


Clean Energy States Alliance

Distributed Renewable Energy Finance and Policy Toolkit

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EXECUTIVE SUMMARY

Over the past decade, states have played an increasingly important role in providing financial support to renewable energy projects, with funding often derived from state-established public benefit funds. The financial support tools for renewable energy projects have ranged from rebates to competitive grants to loans. Complementing these tools has been a set of public policies—tax incentives, net metering and interconnection rules, renewable portfolio standards—passed by state legislatures and regulators. Recently, the American Recovery and Reinvestment Act (ARRA) also provided significant funding to states to support clean energy investments. The purpose of this report is to describe the many financing options available to state energy offices, municipal governments, and other energy agencies for utilizing public funds for clean energy project support. The report analyzes their strengths and weaknesses and identifies best practices. One key finding is that, while each tool has its own strengths and weaknesses, the use of these tools as a portfolio of approaches creates the most robust, effective programs.

INTRODUCTION

Throughout the country, states are looking for ways to support distributed renewable energy projects. There are several reasons why states support the growth of distributed renewable energy generation:

- **Market Transformation**: High, upfront costs of renewable energy technologies discourage installations of these technologies. By accelerating demand for and the rate of adoption of these technologies, states can help to drive manufacturing innovation, increase scale and bring capital costs down, leading to more widespread adoption.
- **Environmental Benefits**: Distributed renewable generation can reduce greenhouse gases and other pollutants associated with power generation. This benefits public health both locally and globally.
- **In-State Economic Benefits**: A robust renewable energy market creates jobs for distributors, installers and manufacturers of these systems.
- **Reduced Consumer Electricity Costs**: Renewable energy systems have no on-going fuel costs and help customers immediately and permanently lower their utility bills.
- **Supply Diversification**: Distributed generation helps states to reduce their dependency on certain fuels and central generation facilities.

WHAT'S IN THE TOOLKIT?

FINANCING TOOLS

- Rebates
- Performance-based incentives
- Grants
- Loan programs (direct loans, subsidized interest, directed deposits, PAYS)
- Loan guarantees
- Leases
- REC Purchases
- Feed in Tariffs or Standard Offer Contracts

TAX INCENTIVES

- Investment Tax Credits
- Sales Tax Exemptions
- Property Tax Exemption

- **Grid Security**: Distributed renewable energy can reduce the stresses on electric distribution grids, particularly in periods of peak power demand. This lowers the risk of blackouts and the need for costly grid upgrades.

This Toolkit provides an overview of financing tools that states are using to advance distributed renewable energy technologies. The portfolio of options is broad and includes some tools which can be used in any state regardless of the state's political or regulatory climate or particular renewable resource mix.

EVALUATION CRITERIA

In evaluating each of these financing tools or programs and their appropriateness for a given market and technology, states should consider the following criteria:

- **Does it facilitate market transformation?** The financing mechanism should allow the state to gradually diminish support over time, drive technology cost reductions, and enable the building of a mature market.
- **Is it adaptable to changing market conditions?** The financing mechanism should be flexible in response to changing market conditions, such as a breakthrough in technology or price.
- **Does it increase investor confidence?** A financing program should be designed for longevity in order to make the market more predictable to investors.
- **Is it economically efficient?** For public funding to be used efficiently, the program design should provide only the incentive level required to make the project viable.
- **Is it sustainable?** Can the program be maintained and funded for a sufficient duration to achieve market transformation?
- **Does it have low administrative costs?** The financing program should require fairly low administrative costs and be simple to apply for and participate in without excessive administrative burden.
- **Is it open to wide participation?** An effective financing program will offer an appropriate type and level of incentive to address the specific needs of a wide variety of technologies, sectors, and participants, including low income customers.
- **Does it leverage private capital?** The financing tool must fill financing gaps that private capital cannot meet; it should not replace the need for either private equity or debt.
- **Is it measurable?** Program results must be able to be measured in terms of completed projects, quantity of energy generated or saved, and financial leverage obtained.

THE IMPORTANT ROLE OF PUBLIC BENEFIT FUNDS

Before describing the range of financing programs available to states, it is critical to emphasize that all of these programs are dependent on the establishment of robust, predictable and long-term funding sources. Today, most of the states' financing programs for clean energy are made possible through the establishment of a Public Benefit Fund. Public Benefit Funds (PBFs) are special-purpose funds set up to support renewable energy and energy efficiency investments within a state. They are typically funded through a modest surcharge on utility bills, although they may have a more specific source of funding (for example, a negotiated settlement with a utility). Sixteen states have PBFs that support both renewable energy and energy efficiency projects while six other states have PBFs which support energy efficiency only.[1]

PBFs have a number of benefits as a legislative and administrative mechanism to support clean energy projects. While many PBFs arose out of utility restructuring, they can work regardless of whether the utility sector is deregulated or traditionally regulated (i.e., vertically-integrated utilities with traditional cost-recovery ratemaking). PBFs allow for the use of an equitable funding mechanism (i.e., a charge per kWh of electricity consumed) without depending upon an annual state budgeting process for continued funding. A PBF offers significant flexibility in how funds are applied to support renewable energy and energy efficiency, allowing the funds to respond to market opportunities and conditions. Finally, by creating an equitable funding structure, the cost of a PBF to each ratepayer is known in advance.

The size of public benefit funds varies widely from state to state as a percentage of retail electric sales. Public benefit funds for energy efficiency have been established at levels of up to 2.5% of revenue while renewable energy funds typically have not exceeded 0.75% of revenue.

Funds can be administered through a new state agency set up for that purpose, an existing state energy office or an independent entity, such as a public benefits corporation[2] or a non-profit organization.[3] Whether run through an existing agency or independent entity, it is critical that the legislative or regulatory structure protects the fund from "raiding" for a state's general revenue fund. Since the source of funding is generally a designated utility rider (rather than a tax), funds should be designated and protected for the purpose for which they were collected. Nevertheless, it is critical in both legislative language and regulatory decisions that the funds collected be explicitly protected for use in supporting clean energy. Other means to protect the funding are to 1) minimize fund balance carryovers from year to year, 2) ensure independent evaluations of fund expenditures and results, and/or 3) establish an independent board to guide and promote the fund.

A critical challenge for PBFs is to ensure the durability of the fund itself. Long-term funding sources are essential in building robust markets for renewable energy and energy efficiency. Programs should run a minimum of five years because markets take time to build, and programs take time to implement effectively. Comprehensive, independent evaluation of programs should be conducted at least annually. These evaluations help to guide the direction of the fund. More importantly, they give a clear picture to regulators and public officials with respect to the cost-effectiveness and energy savings/energy production attributable to the programs.

1 This does not include utility-run efficiency programs funded through a systems benefit charge.

2 For example, the Massachusetts Renewable Energy Trust.

3 For example, Wisconsin Energy Conservation Corporation administers Wisconsin's Focus on Energy program.

LEADING PUBLIC FINANCING TOOLS AND MECHANISMS

REBATES

Rebates are lump-sum payments that cover a portion of a renewable energy project's capital cost and are normally paid to the project owner upon project installation. Funds offer rebates for a defined set of widely-available renewable energy technologies—solar photovoltaic, solar hot water systems, geothermal systems and small wind turbines. Rebate programs establish specific criteria for eligibility—for example: system size, performance standards, and the use of approved installers or application (e.g., residential or commercial). Rebates are generally capacity-based subsidies in which the absolute amount of the rebate is a function of the size of the renewable energy system installed.

Rebate levels are ideally based on the market cost of a technology and the desired support of that technology. Many states provide rebates based on a fixed dollar amount per watt of installed capacity. An important feature of these programs is that rebate levels can be adjusted downwards as the cost of the technology declines, other state or federal incentives become available, or market acceptance of a technology increases. Rebates can also be capped based on a maximum dollar amount per project or maximum project size. Table 1 lists current rebate levels for residential solar photovoltaic systems offered by several leading state clean energy funds. Rebates for commercial-scale systems are generally lower.

STRENGTHS

- **Supports Market Transformation**: By providing financial support to a large number of similar projects, rebates help to drive market demand, bring installed costs down and, over time, reduce the need for the rebates.
- **Adjustable**: Rebates can be adjusted from one program cycle to the next based on market conditions, changes in state or federal tax laws, and program goals. They can also be tailored to give differential or preferential support to

Table 1. Examples of Current Residential Solar PV Incentives

State	Rebate Level ($/Watt)	Maximum System Rebate	Notes
Arizona (Arizona Public Service)	$3.00/watt	50% of project cost up to $75,000	
California	$1.10 -1.55/watt (varies by utility, incentive declines as more systems are installed).	None	Alternative performance-based incentive of $0.15-$0.22/kWh. Performance-based incentives required for non-residential systems >30kW
Maryland	$1.25/watt (1st 2kW) $0.75/watt (from 2-8kW) $0.25/watt (from 8-20kW)	$10,000	Maximum system size eligible for rebates: 20kW; home energy audit required
New Jersey	$1.75/watt	$17,500 (10 kW)	Subtract $0.20/watt if no energy audit performed; owners can also sell solar RECs
New York	$3.00/watt (1st 4kW), then $2.00/watt (next 4kW)	$20,000 (8 kW)	Applies to NYSERDA coverage area only; individual utilities have different incentive levels; incentives can be reduced based on siting factors (shading, orientation)
Oregon	$2.00 -2.25/watt	$20,000	Varies by utility
Wisconsin	$1.50 per kWh of production per year	25% of system cost up to $35,000	Production estimated, based on rated system performance and siting factors

Source: *www.dsireusa.org* and individual program websites.

different types of applications (e.g., commercial, municipal, affordable housing) or projects in certain geographical areas of a state.

