

Survey of State and Local Incentives for Solar Photovoltaics: California Programs in an International Context

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Solar generation systems are costly and incentives help reduce the costs. The proper mechanism design in combination with other measures determines the success of the program. The different kinds of incentives are discussed below.

A. Direct Incentives

Direct incentives from governments and utilities¹ reduce the installed cost of residential and small commercial systems by 20% to 60% through upfront means like grants, rebates and buy-downs or through providing a revenue-stream via performance-based incentives. **Rebates** and **buydowns** are similar in that they pay system owners once the system is up and running but buydowns refer to reductions in the installation costs while rebates just give a certain amount of money back after installation. **Grants**, on the other hand, award funding for systems that are yet to be installed and usually involve detailed and competitive applications for larger systems.² These upfront incentives reduce the initial equipment and installation costs, whereas performance or production-based incentives reduce costs by providing cash payments based on a monetary value per kilowatt-hour (KWh) of electricity produced over a period of time. Upfront incentives are very popular but performance-based incentives are gaining ground because they lead to maximized system design, installation and production.

Trends and Tips

Most countries offer direct incentives for solar hot water installations in homes but direct incentives for the installation of solar panels are given without preference to consumer type. The bigger incentives, which are in the form of grants, are awarded to commercial and industrial energy consumers and these range from the hundred thousands to millions of dollars. Such is the case of the Crowne Plaza in Alice Springs, Australia wherein it received a \$1.5 million grant from the Australian Government to install the largest roof-mounted PV system in Australia to date so that it can reduce 0.5% of the city's electric load.³ Some have also enacted laws that require new buildings to be energy efficient, and in South Korea the new building code highly recommends having solar installations and direct incentives from the government maybe availed of for these.⁴ In the US, many states and local governments also offer direct incentives for building low-cost housing that install solar. Studies in the US have found a number of best implementation practices and issues to consider:^{5,6}

- Determine the direct incentive level with complementary incentives in mind such as tax credits and feed-in-tariffs. The overall incentive package should be high enough to stimulate demand that will meet targets.
- Budget and funding streams should be secured as uncertain funding may disrupt any progress stimulated by the direct incentives and potential participants may hold off purchase and installation in anticipation of renewed funding.
- Application process should be easy and concise but should not compromise the level of technical and financial details necessary for project feasibility.

¹ Utilities that give incentives are usually the IOUs and state-owned or municipally-owned utilities.

² NC State University - Solar Center. "DSIRE Solar." Dsireusa.org. DSIRE. 2009. Web. 28 Aug 2009.

³ Garrett, Peter. "Power Turned on at Largest Solar System in Australia." Department of the Environment, Heritage and the Arts, 2009. PDF.

⁴ Evans, M., Chon, H., Shui, B. and Lee, S-E. "Country Report on Building Energy codes in Republic of Korea." U.S. Department of Energy, 2009. PDF.

⁵ Gouchoe, Susan, Evrette, Valeria and Haynes, Rusty. "Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy." National Renewable Energy Laboratory, NREL/SR-620-32819, 2002. PDF file.

⁶ NC State University - Solar Center, 2009. op. cit.

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- Support for adequate training and certification programs should be in place to meet the demand for trained technicians. Incompetent installers frustrate and discourage consumers.
- There should be support and cooperation with utility providers to have an easy interconnection process for PV systems
- A cost-effective quality-assurance mechanism guarantees adequate system performance and protects consumers.
- Details of program use, cost and solar energy production should be tracked for evaluation and improvement.
- Allow flexibility for program modifications.

The Case of California: The California Solar Initiative⁷

California created a performance-based buy-down solar program that is offered to commercial, industrial, agricultural, institutional, and low-income residential customers by three investor owned utilities in the state, with a component assigned to non-state regulated public power utilities. The CSI goal is to install over 3,000 MW of solar systems on homes and businesses by 2016. As of July 1, 2009, the program has reached 13 percent of its goal for installed capacity and has another eight percent of pending installation, totaling over 600 MW. Demand for the program has grown rapidly with over 22,000 solar applications which, including both pending and installed systems, will account for an estimated 373 MW of new solar capacity.⁸

The program was developed in 2006 with a US\$2.167 billion budget to provide different level of incentives depending on the project, customer class and available incentive in the utility territory. The buy-down was designed to have a ten-step degression wherein the incentive level decreases as the demand for solar energy increases, until the incentive reaches zero. Each step is allocated a certain megawatt target for each utility and customer class; once the target generation has been reached for a step, it moves up to the next step with a lower incentive. The program is also divided into an Expected Performance-Based Buy-down (EPBB) for systems smaller than 50 KW in capacity and into a Performance Based Incentive (PBI) for systems over 50 KW and over 30 KW starting 2010. Customers under the EPBB can receive a one-time payment based on the expected performance of their system, which is calculated through equipment ratings and installations factors while those under the PBI pay monthly over a period of five years based on actual production, i.e. a dollar per kilowatt-hour generated.

Advantages and Disadvantages

Direct incentives are usually given as a complement to other incentives like tax credits and feed-in tariffs (these are discussed later on) because they help drive demand despite high prices early in the technology development and in the long run will, ideally, increase production levels, decrease prices and expand markets until subsidies are no longer needed. They are also more advantageous than tax credits in the sense of having a broader range of participants than being limited to those who have a tax appetite; however, they are also more politically impracticable because government funds are needed for these direct incentives. When a budget crisis occurs or when funds run out, the direct incentives will be stopped and it may disrupt whatever progress it has achieved.

