems at different facilities on the same piece of property owned by the same customer. A small number of states (including California) allow "virtual" meter aggregation, where certain customers can net meter multiple systems at different facilities on different properties owned by the same customer. In addition, "community net metering" or "neighborhood net metering," which allows for the joint ownership of a solar energy system by different customers, is in effect or under development in a small number of states, including Massachusetts.

The Interstate Renewable Energy Council (IREC) has established the following best practices for net metering policies:

- All utilities (including municipal utilities and electric cooperatives) should be subject to the state policy.
- All customer classes should be eligible.
- The individual system capacity should not exceed the customer's service entrance capacity. Otherwise, there should be no individual system capacity limit.
- There should be no aggregate system capacity limit.

Status & Trends (continued)

- Any customer net excess generation at the end of a billing period should be credited to the customer's next bill as a kWh credit (i.e., at the utility's full retail rate) indefinitely, until the customer leaves the utility's system.
- Utilities should not be permitted to impose an application fee for net metering.
- Utilities should not be permitted to impose any charges or fees for net metering that would not apply if the customer were not engaged in net metering.
- Utilities should not be permitted to force customers to switch to a different tariff. Customers should have the option to switch to a different tariff, including a time-of-use tariffs, if they choose to do so. If a customer is on the time-of-use tariff, they should be credited for the appropriate time-of-use period in the billing period.
- Customers should have ownership of any renewable-energy credits (RECs) associated with the customer's electricity generation.
- Customers should be permitted to offset load measured by multiple meters on the same property using a centrally-located system.
- The state public utilities commission should adopt comprehensive interconnection standards for customer-sited systems.

Examples

- Colorado's net metering policy, established in 2004 and subsequently amended, is widely considered to be one of the best in the United States.[1] Colorado allows net metering for systems sized up to 120% of the customers average annual consumption for all customers of investor-owned utilities. For customers of municipal utilities and electric co-ops, the limits are 10 kilowatts (kW) for residential systems and 25 kW for non-residential systems. There is no stated limit on the aggregate net metering capacity in Colorado. Any net excess electricity generated by a customer during a billing period is carried forward to the customer's next bill as a full kWh credit (i.e., at the utility's retail rate). At the end of a 12-month period, the utility purchases any remaining excess electricity from the customer at a rate lower than the retail rate. Alternately, customers can choose to roll-over the net excess generation credits indefinitely. Customers own the RECs associated with the electricity they generate.

Examples (continued)

- New Jersey's net metering policy, established in 1999 and significantly expanded in 2004, is also regarded as one of the best in the country.[1] New Jersey has no individual system capacity limit. There is no firm limit on the aggregate net metering capacity in New Jersey. (The Board of Public Utilities is authorized to limit the aggregate capacity to 2.5% of a utility's peak demand). Any net excess electricity generated by a customer during a billing period is carried forward to the customer's next bill as a full kWh credit (i.e., at the utility's retail rate). At the end of a 12-month period, the utility purchases any remaining excess electricity from the customer at the utility's avoided-cost rate. Customers own the RECs associated with the electricity they generate.

Resources

- DSIRE: Summary of Net Metering Policies in the U.S.
- Model Net Metering Rules, Interstate Renewable Energy Council, October 2009.
- The Impact of Rate Design and Net Metering on the Bill Savings from Distributed PV for Residential Customers in California, Naïm Darghouth, Galen Barbose, and Ryan Wiser, Lawrence Berkeley National Laboratory, April 2010.
- Freeing the Grid, Vote Solar, et al., 2012.

Footnotes

[1] Freeing the Grid 2011, Network for New Energy Choices, et al., October 2011.