- **Provides Upfront Capital**: Rebates provide much-needed capital to projects, reducing financing requirements and accelerating return on investment. Upfront rebates reduce financial risks associated with renewable energy projects, enabling faster market growth.
- **Low Administrative Burden**: Once rebate levels and program budgets are set, rebate processing is relatively simple. Applicants fill out a form confirming their and the project's eligibility, providing proof of purchase/installation and demonstrating that they have met any other program conditions (for example, the use of a certified installer).
- **Equity of Opportunity to Participate**: Rebates are equitable to the extent that system owners are eligible regardless of income levels or ability to submit a successful grant proposal that may be required for "competitive" funding opportunities.
- **Facilitates Program Evaluation**: At the end of a reporting period, programs can report exactly on the program spending and the resulting installed system capacity as well as renewable energy generated.

WEAKNESSES

- **Creates Rebate Dependency**: Customers may only install renewable energy systems when rebates are available. If the rebate levels decline or the programs end, demand for the technology may drop off. This is partly due to the high level of rebate support that states have determined is needed to move the market for certain technologies.
- **Economically Inefficient**: It is challenging to set economically efficient rebate levels to prevent over- or under-subsidization, and to provide only the incentive level necessary to make projects viable. For example, one homeowner may install a solar PV system without regard for system payback whereas others may not install a system unless it pays for itself within ten years. In addition, commercial projects may be economically viable with much lower incentives because of their ability to more fully utilize available state and federal tax incentives.
- **Depletes Program Funding**: Rebate programs use up program funding with no recovery. Once the funds are awarded, they are spent with no return back to the fund.
- **Uncertain Project Performance**: Traditional rebate programs can specify equipment specifications and installer qualifications; but they generally cannot control site selection or long-term system performance. As a result, some programs are moving towards performance- or output-based incentives. See the discussion on performance-based incentives below.

The extension and expansion of federal tax credits for solar and small wind systems in 2008 is encouraging many clean energy fund managers to revisit their rebate levels. Combining the 30% federal investment tax credit with rebates that can cover up to 50% of installed costs provides support levels in excess of what may be needed. Fund managers should revisit incentive levels to evaluate total (state and federal) incentives relative to system costs and prevailing electric rates in the area. For example, in late 2008, New Jersey's Board of Public Utilities reviewed rebate levels in light of changes in federal incentives and elected to lower residential rebate levels for all new projects going forward.

- **Not Well Suited to Emerging or Non-standard Technologies**: Rebate programs are best suited for market-ready, standard technologies and are not appropriate for supporting nonstandard technologies or early stage technologies.

BEST PRACTICE RECOMMENDATIONS FOR REBATE PROGRAMS

Since rebates have been the most widely-used public financing mechanism for distributed renewable energy, state experiences in administering these programs have led to an extensive set of best practices. Below is a sampling of these practices:[4]

- **Ensure Program Continuity**: Ensure that rebate programs run for several years with limited programmatic changes to build market awareness and dealer support. Renewable energy systems have long purchase-decision cycles.
- **Partner with Dealers and Installers**: These partnerships work to both the program and market's advantage by building consumer confidence, ensuring quality installations, increasing competition and lowering the costs of installation (eventually allowing for reduced rebate levels).
- **Promote Technology-Friendly Policies**: Rebates by themselves will not help to build a market if potential customers are thwarted by policy barriers ranging from unfriendly local building codes and zoning restrictions to restrictive net metering and interconnection rules.
- **Provide Clear, Consistent Eligibility Rules**: Rebates can offer differential support based on project location, ownership type and system size; but these distinctions should be clear, equitable and simple.
- **Ensure System Performance**: Provide rebates only for approved equipment and/or installers. Hold back a portion of the rebate amount until local building officials or other designated agencies verify systems are operating properly.
- **Market the Program Effectively**: Create an effective marketing plan to establish the value proposition of solar energy (lowering electric bills) and make consumers aware of the creative, easy-to-use solar financing offerings available to make solar affordable.[5]
- **Use Declining Funding Blocks**: Consider distributing the rebates more or less evenly over a series of funding blocks of decreasing incentive value to reflect anticipated cost reductions over time.

EXAMPLE—Rebate Program

Wisconsin's Focus on Energy program has a strong quality control dimension to its solar electric cash-back rewards program. First, it provides support for renewable energy site assessments to ensure that projects are feasible prior to submission. Second, its incentive system is based on estimated production rather than simply capacity. System capacities are adjusted for tilt angle, azimuth and snow and obstacle shading to calculate estimated annual kilowatt-hour production. In 2009, rebates ranged from $1.50 to $1.00 per kWh generated over an average year for systems owned by tax-paying customers, and from $2.00 to $1.50 kWh generated over an average year for systems owned by not for profit and governmental (i.e., non tax-paying) customers. Rebates were limited to 25% and 35% of system cost and a maximum of $45,000 and $75,000 for tax-paying and non tax-paying customers respectively. To further quality assurance, all projects must use a qualified installer. New installers must be either NABCEP certified or attend a recognized advanced installation course and have their first installations reviewed. Over the first eight program years, 450 residential and 225 non-residential systems have been installed.

PERFORMANCE-BASED INCENTIVES

Performance-Based Incentives (PBIs) are tied to system performance and actual energy generation rather than units of installed capacity. PBIs are paid on a per kilowatt-hour basis for a fixed number of years. The idea behind PBIs is to encourage good system siting, the use of equipment that meets performance specifications, quality installations and ongoing maintenance. PBIs can also reflect the relative "grid value" of a technology or system. For example, solar PV systems located in densely populated urban areas could conceivably receive higher PBIs because those systems reduce distribution system stress during peak load periods.

PBIs are not the only way to assure that performance criteria are met. Other approaches include equipment standards and warranty requirements, installer training and certification, design and siting standards, post-installation inspections and ongoing system monitoring. However, fund managers are adopting PBIs as a way of shifting the risk for system performance to the system owner.

A number of different PBI models[6] can be used. These include:

1. a multi-year incentive that is based on actual system performance,

4 For a more extensive analysis and best practice recommendations specifically targeted at solar PV (although applicable to other technologies), see "Mainstreaming Solar Electricity: Strategies for States to Build Local Markets", written by Clean Energy Group, April 2008, available at *www.cleanegroup.org/reports*.

5 See "Smart Solar Marketing Strategies: Clean Energy State Program Guide" written by Clean Energy Group and SmartPower, August 2009. *www.cleanegroup.org/Reports/CEG_Solar_Marketing_Report_August2009.pdf*.

6 A thorough discussion of approaches to performance based incentives can be found in a joint LBNL/CESA report. "Designing PV Incentive Programs to Promote Performance: A Review of Current Practice", November 2006, available at *www.cleanenergystates.org/library/reports*.

2. expected performance-based buy-downs, i.e., making an upfront rebate payment but adjusting it to the expected performance of the system based on rated system efficiency and siting factors,[7]
3. incentive holdbacks, where a portion (50% or more) of a rebate is paid 6-12 months after system installation upon submission of performance data,
4. a "compressed" PBI providing performance incentives only over the first year's operation of the system (in essence, a rebate paid in installments), and
5. paying PBIs on estimated rather than verified system output, based on system size, rated efficiency and site characteristics (to reduce system monitoring requirements).

In establishing PBI programs and incentive levels, program managers need to make several decisions related to project technologies and sizes, customer classes and duration of the incentive payments.

These decisions include:

- **Project Technologies**: While the number of solar PV installations makes them the principal target for PBIs, PBIs can also be used for small wind systems, solar hot water and even anaerobic digesters.
- **Project Sizes**: PBIs can be used for any size project. However, they may be more appropriate for larger-scale projects (for example, solar PV installations of 25 kW or larger). Because there is more exposure of ratepayer or other public dollars per project, these larger projects are more easily financed without an upfront, capital cost buy-down, and performance monitoring is less of a burden.
- **Customer Class**: PBI incentive levels should be set separately for residential, commercial and public-sector projects to reflect both size-related system cost differences and the differential ability to utilize state and federal tax incentives.
- **Duration of Incentive Payments**: PBIs are not a long-term guaranteed rate; they are an incentive paid out over time. One year may be long enough to verify system performance while reducing ongoing monitoring and administrative costs. Five years may help program budgeting by spreading payments out over time while encouraging on-going system maintenance; but it will carry a longer administrative burden.