⁷ The California Solar Initiative. Go Solar California Site, n.d. Web. 28 Aug. 2009.

⁸ Governor Schwarzenegger Praises Success of California Solar Initiative, California News release, June 30, 2009

B. Renewable Energy Payment System/Feed-in-Tariffs

A Feed-in-Tariff (FIT) or renewable energy payment system is a very popular incentive mechanism that is proven to be the most successful for stimulating the market and investments in solar.⁹ A FIT is the fixed price per unit of electricity that a utility or electricity supplier has to pay to a private generator over a definite period of time for the generation of renewable electricity fed into the grid.¹⁰ It is similar to a performance-based incentive but it is a payment from rate-payers rather than a payment from the government.

Payment of FIT can be structured in different ways that will meet the policy objectives of the province/municipality such as a net feed-in tariff, which only pays for excess renewable energy produced, or a gross feed-in tariff that pays for all renewable energy produced.¹¹ The FIT rate may be a fixed-price, a predetermined payment that is independent of electricity market rates; a non-variable premium price, a fixed, predetermined adder; or a premium-price where the premium varies with the spot-market electricity price.^{12,13} FIT rates can also be set to gradually decrease over time to promote innovation.¹⁴

Trends and Tips

FIT policies are now implemented in over 45 countries and regions¹⁵ with policies varying depending on the goals of the jurisdiction and the acceptable cost burden in the area. A FIT policy can be tailored to utility-scale projects owned by project developers or distributed generation projects owned by individuals. Many European FIT policies are designed in a way that utilities are obliged to purchase, at a premium, electricity from large utility-scale project developers and from private individuals who have solar installations. Ideally, for purposes of public acceptance and political sustainability, the extra cost for paying the premium is relatively small and shared among all energy users, making it barely noticeable in the bills. In Germany, this extra monthly cost per household is only €2.00 to €3.00. The National Renewable Energy Laboratory (NREL) in the US has developed recommendations on how to design and implement a FIT:¹⁶

- FIT interaction with the RPS should be considered and it should complement the RPS.
- Have a clear rationale for the FIT rate, which can be based on either the levelized cost of generating the electricity, or on the value to society and/or the utility of producing electricity from solar
- Consider the FIT payment structure that will best work for the objectives.
- Make sure there is easy access to the grid.
- Differentiating FIT payment levels should be considered for the location of the solar project, the size of the system and the quality of the installation at the particular site

⁹ Gipe, Paul. "Renewable Energy Policy Mechanisms." 17 Feb 2006. PDF file

¹⁰ European Environment Agency. "Feed-in Tariff." eea.europa.eu. EU. Web. 28 Aug. 2009.

¹¹ "Feed-in Tariff for Grid-Connected Solar Systems." Energymatters.com.au EnergyMatters. Web 28 Aug. 2009.

¹² Spot Market: Also known as spot price and is the price of electricity at one point in time in the market; the price is based on the supply and demand for immediate requirements (source: energystore.com)

¹³ NREL. "Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions." 2009. PDF.

¹⁴ Parliament of Australia. "Feed-in Tariffs." Aph.gov.au. Parliament of Australia Library, 2009. Web. 28 Aug. 2009.

¹⁵ "Global Solar Leaders to Policymakers: Tax Incentives Don't Go Far Enough." World Future Council and Solar World, 14 Oct. 2008. Doc.

¹⁶ NREL, 2009. op. cit.

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- Decide the acceptable cost burden and how to weigh the impact relative to resulting job creation and economic benefits
- Determine who will own the renewable energy certificate (REC) that result from the solar power generation – the utility who can use the RECs to meet RPS requirements, or the system-owner who can sell it in the REC market

Advantages and Disadvantages

The contracts for FITs usually last for 15 to 20 years and this helps meet the RPS and creates a stable investment environment that will stimulate the economy and create new jobs. In Europe, the FIT policies have driven the creation of \$30 billion a year industry¹⁷ and it is cited as the main driver of the Danish, Spanish and German renewable energy markets. Benefits of FIT have included:^{18,19}

- Accelerated use of renewable energy since FITs are empirically proven to have the fastest deployment of renewable energy.
- Avoid large government subsidies
- Overcome barriers in market entry for solar installations particularly with costs, pricing and legal and regulatory framework for grid access
- Drive economies of scale through the rise in demand and investments and market expansion.
- Promote new industrial activity in areas where the FIT is introduced.
- For national FITs, it encourages the deployment of solar installations in a wide geographic area.
- See installations of different sizes and technologies that can get a shorter period of guaranteed pay-back.
- Gain public support through public participation in the scheme with no direct taxpayer cost and through increased awareness of the benefits of renewable energy

Despite these advantages, FIT may result in higher than justified profits for system producers if the FIT is set too high a rate. If the tariff is also too high and/or it was not designed to be sustainable for the long-term, it may lead the market to crash as is with the case of Spain. If the price is not also set right, it will not do much to accelerate the market like in California.