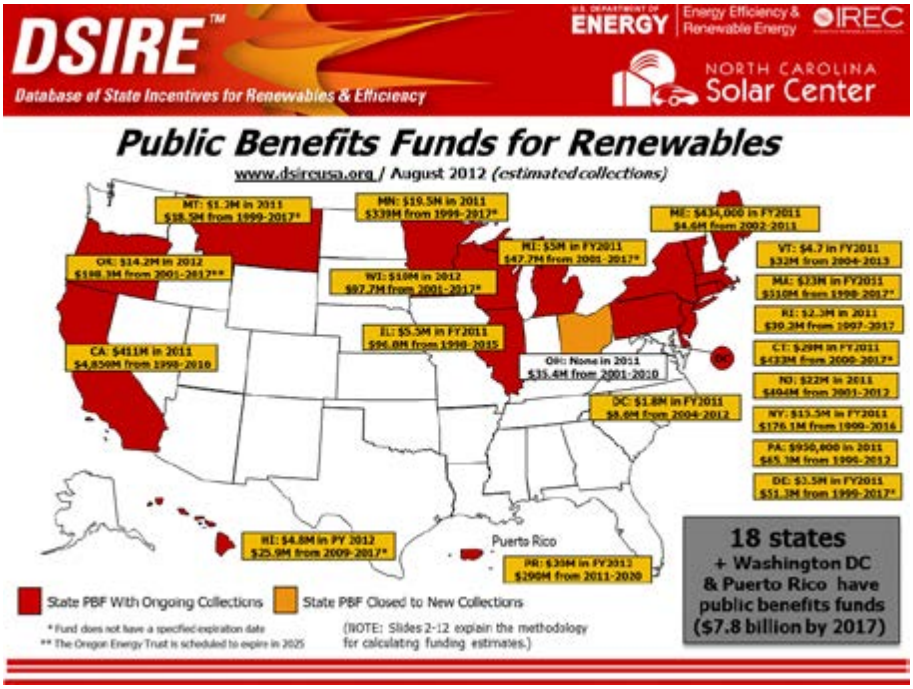
Description

A public benefits fund (PBF) is a policy mechanism intended to provide long-term, stable funding to support energy efficiency, renewable energy or low-income programs.

Public benefits funds for renewable energy provide direct incentives and financing for renewable energy projects, business development and industry recruitment activities, and research and development. In addition, funds support workforce development activities like installer training, as well as initiatives to promote public awareness about energy issues and renewable energy technologies. These funds have been instrumental in spurring the growth of solar markets in recent years. As a rule, only customers that pay into a PBF are eligible for assistance through the programs it funds.

PBFs are usually supported by a small surcharge ("system benefits charge") 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 casks of nuclear waste. Most often, the surcharge only applies to customers of investor-owned electric distribution utilities, but some funds also make collections from natural gas customers.

Although public benefits funds are usually established at the state level, municipalities that have authority over their local electric utility may be able to establish a PBF via a dedicated surcharge or flat monthly fee to support solar programs. In other instances, municipal utilities or electric cooperatives may be permitted to "opt-in" voluntarily to a state-administered program.



Status & Trends

Most state public benefits funds were established through the electric utility restructuring processes of the late 1990s to assure continued support of renewable energy, energy efficiency, and low-income programs as utilities moved to a competitive industry model. Although the kilowatt-hour (kWh) surcharge on electricity sales is common, several variations exist. In Pennsylvania, four "Sustainable Energy Funds" for five distribution utilities were established through separate utility settlement proceedings. The funds initially received revenue through a combination of lump sum payments and recurring annual payments over a specified time period. Several subsequent utility mergers resulted in additional lump sum and recurring payments for general fund operations or to fund specific programs defined in the settlements.

In Minnesota and Vermont, renewable energy funds are derived from annual payments by investor-owned utilities as compensation for nuclear waste storage. In another variation

Status & Trends (continued)

of funding practices, the Illinois Renewable Energy Resources Trust Fund is funded by a flat monthly surcharge (e.g., $0.05/month, but varies by customer class) on electric and natural gas customer accounts. In some cases, like Massachusetts, funds for certain renewable energy programs offered under the PBF may be supplemented by alternative compliance payments made by utilities under the state renewable portfolio standard or revenue from the sale of carbon emissions allowances in the Regional Greenhouse Gas Initiative (RGGI) auctions.