It is important to draw a distinction between a PBI and feed-in tariffs (described later in the Toolkit). A PBI is not a "tariff" designed to cover the market premium needed to support renewable energy installation and is not intended to provide long-term price support. Rather, it is a way to support projects while protecting the use of public dollars by aligning PBI awardees' financial interests with the performance-related interests of the fund.

There is some overlap between PBIs and net metering laws. Since most distributed renewable generation is installed in states with net metering, system owners already have an incentive to select, install and maintain their systems to maximize performance. PBIs serve to reinforce that incentive.

STRENGTHS

- **Economically Efficient**: While PBIs do not address upfront financial need, they guarantee that the greatest incentives go to the most productive projects.
- **Reduces Risk and Motivates Quality Installations**: Production incentives reduce the financial risk of poorly-performing projects. Because they are based on energy output, production incentives can ensure that applicants are thoughtful about technology and site selection, installation and system maintenance. A poorly-performing project will receive less support over the life of the incentive than a high-performing one.
- **Sustainable**: Spreading incentive payments out over a number of years may allow a program to support more projects over time.
- **Leverages Private Capital**: PBIs place the burden of upfront capital costs on private debt and equity contributions.

7 A number of states, including California, Wisconsin and New York, adjust standard rebate levels based on site characteristics and rated performance of a system. See, for example, a description of the calculation of these adjustments found on pages 32-36 of the California Solar Initiative Handbook found at *www.gosolarcalifornia.org/documents/CSI_HANDBOOK.PDF*.

- **Avoids "PTC Haircut"**: Upfront rebates or grants can affect the ability of projects that are eligible for federal production tax credits to fully claim these credits. Upfront capital payments may also reduce the depreciable basis of a project. Based on previous IRS rulings, an ongoing production incentive should not have these impacts.

WEAKNESSES

PBIs also have disadvantages relative to capacity-based rebates:

- **Provides No Upfront Support**: PBIs do not help to overcome upfront, cost barriers for renewable energy systems unless they are paid up front, based on estimated system performance. Therefore, they may be better suited for 1) systems installed at the time of building construction when their costs can be wrapped into a mortgage or 2) systems owned by third parties.
- **Declining Time Value of Money**: Rebates or grants are worth more than the equivalent support through a PBI.
- **Ongoing Obligation**: PBIs impose an ongoing financial obligation by the sponsoring entity.
- **Ongoing System Tracking**: PBIs require the measurement or at least some estimation of system performance to make periodic payments based on this performance. These requirements may increase administrative costs.

BEST PRACTICE RECOMMENDATIONS FOR PBI PROGRAMS

- **Tailor PBIs to Projects and Ownership Status**: PBIs should reflect differences in costs between small and large systems and differences in tax status among owners.
- **Minimize Administrative Burden**: Particularly for smaller systems, PBIs should be based on expected, rather than actual performance. This expected performance should be based on both rated system capacity and site characteristics. Systems should also be spot-checked to ensure ongoing performance.
- **Limit Length of Payments**: Even for larger systems, PBIs should not be paid out over a long duration (e.g., life of the system) but, rather a period that is long enough to stretch out payments while proving system performance.
- **Set PBI's Based on Required Rate of Return**: For commercial systems, in particular, the level of PBIs should be set to allow a target rate of return for project owners to achieve a rate of return, inclusive of other state and federal incentives.

EXAMPLE—PBI Program

California has introduced a PBI for solar systems between 50 kW and 1 MW in size. This program offers a PBI of $0.22–$0.37/kW depending on location and system ownership (commercial or public/non-profit). The PBI will gradually decline as more solar capacity is installed. After January 1, 2010, all systems over 30 kW in size must use these performance-based incentives instead of rebates. California also has an "Expected Performance Based Buy-down" (EPBB) for residential systems systems below 50 kW, which combines a performance-based incentive with the simplicity of a one-time rebate. The EPBB is based on a formula that combines system capacity, system rating and a design factor reflecting site characteristics. For details on this program, see Section 3.2 of the California Solar Initiative Handbook, *www.gosolarcalifornia/documents//CSI_handbook.pdf*.

GRANTS

Grants can provide financial support to projects at different stages of project development from feasibility assessment to construction. Grants are used for larger, less standard projects where the degree of required project support and the expected energy output of the project can vary considerably. Grants are also useful for demonstration projects or pre-commercial technologies. Finally, grants can be used for all types of technologies and project sizes when program funding is limited. This allows program managers to award project support on established criteria and strategic

program objectives rather than "first come, first served" awards as in rebate programs.

Grant programs are run through a solicitation or request for proposal (RFP) process and require applicants to put together a comprehensive application package including technical, economic, environmental and financial details on their project. Program managers review applications and determine whether to support a project and at what level of funding, sometimes using external advisory groups or consultants with technical expertise. Grant funding can also be awarded through a "reverse auction" process in which projects bid against one another, and grants are awarded to the set of projects that request the *least* amount of funding.

In "best practice" grant programs, the program managers do much more than issue RFPs, evaluate applications and make awards. The program manager partners with the project developer or owner to ensure that the project is successful and public funds are well-spent. This involves ongoing assistance with a project's technical issues, zoning or permitting approval, financing and construction.

States have developed a range of competitive solicitations for grants, from highly structured to more open and competitive solicitations. Highly structured competitive solicitations, less structured solicitations, and a willingness to accept certain unsolicited applications all have merit in certain circumstances. The benefits of clearly defined competitive solicitations (identifying a distinct technology area, such as wind or fuel cells) lie in encouraging competition for limited funds, potentially lowering costs. They also result in an open and less politically sensitive proposal selection process. Many states have determined, however, that a more open competitive solicitation is appropriate to encourage new technologies and innovative proposals.

Table 2. Examples of Evaluation Criteria for Grants

Team and Qualifications	• Relative commitment of applicant and applicant understanding of project compared to other similar applications. Related criteria may include the applicant's commitment to proceed to construction, and the applicant's impetus for the project. • If applicable, the commitment of other key players, such as site property owners (if different than the applicant). • Qualifications, experience, and commitment of the key technical personnel in providing similar services for other projects.
Project Characteristics	• Suitability of site and on-site energy load for proposed project. • Proposed renewable energy system technical feasibility, efficiency, and onsite utilization. • Economic analysis or estimates supporting the ability of proposed project to meet or exceed the end user's target payback threshold. • Feasibility of ownership model(s). • Project risks relative to similar proposed projects. • Development progress and timeframe relative to similar proposed projects. • For new construction or major renovation projects seeking additional green building incentives, evidence of overall commitment to relevant standard.
Project Programmatic Benefits	• Use of commercial technologies new to State (e.g., PV tracking system) • Location in an electric utility congestion area; improvement of homeland security or system reliability. • Diversification of projects based on renewable energy technologies, building applications, and geographic distribution throughout the State. • Potential for replicability - the degree to which the project provides lessons applicable to other projects. • Potential for public visibility and access.
Scope of Work and Schedule	• Understanding of deliverables. • Clarity and reasonableness of work plan (realistic goals and timetables).
Incentive Request	• Cost benefit of dollars requested per watt relative to similar proposed projects. • Amount of request relative to overall project budget.
Budget	• Reasonableness of the budget relative to the proposed level of activity and deliverables.

For all competitive solicitations, it is important to establish clear criteria by which a proposal will be judged.[8] Common criteria employed by states include:

- The impact of the proposal on the renewable marketplace
- Cost/kWh generated
- The visibility of the project
- Financial assuredness of the proposal
- Potential for securing and leveraging private financing
- Environmental and public benefits

Table 2 provides a more detailed set of criteria that can be used in evaluating grant requests.

STRENGTHS

- **Focused Solicitations**: RFPs can be targeted to focus on particular technologies, market segments or geographic areas.
- **Project Selectivity**: Competitive grant programs allow fund administrators to select projects that best meet the criteria of the solicitation or strategic needs of the program.
- **Adjustable**: Grant awards can be adjusted based on the financial needs or other criteria of a particular project, the number of applications, and available funding.
- **Leverage Private Capital**: Grants typically only cover a small share of a project's overall cost and therefore effectively leverage limited public dollars.
- **Supporting Demonstration Projects**: Grants can encourage pilot and demonstration projects.
- **Program Publicity**: Since projects are often more unique and fewer in number, grants provide an opportunity to generate publicity for both the project and the fund.