Case of California: Inadequate FIT? ^{20,21}

The California Public Utilities Commission (CPUC) approved two FIT systems in 2008 for the purchase of up to 480 MW of renewable energy to help the State meet its climate mitigation and renewable energy targets, and to complement large alternative power deals between utilities and private companies. The FIT program is also not equal for all electric utilities involved – the seven utilities involved have been approved to purchase generations from renewable energy systems located in public water and wastewater facilities with up to 1.5 MW capacity, and two out of the seven can also buy from non-water and non-wastewater systems. Three out of the seven utilities can also provide two FIT payment options- a Full Buy/Sell Arrangement where the utilities buy all eligible generation net of station use, or an Excess Sale Option where the eligible

¹⁷ “Global Solar Leaders to Policymakers: Tax Incentives Don’t Go Far Enough.” op. cit.

¹⁸ World Future Council, n.d. op. cit.

¹⁹ Parliament of Australia, 2009. op. cit.

²⁰ Wang, Uclia. “California Feed-in Tariffs: The Price Isn’t Right.” Greentechmedia.com. Greentech Media. 3 2009 April. Web. 28 Aug. 2009.

²¹ “California Approves Feed-in Tariffs for Renewable Energy Systems.” Eere.energy.gov. Energy Efficiency & Renewable Energy. 20 Feb. 2008. Web. 28 Aug. 2009.

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facility uses a part of its own generation to meet its own load and the rest is for the utility to purchase.

The CPUC determines the market rate (based largely on the cost of natural gas) that ranges from \$0.80 to \$0.31/KWh, depending on the time and the day. Some have said that the rates are low since they are based on the cost of building and operating a combined-cycle natural gas power plant, and not the actual cost of generation of a renewable energy resource. Another limitation to the California FIT that inhibits investments in solar and renewable energy is that facilities participating in the tariff cannot avail of other state incentives.

As of April 2009, only PG&E, out of the seven utilities, had signed power purchase contracts that only have a total of 9.6 MW capacity as part of the FIT - none of these involving solar. The inadequate FIT and State incentives have led to lobbying for higher rates for small-scale power generation systems such as for homes and business. Some developers would also like to have the option of opting out of the long-term contract with one of the utilities if they can get a better price in the market. It has also led the State's public utility commission to consider including projects with capacity of up to 20MW into the FIT since it has been found that there is a niche role for FIT in the 1 or 2 MW to 5-20 MW area.²²

C. Tax and Fee Reduction

i. *Property Tax Incentives*

The capital cost for solar installations are high and this increases the property tax burden. One way to reduce this burden is through a *property tax incentive* that involves exemptions, tax abatements, tax credits or special assessments that eliminate or alleviate the increase in the assessed value of the property.²³ Since property tax is levied at the local level – in cities, county capitals, townships and districts, the local government can insulate the residents and businesses in its area that has solar installations or plan to install solar energy systems from higher property taxes that will result from such installations. An additional incentive through a tax abatement or credit may also be given to encourage small scale installations. In the US, a few states allow tax breaks for a defined period ranging from 5-20 years but most exclude solar installations from property tax for an indefinite period. Separate policies that preserve a portion of property tax or assess the property as a non-renewable energy property/facility maybe developed for large-scale or utility-scale installations,²⁴ which are rapidly growing, so as to give revenue to the local government.

Advantages and Disadvantages

Property tax incentives for solar projects can encourage solar installations in the community by reducing or eliminating the added cost of having a solar installation, which reduces the overall cost of the project. This is especially valuable in areas where property taxes are high.²⁵ Property tax incentives alone may not draw a lot of installations as solar energy system costs are still high and gives a very long rate of return; complimentary policies such as rebates could add more value to the tax incentive.

²² Interview: Chris Busch, 2 Sep. 2009.

²³ NC State University - Solar Center. op. cit.

²⁴ "Solar Powering Your Community: A Guide for Local Government." op.cit.

²⁵ "Solar Powering Your Community: A Guide for Local Governments." op. cit.

The Case of New York City: Real Property Tax Deductions

In New York City, where real estate is gold for the local government, a tax deduction of 8.75% percent is given to total real property taxes over a course of four years when PV systems are installed. This gives a total tax benefit of up to 35% 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. This incentive is similar to an investment tax credit but it differs in a way because the tax benefits are recouped through reduced property taxes on the host building instead of the income taxes. Aside from this, property owners may avail of the state-wide property tax exemption that local governments are required to offer.

ii. Income/Investment Tax Credits

An income tax credit directly reduces the amount of total income tax that the system owner will pay, while an income tax deduction reduces the amount of gross income in which tax calculations are based. The amount to be deducted on both tax credit and tax deduction is based on a percentage, usually between 10-50%, of the total system cost or investments made for the solar installation.²⁶ These are useful in cases where there are no other direct funding resources available, but it would also work well to complement other financial incentives. In the US, a federal investment tax credit of 30% of the total installed system cost is set and will expire in 2016.²⁷ This federal tax credit is coupled with federal and state rebates, and state feed-in tariffs depending on the incentives available in the state.