Half of the state funds do not have a specified expiration date, but others are scheduled to end in the next few years unless extended. Ohio's PBF - the Ohio Advanced Energy Fund - expired at the end of 2010, as did the mandatory requirement in Maine. Currently, Maine's PBF is supported by voluntary contributions. Annual funding levels range from less than $1 million in Pennsylvania to over $411 million in California. Many states include renewable energy in PBF-funded programs while others focus solely on energy efficiency and low-income assistance. In a few cases, funds are dedicated exclusively to renewable energy development. Currently, seventeen states plus the District of Columbia have established a public benefits fund supporting renewables. In sum, the funds will collect an estimated $7.8 billion by 2017.

Unfortunately, the funding generated for PBFs has not always been used as originally intended. A number of PBFs have been "raided" by state legislatures and governors to fill state budget gaps. Some states have avoided this problem by directing fund revenue through independent administrators or utilities as opposed to state government agencies. However, it has been suggested that no funds are completely "raid-proof". The state of

Status & Trends (continued)

Connecticut transferred money from utility-held accounts to the general fund in 2003 and, though the fund is currently administered by a quasi-public organization, the fund faced similar pressure in 2009.[1] State-administered funds in Illinois[2] and Ohio have experienced funding transfers while the independent third-party administrator of Oregon's PBF was also subjected to similar threats in the past.[3]

Examples

- In Wisconsin, the Focus on Energy program was originally authorized in 1999 by the state legislature. As originally designed, funding ran through the Wisconsin Department of Administration, which, in turn, contracted with third-parties for program administration. However, from 2002 – 2006 a total of $108 million was transferred out the PBF to the general fund for other uses. In 2006 the program was substantially redesigned by Act 141, in part to prevent "raiding" of the fund for other purposes. The new design requires utilities to contract directly with third-party program administrators rather than passing funding through a state government account where it may be vulnerable to further transfer.[4] Under the current fund design, electric and natural gas utilities are obligated to spend 1.2% of their gross operating revenue on energy efficiency and renewable energy programs.

- Municipal utilities in California have been administering solar programs supported by individual PBFs, as directed by state policy, for a number of years. Under SB 1 (2006), municipal utilities in California are required to create solar programs that collectively spend $784 million on solar incentives. Approximately 40 POUs are expected to install 700 MW as part of the California Solar Initiative by 2016.

- Boulder, Colorado (served by Xcel Energy) collects an excise tax from residential, commercial, and industrial electricity customers for the purpose of funding a climate action plan to reduce greenhouse gas emissions. This is a rare example where a city without a municipally-owned utility created a local PBF. The Climate Plan Action Fund was approved by ballot initiative in 2006. In 2010, the rate surcharge supported an annual program budget of approximately $1.8 million. The proceeds help fund a variety of residential and commercial energy programs, including a solar water heating rebate for residential customers. A separate renewable energy fund collected through the city's local sales and use tax helps fund a low to moderate income solar grant program.

Resources

- DSIRE: Summary of Public Benefits Funds in the U.S.
- Advancing State Clean Energy Funds: Options for Administration and Funding, Prepared for the U.S. Environmental Protection Agency's Climate Protection Partnerships Division by Optimal Energy, Inc., May 2008.
- Clean Energy States Alliance website
- Clean Energy State Program Guide: Mainstreaming Solar Electricity: Strategies for States to Build Local Markets, Clean Energy Group and Peregrine Energy Group, April 2008.
- States Advancing Solar website

Footnotes

[1] "Rell's Budget Would Raid Energy Funds," Connecticut Post, February 7, 2009
[2] "Illinois House Passes Supplemental Appropriations Bill to Save Parks," Illinois Environmental Council, September 18, 2008.
[3] Who Should Deliver Ratepayer Funded Energy Efficiency? A Survey and Discussion Paper, Regulatory Assistance Projects, May 2003.
[4] Wisconsin Legislative Council Information Memorandum, IM-2006-01