WEAKNESSES

- **Excessive Awards**: Grants may provide more support to a project than is needed, eliminating project risk and reducing the role of private capital (debt or equity) in the project.
- **Fewer Awardees**: Although projects which receive grants are generally larger, there are fewer of them than in a rebate program. This may limit the political base of support for the program. Legislators enjoy seeing projects in their districts.
- **High Administrative Costs**: The grant application and review process is time consuming for both the applicants and the fund program staff. The application process may discourage good projects from seeking funding, particularly in a competitive program with limited funding.
- **No Guarantee of Project Results**: Grants can be awarded to projects that ultimately never get built (although grant funds remain un-spent) or perform below expectations.

BEST PRACTICE RECOMMENDATIONS FOR GRANT PROGRAMS

- **Ensure Focused RFPs**: RFPs should be targeted specifically at the technologies and/or sectors the fund is trying to support. Different technologies may require different RFPs.
- **Establish Clear Evaluation Criteria**: The RFP should contain clear and specific evaluation criteria. This will both help applicants and allow grant reviewers to review each application consistently.
- **Grant Awards Should Be Based on Project Need**: Grant awards should be based on the project's, not the applicant's, financial need. They should fill a funding gap required to meet a reasonable rate of return on the investment and take into consideration other available incentives and financing opportunities available to the project.
- **Consider Emerging Technologies**: Grant programs should consider how best to support emerging technologies to drive innovation and new markets. However, the fund may wish to be protected from these projects' increased risk by requiring greater matching funds or providing a portion of the grant at time of project commissioning.
- **Provide Milestone-Based Payments**: Grant awards can be paid out over time based on a project reaching specific development milestones. This will reduce the financing burden on the project owner. At the same time, fund managers should be able to "un-commit" funds for projects not moving forward in a timely fashion.

8 See the RFP for the Vermont Clean Energy Development Fund grant program as an excellent example of a competitive grant solicitation. *http://publicservice.vermont.gov/energy/ee_files/cedf/July2009CleanEnergyDevelopmentFundRFP.pdf*

EXAMPLES—Grant Programs

- **Connecticut:** The Connecticut Clean Energy Fund's Onsite Renewable Distributed Generation Program provides flexible grant support to buy down the cost of renewable energy generating equipment. The level of support for individual awards will vary based on the specific economics of the technology and project with a maximum grant per project of $4 million. There is a technology-specific funding cap per watt of capacity. Additionally, the program offers grants of up to $50,000 per installation to support site-specific technical and financial feasibility studies. *http://www.ctcleanenergy.com/default.aspx?tabid=95*
- **NYSERDA**: The New York State Energy Research and Development Authority has issued a recent solicitation for grants to support the manufacturing of renewable energy and energy efficiency products in New York State. Maximum grants are up to $1.5 million per company. (*http://www.nyserda.org/funding/1176summary.pdf*)
- **Massachusetts Renewable Energy Trust**: Massachusetts' clean energy fund has a wide range of grant solicitations including a Commonwealth Wind grant program for community-scale wind projects. This program provides financial support for site assessment, project feasibility and, ultimately, wind turbine installation. (*http://www.masstech.org/renewableenergy/CommonwealthWind*)
- **Wisconsin Focus on Energy**: Wisconsin has been a leader in the promotion and installation of anaerobic digesters and energy generation through biogas combustion for many years. Wisconsin's program offers grants up to $250,000 for qualifying systems. In addition, Wisconsin provides extensive feasibility and technical assistance to dairy farmers considering the installation of a digester. (*http://www.focusonenergy.com/Incentives/Renewable/Biogas*)
- **Energy Trust of Oregon**: The Energy Trust of Oregon supports the "above-market costs" of projects utilizing "emerging technologies" as well as existing technologies in new end uses. The Energy Trust retains a project's renewable energy credits in exchange for the grant support. The Energy Trust also provides grants covering up to 50% of feasibility study costs. (*http://www.energytrust.org/grants/up*)

LOAN PROGRAMS

Loan programs have been used by states for both renewable energy and energy efficiency improvements. These programs help to reduce upfront cost barriers of renewable energy systems and improve upon the standard credit and lending terms that may be available for these systems from private lenders. There are several types of loan programs that have been offered by states—each has varying degree of capital requirements, risk and administrative responsibility.

DIRECT LOANS

With a direct loan program, an agency or fund underwrites and manages a portfolio of renewable energy project loans. The initial capital for this program can be appropriated from the state or allocated from a state clean energy fund. The state can also issue a tax-exempt bond to provide the initial capital base for the loan program. Payments on the bond are supported by interest payments on projects receiving loans from the loan fund. The program can be established as a revolving loan fund in which principal payments from one loan are used to make subsequent loans. Under a direct loan program, interest rates may be at or below interest rates offered by private lenders for similar projects. Because the program's underwriting team has greater understanding of renewable energy technologies, economics and risks, a state-supported loan program may be more likely than private lenders to both underwrite a given renewable energy loan and provide favorable terms.

STRENGTHS

- **Adaptable**: Loan programs supported by PBFs or other state programs can offer below-market interest rates and longer repayment terms to match the actual energy production and cash flow of the project over time.
- **Sustainable**: A loan program allows the state to deploy capital and recover it with a return, to be used or loaned again (assuming no defaults).
- **Fills Lending Gap**: A state-sponsored loan program is more likely to approve renewable energy loans than private lenders because the loans are consistent with policy objectives and underwriters are more familiar with the technologies.
- **Provides Project Screen**: Loan approvals by state-sponsored loan funds provide a mark of confidence to other investors or private lenders who may provide additional project financing.

WEAKNESSES

- **High Capital Requirements**: The capital required to establish a public loan fund may exceed that required for rebates or grants since project loans may need to cover a larger share of the project cost. For example, a state clean energy fund might provide $100,000 in grant assistance but a $600,000 loan for a $1 million project. In addition, public loan funds cannot leverage dollars as private lenders can. If a loan fund wants to support $10 million in project loans, it must have $10 million available in the fund. If a private lender wants to underwrite a portfolio of $10 million

in loans, it can borrow funds from other banks or syndicate these loans.

- **Principal Risk**: The loan fund assumes the risk of loan defaults.
- **High Administrative Costs**: The lending team must have (or sub-contract for) the capability to evaluate both project risk and credit risk. Loan funds also require ongoing loan servicing and monitoring.
- **Competition with Private Lenders**: State-sponsored loan funds can be perceived as competing with private lenders.
- **Remaining Equity Gap**: Projects still need upfront, equity contributions (i.e., generally, loan funds cannot provide 100% financing).
- **No Project Financing**: Unless set up to provide project financing, loan programs only provide funds at project completion.
- **May Impact Federal Tax Credits**: The federal Internal Revenue Code reduces the value of renewable energy Production Tax Credits by the value of "subsidized energy financing." If the loan program offers a below-market interest rate, the entire principal amount of the loan would be considered a subsidy. Note that this provision has been temporarily lifted for Investment Tax Credits under the American Recovery and Reinvestment Act.

BEST PRACTICE RECOMMENDATIONS FOR DIRECT LOAN PROGRAMS

The ideal renewable energy loan program would have several attributes relative to loans offered by commercial lenders:

- **Establish long repayment terms**: The loan should have a term that is long enough to reduce monthly payments to levels that match the positive cash flow from avoided energy purchases (or energy sold). The payback period for renewable technology is typically longer than for energy efficiency projects, potentially up to 20 years.
- **Set low interest rates**: A low interest rate will encourage applicants to seek out and utilize a clean energy loan program.
- **Offer Bridge Loans**: Loan funds should assist in providing funding during project construction.
- **Avoid application burden**: Applications, paperwork, and fees should be kept to a minimum, with quick loan approval, especially for smaller loans. A less rigorous process of program implementation is optimal for public sector applicants (municipalities, state agencies, etc.). Private entities should require more due diligence over loan provisions.
- **Foster Relationships with Private Lenders**: For larger projects, state-sponsored loan funds should participate with private lenders for joint financing opportunities. This helps in sharing risk, leveraging the state loan program, reducing competition with private lenders, and extending the reach of the state program.