One way to implement an income tax incentive is through a *clean renewable energy bond (CREB)*, which is an interest-free loan for qualifying solar facilities that is funded through the sale of a special-purpose tax credit bond. Investors do not receive an interest payment from the bond, instead they receive tax credits.²⁸

Tips and Trends

Most countries and states that have income tax incentives for solar installations use income tax deduction, as this is more valuable than an income tax credit since it is the tax base that will be reduced. The income tax incentive is often given to the property owner but in Belgium, the tax reduction that started in 2003 has been extended to renters as of 2005. Belgium also gives the tax reduction, which is currently at 40% of installation cost with a cap of €2,600 per household for solar thermal and €3,380 for PV, for solar renovation projects and not just for new installations.²⁹

A few best practices for using income tax incentives are below:

- Determine the best type of income tax incentive to be used – tax credit or tax deduction, and the rate in context with other existing incentive programs
- Consider the target of the income tax incentive program, i.e., who will benefit from the tax credit/deduction. Some allow homebuilders to claim the credit/deduction to encourage the construction industry to integrate solar energy systems in their developments
- Aside from income tax deductions or credits, consider tax exemptions

²⁶ Ibid.

²⁷ NC State University - Solar Center. op. cit.

²⁸ Ibid.

²⁹ *Global Renewable Energy Policies and Measures Database*. iea.org. OECD and IEA. Web. 28 Aug. 2009.

- Easy application and tax filing process

The Case of the US: The Helios Project Clean Renewable Energy Bonds (CREBs)³⁰

CREBs are used mainly in the public sector to finance renewable energy projects through the issuance of US\$800 million worth of bonds, wherein the interest will be received in the form of a tax credit. A grassroots organization called KyotoUSA is leveraging on the CREBs and the federal Qualified School Construction Bonds (QSCB), an income tax credit bond where funds are used to build/renovate schools, to finance solar panels and other renewable energy systems in schools all over the state of California. More than 200 schools districts applied and a total of 43 schools will receive between US\$1-\$25 million in funding for their construction, and solar and renewable energy projects.

Advantages and Disadvantages

Like other tax incentive mechanisms, income tax credit and deductions encourage the installation of solar energy systems by reducing the overall cost of the system. Institutions without tax liabilities such as schools, non-profit organizations and government facilities, are disadvantaged by this policy since they do not pay income taxes, they cannot avail of this incentive. Some states in the US like Oregon, however, have developed provisions to include this benefit to non-taxed organizations and entities.

iii. Sales Tax Incentives

Sales tax exemptions through refunds or upfront non-payment or discount are given for purchasing and installing solar energy systems and its components. A sales tax often ranges from 1-12% and reducing or removing that will not significantly reduce the overall cost of the solar energy system. Complementary policies should be set to have greater cost reductions for solar investments.

Trends and Tips

In the US, sales tax incentives are often in the form of a full exemption and some states give the sales tax incentive at the register and buyers have to obtain a certificate of exemption from the government, which they give to sellers to avail of the sales tax incentive.³¹ Sellers then keep the certificate to verify to the government that a sale was exempted. Some US states – Kentucky, Ohio, Utah, and Wyoming—only give exemptions to commercial buildings or to systems that meet certain minimum size requirements, while some states only offer the incentive only for residential systems. In Argentina, they stretched-out remittance of the 21% value-added tax.

A few recommendations for sales tax incentives are:³²

- Determine whether sales tax exemptions are authorized at the provincial or municipal level
- Evaluate the impact sales tax exemptions will have on the community since sales tax incentives are not that high. Also, in most cases, a sales tax exemption for solar systems will not decrease sales tax revenues compared to previous years; it will just not increase as more solar systems are installed
- Consider sales tax exemptions for all solar technology equipment and not just one kind

³⁰ *The Helios Project*. kyotoUSA, 2009. Web. 28 Aug. 2009.

³¹ NC State University - Solar Center. op. cit.

³² *Solar Powering Your Community: A Guide for Local Government.* US Department of Energy – Energy Efficiency & Renewable Energy, 2009. PDF.

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- If it has been decided that solar systems and installations will be taxed, consider setting aside a portion of the tax revenue for energy efficiency or renewable energy projects.

Advantages and Disadvantages

Equipment cost is reduced through a sales tax incentive but this alone will not be enough to significantly bring the investment costs down, and it may only encourage a few to invest in solar. A local sales tax exemption that is combined with the provincial sales tax incentive helps make the solar equipment and installation more affordable.

iv. Permitting Fee Reductions, Process Improvements

Permitting incentives reduce or waive fees for different local permits that are incurred when installing a solar energy system such as a building permit fee, electrical permit fee and design review fee. Permits are required to ensure that the system meets engineering and safety standards, and in cases where there are performance-based incentives, that the system will meet performance standards. A building permit confirms that a roof can support the weight of a solar system or that a ground-mounted system will not obstruct public right of way. Design review and electrical permit will make sure that a PV system will not cause a power surge hazard or any electrocution.

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. Valuation-based fees are calculated based on the cost of the solar system.”

Trends and Tips

By reducing or waiving permit fees, and having a speedy process for solar-related permits, the government is removing a barrier to community investments in solar projects. The lost revenue can be added to other permit fees for less-desirable projects. A few practices for implementing permitting incentives are:

- Consider a flat-fee method that reflects the actual costs of issuing the permit
- Make easy access to the fee structure and required procedures. Explain in the simplest possible terms.
- Streamline and fast-track solar permits to the extent appropriate, such as for standard residential installations or those from contractors with a reliable track record.
- Have a tiered permit fee structure for the different sizes of equipment such as a fee for small PV systems up to 4KW, another fee for 4-10KW systems, and another one for systems above 10KW.
- Study the best amount of fee that can be charged

Advantages and Disadvantages

Like all other tax incentives, a permitting fee incentive alone will not drive growth in solar development. It is best used in complement to other policies and incentives. There are jurisdictions that impose no permitting fee whatsoever while there are jurisdictions, such as in

the US that charge as much as US\$1,000 for a solar permit,³³ and this can discourage investments in solar.