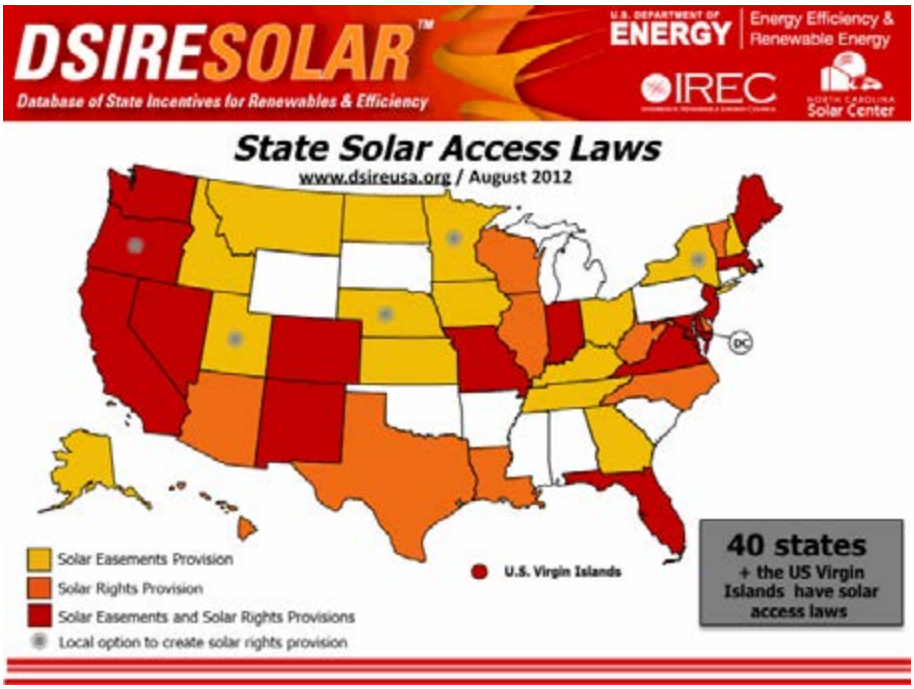
Description

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.

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 (e.g., building, foliage) as to restrict the system's access to sunlight. A solar rights law, on the other hand, provides protection for residential and businesses by limiting or prohibiting private restrictions (e.g., neighborhood covenants and bylaws, local government ordinances and building codes) on the installation of solar energy systems.

Local governments may have the authority adopt ordinances to ensure solar access, including solar access ordinances, development guidelines requiring proper street orientation, and zoning ordinances that contain building height restrictions to avoid shading neighboring solar panels.



Status & Trends

Solar Easements. More than half of the states in the U.S. authorize the creation of solar easements. The majority of 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

Status & Trends (continued)

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.

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. In general, state laws that allow for voluntary solar easements may have limited effectiveness since solar energy system owners have no guarantee of an agreement with a neighbor whose property could interfere with access to sunlight.

Solar Rights. While securing 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. Nearly half of all states in the U.S. have passed solar rights laws. These laws typically limit the restrictions that neighborhood covenants and/or local ordinances can impose on the installation of solar equipment. The laws vary in their provisions, if specified at all, in the areas of solar equipment protected by the law, types of buildings covered, applicability to new vs. existing construction, and enforcement provisions. Vague or absent provisions in solar rights laws have led to lawsuits and delays in a number of states.

Status & Trends (continued)

Some of the key elements in an effective solar rights law include:

- Defines the type of solar energy equipment protected by the law , i.e., solar electric, solar thermal, passive solar construction, etc. [Ex: New Mexico];
- Prevents covenant restrictions from prohibiting solar energy equipment;
- Provides 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% or decrease system efficiency by more than 25% [Ex: Hawaii];
- Defines exemptions from law clearly, i.e., historic districts are exempt from law;
- Defines the types of structures covered by the law , i.e., residential, commercial [Ex: California]; and
- Awards costs and reasonable attorneys' fees to the prevailing party in any civil action arising from disputes with homeowners associations. [Ex: Arizona]

Examples

- Examples of states that have adopted solar easement laws with the basic elements outlined above include New Hampshire, Minnesota, and Utah.
- New Mexico's Solar Recordation Act employs a more aggressive approach to securing an easement 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.
- California's Solar Rights Act, Solar Shade Control Act and other California solar access provisions combine elements of solar easements and protections against government and neighborhood restrictions.