EXAMPLES—Loan Programs

Leading state clean energy loans programs include:

- **Connecticut:** The Connecticut Clean Energy Fund (CCEF) has established a loan program to support the pre-development phase of utility-scale renewable energy projects that qualify as Class I resources under Connecticut's renewable portfolio standard. These non-recourse loans are available for up to $500,000 and would be repaid by the borrower at time of permanent financing, project completion or sale of the project to a third party. Projects must have a high likelihood of successful development and commercialization in order to qualify for a loan. Also, CCEF's Operation Demonstration Program provides flexible loans to demonstrate the commercial feasibility of new technologies not yet in the marketplace or new applications of proven technologies. Examples include solar, wind, small hydro, fuel cells, hydrogen generation and storage, and advanced energy efficiency technologies. The technology must have high probability of commercial success, a qualified team and be demonstrated at a Connecticut host site. These non-recourse loans are available for up to $500,000 and are repaid at 2X principle upon commercial success. More information at: *www.ctcleanenergy.com/opdemo*.
- **Oregon**: Oregon's Energy Office has run an Energy Loan Program since 1981. The program supports energy efficiency and renewable energy projects in both the public and private sectors, including residential projects. The program is funded with tax-exempt bonds issued by the State of Oregon. The fund's current outstanding loan portfolio is over $400 million. *www.oregon.gov/energy/loans*
- **Pennsylvania**: The Reinvestment Fund's Sustainable Energy Fund in Philadelphia is a private, nonprofit, financial organization, offering commercial loans for new or retrofit energy-related projects to established commercial, industrial, municipal, and nonprofit entities. The fund will provide up to 100% financing and can offer more creative loan structuring than commercial lenders including tailoring the payments to the expected energy savings from the project. *www.thesef.orgkb/?View=entry& EntryID=36*
- **Vermont**: Vermont's Clean Energy Development Fund offers below-market interest rates for clean energy projects with a maximum loan amount of $250,000 and a 2% interest rate. *www.revermont.org/pdf/CEDFLoanBrochure.pdf*.

MATCHING LOANS

Under a matching loan program, a state provides a certain share of a loan, often at a below-market interest rate, if the borrower can find a commercial lender to provide the balance of the loan amount. The state's share of the loan can also offer more flexible repayment terms than the private loan.

STRENGTHS

- **Shared Confidence and Risk**: State approval of a renewable energy loan provides a sign of confidence in the project and shared risk exposure to private lenders.
- **Preservation of Capital**: The revolving nature of the loan fund ensures that a stable capital base is preserved as loans are repaid (less any defaults).
- **Shared Underwriting**: The state can rely on the commercial lender for ensuring appropriate underwriting occurs (although the state will still want to perform its own due diligence).
- **Reduction of Interest Expense**: A matching loan program, particularly at 0% interest rates, offers a significant reduction in interest expense for borrowers.

WEAKNESSES

- **Reliance on Private Lenders**: Matching loan programs require the borrower to find a willing, private lender for the loan match.
- **Tax Credit Impact**: The below-market interest rate can reduce the value of available federal production tax credits.

EXAMPLE—Revolving Loan Program

The **State of Iowa** manages a renewable energy revolving loan program in which the state will provide 50% of a project's loan at 0% interest if a commercial lender provides the remaining 50% at market interest rates. In addition to bringing the interest rate down, the program can extend loan repayment periods to as much as 20 years. *www.energy.iastate.edu/AERLP*

INTEREST RATE BUY-DOWN

Under an interest rate buy-down program, the state subsidizes the interest rate offered by a private lender for a qualified loan. Administratively, the state provides a lump-sum payment to the lender in exchange for the lender offering a below-market interest rate. This payment represents the present value of the foregone interest to the lender over the life of the loan.

STRENGTHS

- **Limited Capital Requirements**: The state does not need to have the capital available to lend the principal amount of the loan.
- **No Default Risk**: The state does not bear the risk of loan defaults.
- **Private Lenders**: The state can rely on the private lender for underwriting and loan servicing.
- **Leverages Private Capital**: The state is partnering with rather than competing with private lenders.

WEAKNESSES

- **Reliance on Outside Lenders**: A program of this type requires participating banks that are willing to make these loans. Bankers still have ultimate underwriting decision making and principal risk exposure.
- **Use of Available Funding**: Unlike a loan program, the interest rate buy-down is never repaid back to the state; the funds do not "revolve."
- **Tax Credit Impact**: An interest rate buy-down would be considered "subsidized energy financing" and would reduce the value of federal production tax credits for utility-scale projects.

EXAMPLE—Interest Rate Buy-Down

NYSERDA operates a "Smart Energy Loan Program" under which it buys down the interest rate on a qualifying commercial loan for an energy efficiency improvement or renewable energy project. For example, if a participating bank underwrites a loan at 8% interest, NYSERDA can reduce that interest rate to the customer by an additional 4%. NYSERDA neither underwrites nor services the loan. Rather, it provides a lump sum payment to the commercial lender equivalent to the net present value of the interest rate spread over the term of the loan. *http://www.nyserda.org/loanfund*

LINKED DEPOSITS

Linked deposits are a variation of an interest rate buy-down. Under a linked deposit program, a state treasurer establishes a program with participating banks which pay below-market interest payments on certain state deposits. In return, the banks re-lend these funds at a below-market interest rate for qualified clean energy projects. For example, if the state receives 1% interest on its deposited funds instead of 3%, then the 2% difference is passed through as a lower interest rate to a qualified borrower.

STRENGTHS

- **Limited Cost to the State**: The only state cost is the foregone earned interest on those funds that will be directly re-loaned to qualified borrowers.
- **Limited Administrative Costs and Oversight**: The state only has to monitor its deposits and ensure that applicants are investing in qualified projects.
- **No Legislation Necessary**: A state treasurer can typically begin a program like this without legislative approval and without an established clean energy fund.

WEAKNESSES

- **Requires Bank Participation**: This program requires banks that are willing to make these types of loans. Banks still have ultimate underwriting decision making and principal risk exposure.
- **Requires Active Marketing**: Awareness of a program like this among either bankers or borrowers may be low without active marketing by the state treasurer or other program sponsor.

EXAMPLE—Linked Deposit Program

The **Illinois** State Treasurer has established a Green Energy linked deposit program whereby the Treasurer deposits state funds in participating banks at low interest rates (currently 2%). In exchange, the participating bank lends those funds out with no more than a 3% interest rate mark-up for a qualified renewable energy or energy efficiency project. The Treasurer's office is not responsible for either underwriting the credit-worthiness of the loan or servicing it. It only needs to monitor that the loan was used for a qualified purpose. *www.treasurer.il.gov/programs/cultivate-illinois/green-energy.aspx*

PAYS®

PAYS ("Pay as You Save"), also known as on-bill financing, removes the upfront cost and long, payback barriers associated with distributed renewable energy investments. The PAYS concept is essentially an installment plan with two unique features: 1) the monthly payments are structured to be below the value of the monthly energy savings (or energy produced), thereby making the investment cash-flow positive and 2) the debt obligation is tied to the building's gas or electric meter, not to a specific building owner; therefore, the obligation transfers with building ownership. Because payments are tied to the meter, they may be best administered by the utility company servicing that meter; the payments would be a separate line item on utility bills. Alternatively, the payments could be incorporated into other municipal bills such as property taxes or water/sewer bills. In either case, initiating a PAYS program requires legislative or regulatory action. The program also requires a pool of available risk capital to support the loans.

STRENGTHS

- **Eliminates Upfront Capital Cost Barriers**: A PAYS-type program should encourage more clean energy investments by removing high, upfront cost barriers and linking loan repayment schedules to expected system performance (energy savings or production). In this way, the system is cash-flow positive and the owner is financially better off.
- **Reduces Ownership Risk**: By linking the ongoing financial liability to the building's *current* owner, a PAYS system removes the need to recapture the system cost when a building is sold.

WEAKNESSES

- **Administrative Complexity**: Utilities may be resistant to act as loan administrators through on-bill financing so another billing and loan administration vehicle may need to be developed. In addition, the program may require legislation to be drafted and adopted, possible regulatory approval obtained and financing instruments (such as bonding) secured.
- **High Capital Requirements**: Loan repayment periods will be long due to the need to match loan payments to energy savings/production, necessitating additional capital to continue the program if loan demand is high.

CLEAN ENERGY ASSESSMENT DISTRICTS AND PROPERTY TAX FINANCING

A related and currently popular concept is the creation of Clean Energy Assessment Districts. Under this concept, a municipality or other taxing unit of government is authorized by the state to create a special taxing district for private clean energy investments.[9]. Homeowners and building owners borrow from this pool of capital to pay the upfront capital costs of their renewable energy project. Ideally, repayment terms match both the energy savings/energy generation and useful life of the asset. The loan payments in this type of program are administered through a special property tax assessment. The financial obligation stays with the property, regardless of a change of ownership. Because the taxing authority has a senior lien on the property, payments are secure.

9 The municipality would establish a loan fund either through issuing a bond or, potentially, receiving a grant from a clean energy fund.

As in the PAYS system described above, a state clean energy fund can facilitate this type of financing program by providing the initial pool of capital. While this approach does not leverage public dollars, it creates a reasonably safe repayment schedule so that assets are returned to the fund for additional loans or alternate uses.

This type of financing approach does not preclude a clean energy fund from also providing other support such as upfront rebates. It also does not prevent a system owner from taking advantage of other available state or federal tax incentives.

States giving municipalities the option to provide this type of financing include: California (which originated the model), Colorado, New Mexico, Ohio, Oklahoma, Texas, Vermont, Virginia and Wisconsin.