The Case of Arizona: Permit Standards³⁴

In May 2008 the state of Arizona established standards for how permits are awarded and the method used to determine permit fees for solar installations. The State's counties and municipalities used to design and implement their own fees and these were generally derived from a formula that takes into account the cost and size of the project along with the cost of conducting inspections. With the new State standard for fees, any building or permit fee for solar construction must be directly discharge the expense of the service for which the fee is charged. They must also not exceed the actual cost of issuing a permit, and upon the request of the system owner/installer, an itemized list of the individual costs associated with the permit fee must be provided.

D. Loan Programs

A drawback for residents, organizations and businesses to install solar generation systems is the cost associated with it, and one way to encourage solar installations is through a loan program that can be administered by government or non-government agencies and utilities directly, or by leveraging funds from private lenders. There are two types of loan programs that are often used, a *low-interest loan program* and a *property tax financing program*.³⁵

i. Low-Interest Loan Programs

A low-interest loan program for solar installations is a form of financing that is often initiated by the government and executed by a government agency or a private lender, and the interest rates are lower than the market rate or may even be given at zero-interest, depending on the policy for the loan program. International non-profit development organizations, as well as local non-government organizations, also provide low-interest loan programs for renewable energy which may directly work with interested electricity consumers to finance a solar project, or together with the national or local government in running a loan program like the United Nations Environment Program (UNEP). Having the option of a low-interest loan program will encourage individuals, groups and businesses to install solar instead of receiving financing at normal market rates, which are high, through a private lender or financial institution that will add up more to the payback period of the system and reduce the financial viability of installing a solar system.

Trends and Tips

In the US, 41 existing state loan programs target energy efficiency and solar installations for non-profit organization and public buildings such as government buildings and schools. Those that are exclusively for renewable energy installations usually target low-interest loans for commercial buildings. The loan programs also have a cap, which is around US\$1 million in the US for commercial-scale projects and US\$10,000-US\$30,000 for residential projects. Each project type also has different interest rates and repayment terms, which is usually between 3-30 years. Some utilities offer unsecured loans, and a repayment term of ten years for residential solar installations.

³³ "Solar Powering Your Community: A Guide for Local Governments." Op. cit.

³⁴ Ibid.

³⁵ "Solar Powering Your Community: A Guide for Local Governments." Op. cit.

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Local governments also collaborate with a bank or community development organization to secure low-interest or interest buy-downs and favorable terms. In India, the vast solar off-grid network is supported by low-interest loans of rural banks, NGOs and state agencies that specialize in microfinance. A low-interest commercial lending program initiated by the UNEP and Germany's Ministry of Environment is also being used in the Aceh province of Indonesia to primarily disseminate the use of a solar dryer for drying agricultural and aquatic products of the province such as coffee, cocoa, betel nut and fish, as well as to help give electricity through solar PV to the grid-deprived area.³⁶

The best case practices for a low-interest program include:

- Multiple funding options such as a public benefits fund, annual appropriations from government budget, funds from alternative compliance payment of the RPS, environmental non-compliance penalty payments, revolving loan funds, and sales of bonds
- A zero to low-interest rate with a long repayment term and minimal fees
- Easy and concise application and approval process that also identifies what solar technologies and are qualified
- Efficient tracking mechanism of program for future program evaluation
- Market the loan program through coordination with other government agencies and relevant groups
- Clear provision for late payments and non-payment or bad debts

Advantages and Disadvantages

The cost of the solar generation system and its installation is spread out over the life of a loan and this greatly reduces the upfront costs, which would encourage customers. The loan program that is initiated by the government not only offers zero to low interest rates but also better terms, and lower transaction costs with private lenders. If there is a revolving fund mechanism, a loan program may even become self-sustaining, which increases its political appeal than a direct incentive.³⁷ If coupled with a tax incentive, such as in Netherlands, more private lenders will provide low-interest loans for renewable energy that will be of no direct cost to the government. A loan program may, however, go wrong if proper measures are not in place and if it is not managed properly. Fraud may occur if no controls are in place and like with other lending programs, there is a risk of acquiring bad debts if applicants are not screened properly and if no strict yet easy payment process is set. Also, if the loan program is zero-interest or is a clean loan program,³⁸ it usually requires more stringent requirements and approval process which may discourage those interested in solar and it may significantly limit the number of approved loans.

ii. Property Tax Financing³⁹

Property tax financing is the financing used when purchasing a home under a mortgage, and this same type of financing is also used to deploy solar. Jurisdictions across the US are starting to use this mechanism to enable consumers can pay for their systems over time on a monthly, quarterly or semi-annual basis instead of one lump sum. The local government lends money to property owners and they repay the

³⁶ "Aceh Solar Loan Program." United Nations Energy Programme, 2008. PDF.

³⁷ "Solar Powering Your Community: A Guide for Local Governments." op. cit.

³⁸ Clean Loans are unsecured loans; there is no surety or collateral tied to the loan in cases of non-payment

³⁹ Solar Powering Your Community: A Guide for Local Governments." op. cit.