Resources

- DSIRE: Summary of Solar Access Laws
- A Comprehensive Review of Solar Access Law in the United States, Solar America Board for Codes and Standards, 2008.
- Installing Solar Panels on Historic Buildings: A Survey of the Regulatory Environment, North Carolina Solar Center and National Trust for Historic Preservation, August 2012.
- State and Local Policies Affecting the Advancement of Renewable Energy Sources, American Bar Association Energy Committee Newsletter, January 2007.
- Solar Access Model Code and Recommendations, Solar America Board for Codes and Standards, 2008.
- Clean Energy State Program Guide: Mainstreaming Solar Electricity: Strategies for States to Build Local Markets, Clean Energy Group and Peregrine Energy Group, April 2008.
- Bringing Solar Energy to the Planned Community: A Handbook on Rooftop Solar Systems and Private Land Use Restrictions, Starrs, T., Nelson, L., and F. Zalcman, 1999.

Description

States and cities, as well as the federal government, can lead by example by requiring that new public buildings meet strict energy standards—even beyond statewide building energy codes that may already be in effect.

According to the U.S. Environmental Protection Agency, federal, state, and local government agencies spend a total of more than $10 billion annually on energy. By increasing efficiency and utilizing renewable energy in their own facilities, the government sector can reduce air pollution and greenhouse gas emissions, save money during tight budget conditions, promote economic development, and demonstrate ways in which other sectors can become more sustainable.

Building energy codes cover areas of construction such as wall and ceiling insulation, window and door specifications, heating, ventilation, and air conditioning equipment efficiency, as well as lighting fixtures and controls. Energy codes set minimum standards and define the least efficient buildings (public and private) that should be constructed. These codes vary greatly from state to state. Given that buildings in the U.S. account for one third of the nation's total energy use and two-thirds of total U.S. electricity use, the adoption and implementation of energy efficient building codes is critical from both an economic and environmental perspective. The first step states should take is to adopt a statewide building energy code based on the national model energy codes. City and county jurisdictions should seek to increase code uniformity across the state.[1] National model energy codes are updated every few years, and the state codes should be updated to reflect the most current national model code. Once a state has adopted a statewide building energy code, state and local governments are poised to adopt standards for their

Description (continued)

own facilities that exceed national codes and to meet more aggressive energy efficiency and renewable energy standards.

Advanced policies for government facilities may include attaining "green building" certification, achieving energy reduction goals, exceeding building code requirements by a specified percentage, mandating energy efficiency equipment procurement, and/or performing life cycle cost analysis. For example, all levels of government may require that new and renovated public buildings attain a certain level of certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program or the Green Globes rating system. Equipment procurement policies can mandate the use of the most efficient equipment, such as equipment that meets the federal Energy Star standard. Life cycle cost analysis policies require government entities to consider energy costs (including equipment and construction) over the lifespan of a planned new building.

The government sector may choose to go one step further and adopt specific goals or mandates for renewable energy use in public buildings, or more specifically, for solar installations.

Status & Trends

Municipalities and state governments can play a critical role in supporting renewable energy by buying electricity from renewable resources, developing solar and green building design standards, or committing to installing a specified level of solar capacity

Status & Trends (continued)

on public buildings. Seven states and dozens of cities have green power purchasing requirements. Essentially, these goals or requirements state that a certain percentage of electricity purchased for government buildings must come from renewable resources. In these cases, solar is not typically a big part of the renewable electricity mix.

Gaining popularity at the state and local level are green building standards for new construction of and renovations to public buildings, which usually entail achieving a certain level of certification by the U.S. Green Building Council's LEED program, or less frequently, the Green Globes system. In some cases, the level of certification that must be attained is dependent on the project size, budget, or economic feasibility. More than half the states in the U.S. now integrate one or more green building rating systems into state building policies, with the majority emerging just in the past four years. In addition, the U.S. Green Building Council lists 442 local jurisdictions that have some type of LEED initiative.[2] Solar is an element that can be used to help meet green building certification requirements.

A handful of states target solar installations and other renewables in state building policy. Older laws such as those in Arizona (1997), Florida (1974), Maryland (1992), and Texas (1995) require an evaluation of the life cycle costs of solar or alternative energy in new state projects. In these cases, "economically feasible" or "cost-effective" projects should be implemented, but these terms are not typically defined. Policies that require evaluation of solar on public buildings without strong compliance mechanisms or action plans are not likely to be as effective as specific capacity or investment requirements. California and Oregon have recently adopted stronger policies requiring solar installations on public

Status & Trends (continued)

buildings. These laws are discussed in more detail in the "Examples" section below.