EXAMPLE—Property Tax Financing

The Berkeley FIRST[10] (Financing for Investment in Renewable and Solar Technology) program allows property owners to borrow money from the **City of Berkeley's** Sustainable Energy Financing District to install solar photovoltaic electric systems. The original pool of capital came from the issuance of a municipal bond. Loans are repaid over 20 years through a special line item on property tax bills. The program is completely voluntary so property taxes are affected only for those who choose to participate. The program is administered by a private firm, Renewable Funding, which handles everything from purchase and re-sale of the bonds to processing applications and providing funding to homeowners.

Not only does the FIRST program provide the type of long repayment term needed to make solar systems cash-flow positive, but, because the obligation stays with the property and not the original system purchaser, it eliminates concern from those potential solar purchasers whose home ownership time horizons are shorter than the loan terms. In addition, interest payments associated with the increased tax obligation (if broken out) can be deducted on federal tax returns. *http://www.ci.berkeley.ca.us/ContentDisplayaspx?id=26580*

LEASES

Lease programs involve a public-private partnership to leverage available public dollars while capturing available federal tax credits. Under a lease program, the state contracts with a private leasing company to offer leases for standard renewable energy technologies to residential and commercial customers. Customers pay a fixed, monthly lease rate for an extended period (10-15 years) with an option to purchase the equipment at residual fair market value. The leasing company owns the equipment during the term of the lease and therefore is eligible to capture federal investment tax credits and depreciation. Unlike the PAYS program described above, the lease obligation is to the building owner, not the meter or tax bill. As a result, building owners or homeowners need to negotiate the transfer of the lease to subsequent building owners.

STRENGTHS

- **Avoids Upfront, Cost Barriers**: A lease overcomes upfront cost barriers associated with system purchase. The leasing company contributes the capital to purchase the system.
- **Used with Other Incentives**: Leases can be combined with existing rebate programs to lower the monthly lease rate.
- **Increases Leveraging**: Leasing companies should have greater purchasing leverage with manufacturers, further lowering the monthly cost to the lessee.

WEAKNESSES

- **Transfer Difficulties**: The long-term lease obligation may be difficult to transfer to subsequent building owners.

EXAMPLE—Lease Program

Connecticut has introduced a solar lease program to further leverage its existing solar rebate program. The program is offered by the Connecticut Clean Energy Fund in partnership with CT Solar Lease, LLC, a subsidiary of US Bankcorp and AFC First Financial. Homeowners qualify for a rebate from the Clean Energy Fund and agree to use an approved installer. The leasing company pays the remainder of the system's capital costs. The homeowner makes fixed monthly payments and has an option to purchase the system. The value of solar Renewable Energy Credits is shared with the leasing company, which acts as an aggregator and broker of these credits. See *www.ctsolarlease.com*.

10 A detailed analysis of the Berkeley program can be found in a joint LBNL/CESA study, "Property Tax Assessments as a Finance Vehicle for Residential PV Installations", February 2008. www.cleanenergystates.org/library/reports.

LOAN GUARANTEES

Loan guarantees are an effective way for a state to leverage available dollars while providing valuable protection to commercial lenders that are underwriting large, renewable energy project loans. For example, a loan guarantee program might protect a lender against 80% of its capital losses should a borrower default on a loan. In addition, the guaranteed portion of loans is removed from a bank's balance sheet. A loan guarantee program requires a borrower to pay an upfront fee (generally 1%–2% of the loan value) and annual loan guarantee fee (1/4%–1/2%). The program must set aside a portion (5%–10% or more) of the guarantee amount as a reserve against defaults depending on the evaluated risk of the overall loan guarantee portfolio.

STRENGTHS

- **Lower Administrative Requirements**: The state does not have to administer a full loan program. Loan underwriting and approval is done by a private lender, although the state still must approve the loan guarantee.
- **Leverages Private Capital**: A loan guarantee program does not compete with but, rather, assists commercial banks.
- **Leverages State Funds**: A loan guarantee program significantly leverages available state funding, as much as 10:1 or higher.
- **Builds Lender Confidence**: Loan guarantees have high value to banks making loans for unknown/unproven technologies and during periods of tight credit. Further, the guaranteed portions of loans are removed from banks' balance sheets, providing them with greater lending capacity.
- **Supports Innovative Projects**: Loan guarantees are particularly valuable for pre-commercial or innovative technologies in which the perceived lending risk is greater.

WEAKNESSES

- **Provides No Upfront Capital**: Loan guarantees do not reduce the upfront capital to the project owner/developer (although they may facilitate a higher loan amount or improved terms).
- **Reliance on Private Lenders**: The project owner still must find a lender willing to underwrite the loan. This can still be challenging for large or riskier projects, even with a loan guarantee.
- **Default Risk**: Program administrators must understand default risk and set aside appropriate funds as a reserve against these defaults.
- **Narrow Target Market:** Loan guarantees are best suited for large projects, rather than individual distributed generation projects.

EXAMPLE—Loan Guarantee Program

There are no state-level loan guarantee programs for renewable energy. At the federal level, the United States Department of Energy (DOE) and the Department of Agriculture (USDA) both administer loan guarantee programs for renewable energy investments. While the USDA program provides guarantees for projects of all sizes (from $5,000 to $25 million), the DOE program is targeted at larger projects. Changes to the DOE program under the ARRA redirect some of the implementation and decision-making for these loan guarantees to "designated lending authorities" at the state level. While these are likely to be private banks initially, state finance authorities partnering with energy offices may be able to become designated lending authorities. See *www.rurdev.usda.gov/rbs/farmbill* and *www.lgprogram.energy.gov*.

RPS SET-ASIDES AND RENEWABLE ENERGY CREDIT SALES

Renewable Portfolio Standards (RPS) are state-based requirements that utilities (or load-serving entities) must supply a certain and growing percentage of their electricity supply from renewable energy sources by a certain date. Today, 29 states and the District of Columbia have RPS requirements in place with targets as high as 40% (Hawaii) and often 20%–25% by 2020. Because a traditional RPS—in which all eligible renewable energy technologies compete against each other—only benefit least-cost projects (typically wind and landfill gas), an increasing number of states are designing their RPS policies to provide differential support to higher cost and distributed technologies or applications. This approach is particularly compelling in states with limited low-cost, in-state renewable resources and aggressive RPS targets.

A few states are using "multipliers" where projects that are in-state or utilize certain technologies (e.g., solar PV) earn extra credit towards a state's RPS obligation. However, this has proven to be an unsuccessful policy in advancing these technologies. The preferred approach is an RPS "set-aside" in which some fraction of the RPS must be met with specified technologies or project types. Set-asides for solar or distributed renewable generation now exist in 13 states. If fully met, these set-aside requirements will result in 7,500 MW of installed solar PV by 2025.[11]

Under a typical state solar set-aside, a utility must comply with the solar requirement through acquisition of solar-specific, renewable energy credits ("SRECs") or make a solar-specific, alternative compliance payment (SACP). An SREC represents the "environmental attributes" of one megawatt hour of solar generation from an eligible facility. The SACP is a backstop mechanism to protect utilities and ratepayers from the rate impact implications of an RPS solar set-aside. The SACP sets an upper limit for the cost of RPS compliance, removes the risk of unknown, financial penalties for any solar energy shortfalls, and gives suppliers flexibility in complying with RPS solar requirements. The success of a solar set-aside program is highly dependent on the establishment and level of these SACPs. Without solar-specific ACPs, a solar set-aside has no teeth. If the SACP level is too low, after factoring in other available state and federal incentives, then potential system owners will not have sufficient financial returns on their projects and the solar obligations will not be met. If the state imposes a rate-impact cap on these set-asides that is too low relative to the solar requirement, utilities will be able to opt out of the obligation and, again, the targets will not be met.

The use of a solar set-aside and solar RECs provides states with an alternative, market-based financial incentive for solar installations. Solar system owners can choose to sell their SRECs to a broker, aggregator, or obligated utility which must buy SRECs to meet state RPS obligations. Some solar installers or project developers will offer to buy the SRECs as part of project financing, thereby reducing the amount of capital needed up front to finance a project.

Historically, solar photovoltaics and other distributed, renewable generation projects have had difficulty in selling RECs from these projects because of the small number of RECs generated from any one project and the high transaction costs of doing so. In response, many states now are establishing and encouraging longer-term REC contracting requirements and mechanisms. Others have established higher, solar-specific alternative compliance payment levels as a means of establishing a higher market clearing price for solar RECs and, thereby, providing additional support to solar system owners.

The price of an SREC is determined by the supply of and demand for SRECs in any given year. The SACP establishes the ceiling price for an SREC. Generally, SACP prices are set by a regulatory board to be above the target SREC levels so that utility suppliers have an incentive to purchase SRECs instead of paying SACPs.