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loan under a long-term contract – typically 20 years, where a special assessment of their individual property tax bill is done. The funds for the loan comes from clean energy renewable bonds (CREBS) or municipality/government bonds, wherein the interest is paid back thru a tax credit or reduction, or by collecting payments through a new line item on participating property owners' property tax bills. The property tax financing also ties the solar installation to the property so that when the participating owner sells the property, the loan obligation due from the equipment is passed on to the new owner.

Trends and Tips

This program is completely optional and property owners may choose not to participate in it if they install solar energy equipment on their property. Local jurisdictions must be able to create a special assessment district or other type of district that allows repayment via property tax bills. Recommendations from the experience of US counties and municipalities include:

- Identify if a clean energy bond or municipal bond can be issued and if it will be adequate to support a property assessed solar/renewable energy program in the jurisdiction. Identify also if there are other government bonds that can be used for such an initiative.
- Design a financing structure that yields enough income to cover the principal and interest payments, and a reserve fund for bad debts/delinquent participants
- Determine if an internal or external organization is more conveniently suited to run the program.
- Work with the program administrator to create a simple application process
- Promote the program and consider financing energy efficiency aside from renewable energy projects
- Prioritize property owners who have received energy audits or who have made informed decisions about the most cost-effective installations and improvements for their property

Advantages and Disadvantages

The main advantage to this financing program is that it offers a long-term, secured, fixed-cost financing option that is tied to the property, so participants may freely move and change properties. Local governments will be able to entice more participants and investors with this type of financial model, and it can help meet climate and energy goals with little to no liability or exposure to the government's general fund. Like other programs, this also has administrative costs, which could be repaid through inclusion in the bond issuance and application fees of program participants. Some cities also choose companies to administer the program for them to lessen administrative costs. This type of program can also be self-sustaining and have zero budget impact.

The Case of Berkeley, California: The Berkeley First Initiative⁴⁰

The City of Berkeley, CA, recently adopted a solar financing measure allowing homeowners to implement PV projects (as well as solar water heating and energy efficiency measures) on their property while avoiding the high up-front cost of PV equipment that is all too often a barrier to residential and small commercial deployment. This measure, called the Berkeley Financing

⁴⁰ "Berkeley FIRST Financing Initiative for Renewable and Solar Technology." Ci.berkeley.ca.us. City of Berkeley, n.d.

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Initiative for Renewable and Solar Technology (Berkeley FIRST), attaches the cost of PV equipment and installation to the homeowner's property tax. This allows homeowners that opt in to pay back the cost at a low fixed interest rate over 20 years as a slight addition to their bi-annual property tax bills, instead of paying ten to twenty thousand dollars up front for a PV system. Funding for FIRST comes from a municipal bond issued by the city, which takes advantage of the city's credit and allows interest rates to remain low.

Similar measures are beginning to be adopted by many other U.S. cities, and the creation process behind Berkeley FIRST can serve as a model for cities seeking ways to increase implantation of small-scale by capital-intensive solar and efficiency measures. The Vote Solar Initiative in California has produced a report on Berkeley FIRST that goes into detail on how other cities can implement similar programs.⁴¹

In order offer such a program, and finance project installation Berkeley issued municipal bonds for upfront capital.⁴² Getting to the point of being able to issue the bonds, however, required that Berkeley authorize a form of Special Improvement District; these districts are typically used to finance projects that benefit the public, such as parks, sewer projects, sidewalks and the like. Berkeley created a special district they call a "Sustainable Energy Financing District" that would facilitate solar and energy efficiency projects so that they serve the public good by reducing dependence on polluting sources of energy generation.

E. Renewable Portfolio Standards, Solar Set-Asides, and Multipliers

A sure way for a government to deploy renewable energy is to set a *renewable portfolio standard* (RPS)⁴³ or what is called in Europe as a *renewable obligation or quota system*. The RPS is a mandatory goal for electricity providers to use a specific percentage of eligible renewable energy in their electricity sales or in their generating capacity within a specified time period.⁴⁴ California who has the most aggressive RPS in the US, require utilities to have 20% of electricity supply to come from renewable energy by 2010 and 33% by 2020, whereas the UK only has a 10% quota by 2010 and 20% by 2020. In most countries, the RPS is implemented on the power producer and/or the electricity distributor but in Italy importers are also included,⁴⁵ and in Sweden, aside from the suppliers, consumers who use electricity they generated, imported or purchased on the Nordic Power Exchange also have a quota obligation.^{46 47}

Electricity providers pay a fine when they do not meet the RPS. PG&E, the largest utility provider in California and the US, currently has a 14% renewable energy supply and they are six percent short from meeting the 20% California RPS by the end of next year. If they don't meet this, they will have to pay US\$0.05/KWh below the RPS target, with a ceiling of US\$25 million per year, not unless they are found by the California Public Utility Commission to have

⁴¹ This report is available at <http://www.votesolar.org/city-initiatives/municipal-property-tax-financing.html>

⁴² Ongoing administration of the program is paid for by a portion of the charges attached to participants' property tax charges, and is not covered by the bond money.

⁴³ The difference between an RPS and the *renewable portfolio goal* is that the latter is not legally binding.

⁴⁴ NC State University - Solar Center. op. cit.

⁴⁵ Weller, Julia. "Best Practices and Lessons Learned in Drafting Renewable Energy Laws in EU." Pierce Atwood, LLP, 11-13 July 2008. PowerPoint.