A growing number of local governments, including Boulder (CO), Marin County (CA), Austin (TX), and San Francisco, have taken building codes a step further to require that certain private commercial and/or residential construction meet sustainable building standards. 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 took effect on a voluntary basis in 2009, and became mandatory as of January 1, 2011.

State-level standards targeting solar in the private sector 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. In June 2008, Hawaii enacted legislation mandating that all new homes be outfitted with solar water heating systems. The law prohibits the issuance of building permits for construction of new, single-family homes that do not have solar water heaters as of January 1, 2010. However, there are several escape hatches included in this law. In May 2009, Colorado passed a law requiring builders of single-family homes to offer solar as a standard feature to all prospective homebuyers. Some local governments are also enacting standards that affect the private sector. In June 2008, Tucson (AZ) passed an ordinance that requires all new homes either to have a photovoltaic (PV) and solar water heating system installed, or to have all the necessary hardware installed so that a system can easily be installed at a later date.

Examples

- Oregon requires that all new state public building projects and major renovations invest in solar technologies at a level of at least 1.5% of the total contract price. If the contracting agency can prove that this is not feasible for a certain building, the building may be granted an exemption. However, the dollar amount that would have been dedicated to a solar system on such a building must be used to install a system on the next building that agency constructs—in addition to the 1.5% of the cost of the new building. The Building Codes Division of Oregon's Department of Consumer and Business Services also developed a statewide Solar Installation Specialty Code in October 2010.

- California law required that solar energy equipment to be installed on all state buildings and state parking facilities by 2009, where feasible. In this case, the terms "feasible" and "cost-effective" are clearly defined. In addition, the state's Green Building Action Plan aims to reduce grid-based energy use by by 20% of 2003 levels by 2018 at major state-owned facilities.

Resources

- DSIRE: Summary of State & Local Energy Standards for Public Buildings in the U.S.

- Oregon Solar Installation Specialty Code, Oregon Department of Consumer and Business Services, Building Codes Division, October 2010.

- Building Codes Assistance Project: Status of Commercial and Residential State Energy Codes in the U.S.

- U.S. Green Building Council – LEED Initiatives in Government and Schools

- Solar Ready Buildings Planning Guide, L. Lisell, T. Tetreault, and A. Watson, National Renewable Energy Laboratory, December 2009.

Footnotes

[1] Best Practices for State Building Energy Code Policy, Building Codes Assistance Project, accessed September 2012.
[2] LEED Initiatives in Government and Schools, U.S. Green Building Council, accessed March 2011.

Description

States establish licensing requirements for contractors in order to protect consumers from unsafe practices and protect the reputation of the industry, as improper installation may create safety risks or result in poor system performance.

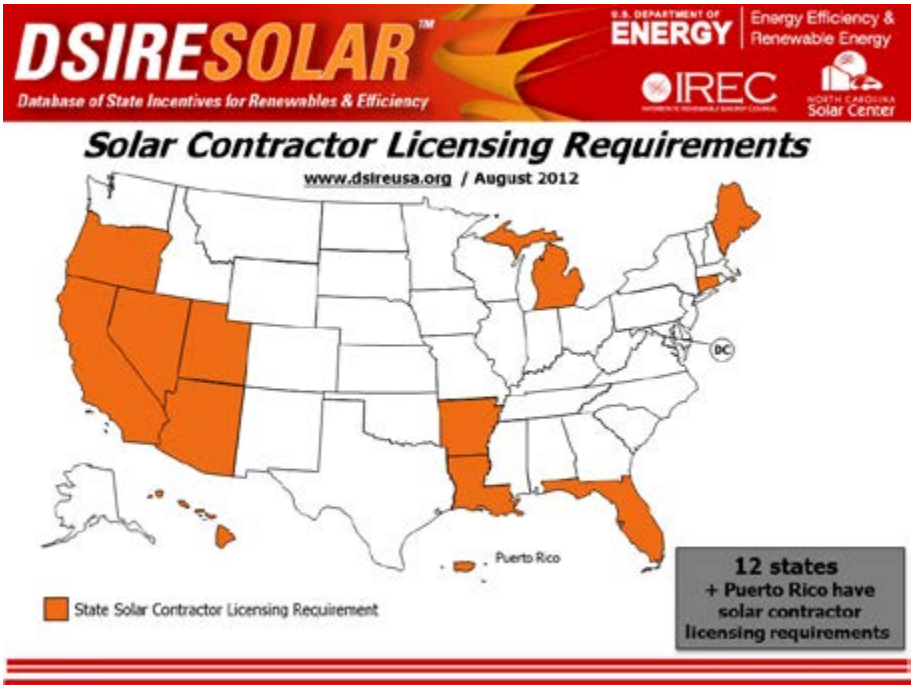
Contractor licensing is a mandatory state standard that contractors must meet to install systems. Licensing is distinct from certification; certification is a voluntary standard that installers attain to differentiate themselves from competition and to instill confidence in consumers. Certification may entail completing coursework, installing systems for a certain period of time, or taking an exam, but it is typically not required to install systems.