States have explored a host of options for providing more revenue certainty from an SREC approach. These include:

1. creation of a underwriter model where the state provides a minimum revenue guarantee for SRECs

11 Berkeley Labs reports that the impact of state RPS set-asides on solar PV already has been substantial. Excluding California, 67% of PV additions from 2000 through 2006 came from states with RPS solar targets. See presentation by Ryan Wiser to the PV Peer Network on solar set-asides in July 2008, available at *www.cleanenergystates.org/library/PVPeerNetwork/Wiser_State_Solar_RPS_7.11.08.pdf*.

2. a SREC-only market with no boundaries on the floor or ceiling values for SRECS
3. an auction-setting price for SREC pricing
4. setting an SACP price level and multi-year schedule

There is a significantly different strategic approach involved when a state uses RECs instead of rebates. In a traditional rebate program, much of the market and performance risk is shifted from the system owner to the public. The combination of rebates, tax credits and depreciation benefits can come close to equaling the installed system cost for systems on commercial buildings. In a market-based solar REC program, however, some of the risk shifts back to the system owner who now bears both system performance risk and the long-term risk of fluctuating solar REC values. The annual solar RPS requirement and established ACP levels provide a backstop to buffer this market risk.

The REC market-based approach may be better suited for large projects, particularly those owned by 3rd parties, rather than for small residential projects. Larger system owners can more easily secure financing for the project, can utilize all available tax credits and have better negotiating leverage in selling the project's RECs. Lenders are also more likely to assign value to the long-term revenue stream from RECs in a larger project than those from a residential-scale project.

EXAMPLE—Solar REC and Carve-out Programs

Two case studies demonstrate the transition that some states are making from rebates to RECs for solar PV programs.

NEW JERSEY

New Jersey's Board of Public Utilities (NJBPU) administers the state's renewable energy public benefits fund. New Jersey has both an aggressive overall RPS and an aggressive solar target within the RPS (2,300 MW by 2021). NJBPU has historically provided large rebates to encourage solar installations but the agency recently determined that a market-based approach would reduce the ratepayer impact of fulfilling the RPS solar carve-out versus a traditional rebate-based system. If the rebate levels were to remain unchanged, achieving the state's 2.12% solar RPS requirement by 2021 would have required an estimated $10.9 billion in rebates, adding about 7.5% to electricity rates.[12]

In response, starting in 2009, New Jersey raised the ACP level for solar RECS to $711 per MWh with an 8-year schedule of ACPs, declining by 3% per year. This ACP level represents the price premium that state regulators have determined is necessary to economically justify solar installations. However, unlike a rebate, it is not a "guaranteed" level of support to all system owners. In effect, the marginal value of these RECs could be as high as $711 per MWh (the point of indifference for a utility between buying a solar REC and paying the ACP), depending on supply. System owners are able to sell their solar RECs towards utility fulfillment of New Jersey's RPS for 15 years from the date of system installation. Any revenue from solar ACPs is used to support solar energy systems on public facilities. The cost of acquiring these solar RECs is an expense that is recoverable through rates and frees up more of the state's clean energy fund budget for other technologies and projects.

More information on New Jersey's program can be found at *http://www.njcleanenergy.com/files/file/SOLARTransitionFAQs121707fnl2(2).pdf*.

MARYLAND

Maryland's solar carve-out is currently .01% of electricity sales but rises to 2% by 2022. The current solar ACP level in Maryland is $400 and will decline by $50 every two years, reflecting what the Public Service Commission believes will be declining installed costs for solar PV and rising market prices of electricity. Again, the ACP level represents the marginal value of these solar RECs. However, this may not be what the system owner receives both because of fluctuations in the market price and the share of solar REC payments captured by broker/aggregators. Any ACP payments made by utilities will be used by the state's clean energy fund to support new solar installations.

Note that Maryland has not eliminated its traditional solar rebate program but rather has reduced the rebate level considerably to reflect both the enhanced federal tax incentives as well as the rising market value of solar RECs. Information on Maryland's solar REC program can be found at *http://www.energy.state.md.us/documents/SRECinfo.pdf*.

12 For a comprehensive review of the analysis that led to the selection of New Jersey's new approach to supporting the solar pv market, see Summit Blue Consulting, "An Analysis of Potential Ratepayer Impact of Alternatives for Transitioning the New Jersey Solar Market from Rebates to Market-Based Incentives", April 25, 2007, available at *http://www.njcleanenergy.com/files/file/NJ- BPU_SACP_RPIAnalysisRep_042507.pdf*.

While these state solar REC programs do not provide the same kind of upfront support as a grant or rebate, system owners may be able to monetize the value of the RECs upfront. For example, solar installers or REC aggregators may provide a lump-sum payment to a homeowner based on some discounted value of the future stream of solar REC payments.[13] However, 3rd party, commercial solar system owners are likely to get maximum value out of the RECs.

STRENGTHS

- **Drives Technology Deployment**: Technology set-asides in state RPS programs are an important driver for distributed generation deployment (credit multipliers have been shown to be ineffective).
- **Provides Technology-specific Support**: The approach combines the regulatory requirements of a state RPS with market forces to both fulfill the RPS carve-out and provide technology-specific support.
- **Reduces the Need for Rebates**: The approach reduces the need for a clean energy fund to provide direct rebates.
- **Reduces Administrative Burden**: The approach puts much of the administrative burden on the participating utilities.

WEAKNESSES

- **No Upfront Support***:* The approach does not provide an upfront, lump-sum payment to the system owner except at a discounted level as provided by a broker or installer who then takes ownership of the RECs.
- **Needs Long-term Support**: The lack of a long-term REC contract leaves system owners potentially vulnerable to supply-demand imbalances and less revenue than anticipated.
- **Aggregator Gain**: SREC aggregators or brokers may capture a significant portion of the SREC value.

BEST PRACTICE RECOMMENDATIONS FOR RPS SET-ASIDE PROGRAMS

- **Utilize Set-Asides Rather than Credit Multipliers**: Set-asides create a fixed, capacity target which utilities need to meet; multipliers do not create such a target and are likely ignored when ample, lower-cost renewable resources are available.
- **Establish Aggressive Targets**: Establish set-aside targets that are aggressive yet achievable without significant adverse rate impact. Long-term targets and intermediate steps need to be realistic given the available resource, demand for the technology, project economics and local installer capacity.

- **Establish Technology-Specific ACPs**: Establish technology-specific alternative compliance payments that reflect the availability of other state and federal incentives while providing project developers with an acceptable financial return. Public utility commission staff should develop financial models in which the ACP level is adjusted to meet these target rates of return.
- **Encourage Long-Term Contracts** for solar (or other technology-specific) RECs to encourage price stability. Long-term contracts should lower the cost of compliance with the set-asides, provide revenue assurance to project owners and reduce end-of-period REC price spikes.
- **Consider Lump-Sum Payments** for the discounted value of the future stream of RECs for smaller (residential) systems. Residential PV owners likely do not want to be trying to sell small quantities of RECs on an annual basis.
- **Revise the ACPs**: Revise ACPs downward over time as system costs decline and the supply of RECs increases. ACPs need not be static but should decline as the cost premium for the technology also declines.

FEED-IN TARIFFS

A feed-in tariff (FIT) (also known as a "standard offer" rate or advanced renewables tariff) requires utilities to purchase electricity from renewable electricity system owners at long-term, fixed rates established by utilities and/or regulatory commissions. These rates are based on technology, system size and project location.

13 A solar installer in Maryland is paying approximately $5,000 as an upfront payment for solar RECs from a residential installation but $10,000 if payments are spread out over a 10-year contract.

Feed-in tariffs are, in a sense, the inverse of a Renewable Portfolio Standard. Whereas in an RPS regime, legislation determines the target amount of renewable energy and allows the market to determine the price paid for that electricity (subject to ACPs or other cost caps), a FIT establishes a technology-specific price for electricity which utilities must pay and allows the market to respond with an indeterminate amount of renewable energy capacity.[14]

In Europe, FITs are the dominant policy mechanism for supporting renewable energy and are used in 18 of 25 European Union countries. In the United States, however, FITs have generated considerable discussion but limited action by legislators or regulators who have instead adopted the RPS (in some cases with technology-specific carve-outs) as the preferred policy instrument for advancing renewable electricity.

But even in states with an RPS, FITs have merit as a substitute for either rebates or performance-based incentives in supporting distributed renewable generation. FITs for distributed generation require neither the administration of a rebate/grant program nor the use of a public benefits fund (or other revenue source) to fund the program. Instead, the aggregate cost of these FITs can be cost-recovered by utilities (subject to the ratemaking authority and any capacity limits set by a public utilities commission). Moreover, like RPS technology set-asides, FITs provide market access and support to technologies that otherwise could not compete in a technology-neutral RPS.