⁴⁶ EREC. "Renewable Energy Policy Review - Sweden." European Commission, 2009. PDF.

⁴⁷ Ministry of Sustainable Development. "Renewable Electricity with Green Certificates." Regeringskansliet, 2006. PDF.

made a “good faith effort” in meeting the RPS.⁴⁸ Countries have used two ways to meet the RPS – through tendering systems or through green tags/RECs. Tendering systems involve competitive bidding for contracts to construct and operate a renewable energy facility while RECs can be purchased for every kWh of *brown power* generated and/or sold.⁴⁹ Some countries and states allow the use of both to meet the RPS while there are those that don't. The State of Rhode Island has also another way to let providers meet its RPS - through a compliance payment of \$60.92/MWh⁵⁰ to the State's Renewable Energy Fund, a public benefit fund for renewable energy development and demand-side management.⁵¹

Trends and Tips

The RPS is not specific to a particular eligible resource so utilities may get their supply from a mix of renewable resources. This, however, leads to more deployment and use of low-cost renewable technologies such as landfill gas, biomass and onshore wind, than other technologies that cost more such as solar PV.⁵² To promote solar or other renewable technologies, a credit multiplier or a *set-aside* is used. Credit Multipliers maybe included within an RPS to provide an additional credit towards RPS compliance for the energy derived from solar or another specified renewable technology. On the other hand, a set-aside or carve-out is used to provide a provision within an RPS that require the use of a specific renewable resource, usually solar, for a certain percentage of electricity sales or generation. By requiring the use of solar rather than giving bonus credit for its use, a set-aside is more effective than a credit multiplier.⁵³ New Mexico and Maryland even cancelled their solar multipliers in favor of a solar set-aside. Three US states conversely use both a solar credit multiplier and a solar set-aside.

There are different ways to design an RPS and it depends on how clear the goals and objectives are. The best practices for promoting solar through RPS include the following.^{54,55}

- Develop broad support for an RPS
- Include a solar set-aside that increases over time or a combination of set-aside and a credit multiplier
- Identify the different types of solar installations eligible such as customer-sited installations, rooftop or ground-mounted, utility scale installations, etc.
- Use energy generation rather than installed capacity as a target and set a long timeline to encourage private investment
- Ensure that net metering/smart meter and interconnection standards facilitate customer-sited solar installations and other eligible renewable technologies
- Make sure there is transparency and ease of use in the accounting and tracking, verifying and trading solar REC systems for compliance.
- Impose a credible monetary penalty mechanism for non-compliance or have an alternative compliance payment option for those that do not meet the RPS

⁴⁸ San Diego Tax Payers Association. “Proposition 7: Solar and Clean Energy Act of 2008.” n.d. PDF.

⁴⁹ “Global Energy Revolution- a Sustainable Global Energy Outlook.” Institute DLR. Greenpeace, Global Energy Scenario and European Renewable Energy Council, 2008. PDF.

⁵⁰ The rate is for the 2009 RPS of four percent.

⁵¹ NC State University - Solar Center. op. cit.

⁵² Handley, David and Turner, Guy. “*The Costs of Supplying Renewable Energy.*” Enviro Consulting for UK Department for Business, Innovation and Skills, 2005. PDF.

⁵³ Wisner, Ryan and Barbose, Galen. “*Renewables Portfolio Standards in the United States – A Status Report with Data through 2007.*” Lawrence Berkeley National Laboratory, 2008. PDF.

⁵⁴ NC State University - Solar Center. op. cit.

⁵⁵ “*Renewable Portfolio Standards Fact Sheet.*” epa.gov. US EPA, 2009. Web. 28 Aug 2009.

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- Require long-term solar power purchase or contracts for solar RECs to ensure financing for project developers
- Make a long-term commitment to the RPS and keep it consistent. Conduct mid-course performance review.

The Case of Austin, Texas: Solar Set-Aside⁵⁶

The City of Austin set a renewable portfolio goal of five percent by 2004 in 1999 for its municipal utility, Austin Energy. The funding for renewable resources was achieved through a green pricing program where customers can opt to have the power charge on their electric bill come from renewable energy instead of fossil fuel for a period of ten years. The State of Texas then created an RPS that municipal utilities can have the option to opt into. The City of Austin, however, decided to develop its own RPS policy that was approved in 2003 and directed the city's municipal utility, Austin Energy, to enter into a contract with the World Wildlife fund to achieve a 20% renewable energy component in the utility's energy mix, among other objectives. The ten year strategic plan of Austin Energy was also created in the same year and it included a 20% RPS that had a solar set-aside of 15MW of solar generating capacity by 2007 and 100 MW by 2020. A rebate program for PV systems was also created to support the RPS. In February 2007, the mayor's Climate Protection Plan was approved and this increased the city's RPS to 30% by 2020, with the solar set-aside unchanged at 100MW. By the end of the 2007 fiscal year, however, the city only had 5.8% renewable energy in its mix, with only 1.6MW of solar generated.