The North American Board of Certified Energy Practitioners (NABCEP) is a nationally-recognized, independent, voluntary certification program for photovoltaic (PV) and solar thermal system installers. To become NABCEP-certified, installers must have at least one year of installation experience and must document systems training and installation. Installers must also pass a four-hour, 60-question examination, sign a code of ethics, and take continuing education courses for re-certification every three years.

Licensing and certification have different advantages and disadvantages. From a financial point of view, voluntary national certification is preferable to mandatory state licensing because it results in a lower cost of installation and provides greater consumer choice than mandatory licensing. In areas that do not require solar contractor licensing, certification can provide a baseline level of quality. State licensing may be restrictive, as state licenses do not typically transfer, so geographic mobility may be an issue

Description (continued)

for installers. Yet, in states where solar installation is becoming more common, state licensure may protect consumers from potential safety hazards and will ensure that systems are installed properly. While both licensing and certification have drawbacks, requiring solar contractors to be licensed or certified is preferable to no regulation of installers and will result in baseline standards being met, which will in turn lead to higher consumer satisfaction.[1]



Status & Trends

Solar contractor licensing began in the 1980s as the introduction of incentive programs for solar water heating resulted in an increasing number of installations. State regulation and licensing of solar contractors continues to evolve as the industry has matured. Currently, 12 states and Puerto Rico have solar contractor licensing requirements.

Status & Trends (continued)

The contractor licensing requirements described here refer to solar-specific licensing requirements, rather than general electrical or plumbing contractor licenses. Most states require PV or solar thermal system installations to use a licensed electrical or plumbing contractor, respectively.

Some states require solar installers to obtain a separate, specialized solar contractor's license. In most cases, solar is a specialty classification under the general electrical or plumbing licenses and all appropriately licensed contractors can install solar systems without the solar specialty license. However, contractors can get the solar specialty license and install systems without having the full electrical or plumbing license. This reduces the cost of licensure for contractors who plan to only install solar systems.

Even in states that do not have contractor licensing requirements, state financial incentive programs often have installer requirements such as pre-approval or in a couple of cases, NABCEP certification. Although intended as a voluntary, value-added credential, NABCEP certification is now either mandatory or is preferred for contractors who wish to participate in several state incentive programs. For example, for solar installations to be eligible for state rebate funds in Maine, Minnesota, or Wisconsin the PV systems must be installed by a NABCEP-certified professional. California, Delaware, and Massachusetts prefer or recommend that NABCEP-certified professionals install systems receiving rebates. In Utah, NABCEP-certification is a prerequisite for qualifying for a state solar contractor license.

In the absence of state licensing or certification requirements, local governments may

Status & Trends (continued)

adopt regulations or have their own licensing procedure. Madison, Wisconsin and Austin, Texas are examples of cities that have acted in advance of the state government by adopting solar contractor licensing and/or certification requirements.

For solar electric systems installed in the United States, nearly all aspects of licensing are governed by the North American Electrical Safety System. Many organizations, however, are involved in developing product codes and standards, testing, and approvals.