Advantages and Disadvantages

The RPS creates a market demand for renewable energy that stimulates technology and economic development due to the government requirement for renewable energy supply and together with a solar set-aside and credit multiplier it helps move investments toward solar energy. Other main advantages include:

- Creates long-term bankable contracts for RE Generators and with a solar set-aside, it increases investor and developer confidence on solar technology
- In US states with a solar set-aside, there has been a direct correlation with increased solar development and a mandatory solar set set-aside
- Less ongoing government intervention; the only significant role for the government is monitoring compliance and enforcement of penalties⁵⁷
- One of the simplest and transparent policy options

Even though the RPS is a market-based program, and is argued by some to be the one of the lowest costing policies for the government if not the lowest, it is still a government regulation that imposes operational costs.⁵⁸ If no set-aside or credit multiplier is also implemented within an RPS, eligible renewable technologies compete and high-cost systems such as solar PV lose out.

F. Customer Aggregation Pricing

Customer Aggregation Pricing or group purchase programs reduce the upfront cost of solar installations through a discounted rate given to bulk purchases by groups of individuals or businesses. The government (usually local) may organize groups to apply for group purchase programs but purchase groups are often formed through own initiative.

⁵⁶ NC State University - Solar Center. op. cit.

⁵⁷ Komor, Paul. *Renewable Energy Policy* NE: iUniverse, Inc., 2004. 157.

⁵⁸ Ibid.

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The groups may either members of a community interested in solar that will directly apply and negotiate for a reduced or discounted rate from solar providers and installers, or a third-party run program that act as the middleman for residents and/or small businesses in a community who want to install solar such as the San Francisco group *1 Block Off the Grid* who sought help for preferential pricing from solar installers and for developing request for proposals (RFP) from the city government. A *co-operative* is also emerging and it is a purchasing structure composed of home and/or business-owners that come together to secure preferential pricing⁵⁹ and it is gaining popularity in communities such as in the State of Maine and in Toronto, Canada.

Trends and Tips

Customer aggregation pricing and solar co-operatives are being used by groups usually in areas where solar incentives and policies have not yet been firmly established by the government. Groups form and solicit from solar vendors for bulk discounts and little government participation is needed. Some tips to get community and business groups to engage in customer aggregate pricing are below:⁶⁰

- Promoting the pricing program to neighborhood associations and community groups through informational meetings to get them interested in participating in an aggregate purchasing program
- Assist with the preparation of a request for proposals from solar vendors
- Assist reviewing proposals from solar vendors and determine which one has the best cost, system type, quality assurance, etc.
- Choose a reputable vendor with a track record of high-quality installations and assist in clarifying the terms of the contract

The Case of San Francisco: Aggregating Neighborhood Purchases^{61, 62}

In 2008, a group of individuals in the city of San Francisco started an organization called 1BOG or 1 Block Off the Grid to make solar more affordable for groups of people in their neighborhood. 1BOG assists residents and homeowners who want to install solar panels but find that solar panels are too expensive, the process involved is too complicated or they don't know which installer to trust. The City of San Francisco also facilitates 1BOG and other communities with the preferential pricing from solar vendors for their bulk solar purchases and assists them with information about solar aggregation and preparing the letters for request of proposals for group purchases. The communities the city is assisting include Precita Valley with 100 households installing solar, Cathedral Hill with four multitenant buildings as the purchasers, and St. Francis Woods with 30 households seeking the discount.

Advantages and Disadvantages

Solar aggregation programs help local governments reach their solar energy goals faster by accelerating solar purchases since they are purchased in bulk and it reaches a wider group of members in the community.⁶³ The program also allows interested purchasers in a community to obtain lower up-front purchase costs. The program, however, may also lead to community or co-operative owned installations which may be an issue for some individuals or business-owners who want to have sole ownership of the system.

⁵⁹ "Solar Powering Your Community: A Guide for Local Governments." op. cit.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² 1BOG- One Block Off the Grid Website. 1BOG, n.d. Web. 28 Aug. 2009.

⁶³ Ibid.

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Since the groups are also soliciting for the bulk purchase discounts, the rates they get are varied and not all solar vendors may give them a discount. The costs might still be too high for groups, if there are no other government incentives set.

DRAFT

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California Solar Initiative

<http://www.gosolarcalifornia.or>

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Database of State Incentives for Renewables & Efficiency - Solar

<http://www.dsireusa.org/solar>

A spin-off the DSIRE website that is dedicated for all US state solar policies, incentives and resources.

Global Renewable Energy Policies and Measures Database

<http://www.iea.org/textbase/pm/?mode=re>

A database of the different renewable energy policies in different countries.

The Helios Project

<http://www.heliosproject.net/>

The Helios Project aims to install solar and renewable energy systems in California schools through the use of Clean Renewable Energy Bonds, which pays through a tax incentive, among other funding.

One Block Off the Grid

<http://1bog.org/>

A nationwide community-based organization that helps residents install solar through bulk purchase discounts on installations.

PACT – Policy Action on Climate Toolkit

<http://onlinepact.org>

A website created by the World Future Council that is dedicated to Feed-in Tariffs.

Renewable Portfolio Standards Fact Sheet

http://www.epa.gov/chp/state-policy/renewable_fs.html

A webpage that is all about the RPS and has a summary of the different eligible resources used in the RPS of different states.

Solar America Cities

<http://www.solaramericacities.energy.gov/GuideForLocalGovernments.aspx>

Solar America Cities is a project of the US Department of Energy – Energy Efficiency & Renewable Energy division. The official webpage has resources, news, publications and links about the different American cities that are going solar.

Solar Set-Asides in Renewable Portfolio Standards

<http://www.dsireusa.org/solar/solarpolicyguide/?id=21>

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A webpage about the RPS and how solar set-asides are used in the US

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