- Standard Practices: The IEEE/American National Standards Institute (IEEE/ANSI) develops standards and recommended practices.
- Product Certification: The Occupational Safety and Health Administration's (OSHA) Nationally Recognized Testing Laboratories (NRTLs) - such as the Underwriters Laboratory (UL) - conduct product certification, listing, and approvals.
- Permitting, Inspection, Interconnection: The electrical building department officials and the Authority Having Jurisdiction (AHJ) conduct permitting, plan review, and inspections, and the local electric utility grants interconnection approvals. The NEC and the National Fire Protection Association (adopted as law by most local jurisdictions) govern installations.
- Installer Certification: The NEC (along with OSHA and the U.S. Department of Labor) establishes the qualifications of those who are allowed to work on electrical systems, including their experience and training on the associated safety hazards.[2]

Examples

- Florida began offering solar contractor licenses in the 1980s. Until 1994, Florida offered limited specialty licenses for residential solar hot water and pool heating, as well a general solar contractor's license. Those specialty licenses have not been issued since then, although installers holding those licenses may renew them. The new solar contractor license defines a broader scope of work. With the new license, solar contractors have the authority to install, maintain and repair solar hot water systems, solar pool heating systems and

Examples (continued)

photovoltaic systems in residential, commercial and industrial facilities. If the scope of work for a solar installation is covered under the scope of work for another contractor license, then the contractor does not need solar specialty license to perform that work. Likewise, solar contractors can perform minor electrical, mechanical, plumbing, or roofing work that is covered by the solar contractor license and that pertains to the installation of the solar energy system (for residential systems only). To qualify for a license, installers must have four years of experience, which may include both installation and education and at least one year of experience must be in a supervisory role. An individual must also pass an examination to become certified as a solar contractor. The licensing exam is in two parts and tests both business and financial management and general solar knowledge.

- Utah is unique in requiring NABCEP certification, in addition to other requirements, to qualify for a solar contractor license. Utah's Division of Occupational and Professional Licensing requires installers of solar energy systems to be licensed contractors. The Division has established two contractor license classifications--one for solar PV and one for solar thermal. A Solar Photovoltaic Contractor is licensed for the fabrication, construction, installation, and repair of photovoltaic cell panels and related components including battery storage systems, distribution panels, switch gear, electrical wires, inverters, and other electrical apparatus for solar photovoltaic systems. A Solar Thermal Systems Contractor is licensed for the construction, repair and/or installation of solar thermal systems up to the system shut off valve or where the system interfaces with any other plumbing system. To become a licensed solar contractor in Utah, an installer must have a minimum of two years of experience as an employee of a contractor licensed in the license classification applied for, or the substantial equivalent of a contractor licensed in that license classification, and NABCEP certification.

- Madison, Wisconsin is an example of a local government that has adopted licensing requirements for solar thermal installations in the absence of state regulation. Madison recently changed its building regulations for solar technology for the first time since the 1970s. The city previously required installers to have a city license for solar water heating, but NABCEP's Solar Thermal Installer certification is now accepted as an equivalent.

Resources

- DSIRE: Summary of Solar Contractor Licensing Policies in the U.S.

- Solar Licensing Database, Pat Fox, Interstate Renewable Energy Council, July 2010.

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- North American Board of Certified Energy Practitioners (NABCEP) website
- Credentialing: What's in a Name? A Lot, J. Weissman, Solar Today, October 2009.
- The Qualified Solar Installer, J. Dunlop, Solar Today, October 2009.
- Costs and Benefits of Practitioner Certification or Licensure for the Solar Industry, Interstate Renewable Energy Council, May 2002.

Footnotes

[1] Costs and Benefits of Practitioner Certification or Licensure for the Solar Industry, IREC, May 2002.
[2] Solar Powering Your Community: A Guide for Local Governments, US Department of Energy, January 2011.

DSIRE Solar Policy Guide:
A Resource for State Policymakers

This guide is meant to serve as a living document and is updated quarterly to reflect new solar policy initiatives, trends, and resources.

For questions about the content, contact DSIRE (dsireinfo@ncsu.edu)