The fundamental rate-making principles used in establishing FITs are to establish tariff levels that reflect:

- **The relative cost of the technology**: Higher FITs are appropriate for technologies that have higher installed costs per unit of capacity.
- **Project size**: If smaller projects are desirable from a policy perspective, FITs may support these at a higher rate, assuming that they are more expensive to build than large ones per unit of capacity.
- **The availability of other incentives**: State or federal tax credits or rebates will lower capital costs and the FIT premium.
- **The required rate of return for investors**: For commercial projects, there is a threshold rate of return that project developers are seeking based on their cost of capital.

FIT's may also reflect social and economic values with respect to:

- **Project Geographic Location and Siting**: For example, projects that have higher capacity factors or that relieve stress on portions of the distribution system.
- **Ownership**: Some FITs may favor "community" or locally-owned projects.
- **Desire to Advance a Specific Technology**: For example, if building a solar market is important, then FITs can specifically target solar PV.
- **Reward Avoided Externalities**: Solar PV system output is at its maximum on days of peak demand and can displace expensive (and inefficient) peak generation.

In practice, it is difficult to establish the "right" FIT levels since renewable energy projects have so many unique site-specific and size-specific characteristics. FITs should be high enough to attract the marginal projects (in order to get the desired quantity of renewable energy capacity) without providing excessive economic windfall to the best or least-cost projects. However, creating a wide range of FITs to reflect site-specific conditions (for example, providing higher support to lower-capacity projects) adds complexity to the tariff-setting process.

In designing an effective FIT, there are several key elements that should be considered:

14 A comprehensive review of feed-in tariff practices and principles can be found in a recent NREL report, "Feed In Tariff Policy: Design, Implementation and RPS Policy Interactions," March 2009, available at *www.nrel.gov/docs/fy09osti/45549.pdf*. An analysis of feed in tariff experience in the United States is in another NREL report, "An Analysis of Renewable Energy Feed In Tariffs in the United States," May 2009 available at *www.nrel.gov/docs/fy09osti/49551.pdf*. For background on the European experience with feed-in tariffs, see "Evaluation of Different Feed-In Tariff Design Options: Best Practice Paper for the International Feed-In Cooperation," 2008, published by Fraunhofer (Germany) Institute for Systems and Innovation Research, *http://cms.isi.fraunhofer.de*.

- **Continuity and Long-Term Investment Policy**
  As with all state-based incentives, a stable, transparent policy framework is a key to a successful FIT program. FITs should be accompanied by long-term targets and sufficiently long periods for which the tariff is guaranteed.

- **Size Limits**
  The cost and ratepayer impact of a FIT program can be managed through program or project size limits or through differential pricing. By limiting individual project size (e.g., wind projects under 10 MW), policymakers can also provide greater support to projects that have cost disadvantages relative to larger projects or have other merits (e.g., local ownership or grid congestion relief). Limiting the total capacity amounts from specific technologies can both lower program cost and ensure a diverse renewable portfolio.

  However, limiting eligibility or reducing pricing based on total project size can prevent inclusion of larger projects that are more economic to build and generate more power. Also, such rules can be circumvented by project developers by legally dividing up larger projects into smaller ones. Finally, if total program or technology capacities are limited, applicants may submit a speculative bid to secure a FIT guarantee without a fully conceived project, displacing or delaying more likely projects.

- **Adaptability**
  While the feed-in tariffs for projects installed in a given year need to be guaranteed for a sufficient duration to build investor confidence, the tariffs for new projects should be reviewed regularly in order to determine if they are still consistent with the policy objectives and needs of the market.

STRENGTHS

- **Supports Market Transformation**: FIT regimes create markets for a variety of technologies from an early stage of development until market competitiveness. In contrast, standard RPS policies are of no help for early-stage or high-cost technology due to their least-cost approach to procurement.
- **Adaptable**: A FIT structure can be customized to support particular technologies, project sizes, ownership, location and other factors.
- **Builds Investor Confidence**: A FIT's long duration, guaranteed market and guaranteed grid access help to secure both debt and equity financing for a project. In contrast, renewable portfolio standards are generally met with short-term REC purchases through competitive solicitation. The result is that a FIT may lower the risk for project developers, lenders and investors and, consequently, lower the cost of capital and required rate of return on these projects. This in turn lowers the costs to ratepayers.
- **Sustainable**: FITs are not subject to "funding raids" or other potential loss of program funding.
- **Economically Efficient**: Like performance-based incentives, FIT's reward production, not installations.
- **Wide Participation**: FITs encourage small, decentralized projects through a standardized contract/tariff mechanism. FITs also ensure non-discriminatory access to utility distributions system as an element of the program. This "open access" helps to democratize renewable energy.
- **Low Administrative Costs**: FITs eliminate the administrative burdens associated with rebate and grant programs. However, a FIT imposes different administrative burdens associated with the upfront, administrative and regulatory costs of designing and approving an effective FIT program.

WEAKNESSES

- **Requires Regulatory Review**: FITs require upfront legislative and ongoing regulatory review and approval.
- **Price Setting Challenges**: It is difficult to set FIT prices without over- or under-subsidizing some project owners.
- **Regulatory Complexity**: A desire to "fine-tune" FITs can lead to regulatory complexity and market confusion.
- **No Upfront Capital Support**: FITs do not provide upfront capital support to projects, forcing the projects to assume higher debt burdens or secure greater equity than may be necessary under a rebate program.
- **Supply Uncertainty**: FITs lead to an uncertain number of projects and capacity. As a result, FIT programs could put near-term, upward pressure on electricity rates (if generous FITs lead to a surge in projects) or inadequate, new renewable generation (if FIT rates are too low). This uncertainty and potential rate impact could be managed with technology-specific caps.
- **Long-Term Monitoring and Revisions**: FITs have to be monitored and revised regularly based on program results, state renewable energy goals, technology cost reductions, large shifts in capital costs and significant federal policy changes (e.g., elimination of tax credits or adoption of carbon legislation).

EXAMPLES—Feed-In Tariff Programs

- **Ontario Power Authority**: Under the Province of Ontario's Standard Offer Program, solar PV system owners are receiving $0.42/kWh and smaller "community-scale" wind projects are receiving $0.111/kWh. For information on the Province of Ontario's Standard Offer Program, see *www.powerauthority.on.can/sop*.
- **California**: The California Public Utility Commission (CPUC) approved a feed-in tariff program for renewable energy generators up to 1.5 MW in size. Under this program, investor-owned utilities are required to enter into long-term (10-25 year) contracts with generators and pay a "market-price referent" for all power not consumed on-site. This price is based on the levelized cost of natural gas generation (currently around $0.10/kWh). The CPUC does not set the feed-in tariff price itself. The CPUC is considering but has not yet approved a feed-in tariff for larger generators. See *www.pge.com/feedintariffs* as a reference on California's program.
- **Gainesville, FL**: Gainesville (FL) Municipal Utilities implemented a feed in tariff for solar PV systems in 2009. The regional utility offered to pay $0.32/kWh for solar PV generated electricity; however, the program was capped out the day it went into effect.
- **Vermont**: On May 27, 2009, the Vermont legislature passed a first-in-the-nation comprehensive pilot feed-in tariff program (HR 446). The program is capped at 50MW of capacity with no eligible project larger than 2.2MW. The program will initially include FITs for small wind systems ($0.14-$0.20/kWh), landfill gas and biogas ($0.12/kWh), and solar PV ($0.30/kWh). Future rate revisions will be based on the levelized cost of generation net of tax and other financial incentives as well as a return on investment. See the Vermont Public Service Board's initial determination of Standard Offer Prices at: *http://psb.vermont.gov/sites/psb/files/docket/7523/7523_interim_price_order.pdf*.
- **Wisconsin**: Several Wisconsin utilities have established technology-specific feed-in tariffs. For example, WE Energies is offering $0.225 /kWh for solar PV systems. However, these utility-specific FITs have low capacity caps.

BEST PRACTICE RECOMMENDATIONS FOR SETTING FITS

Several elements are key in setting an effective FIT:

- **Term**: The guarantee of a FIT should be linked to the life of a project or typical project debt term (5-10 years). Because of the time value of money, a higher FIT with a shorter project life will be equivalent to a lower FIT with a longer guarantee. Because capital structures can vary so much among projects, the term should be based on some assumed capital structure and expected rate of return. For example, homeowners with rooftop solar PV will generally have much lower return expectations than third-party owners of larger projects.

- **Structure**: A FIT can be structured as a level fixed-payment for all output (¢/kWh), a premium-payment above the current market price (wholesale or retail) of electricity market price, or a tiered-payment (in which output beyond a certain level per unit of capacity receives a reduced price).

- **Pricing**: Ideally, a FIT should be established on the basis of the technology's costs plus a required rate of return. FITs can also incorporate an estimate of the energy and environmental "value" of the generation procured under the program. For example, pricing could recognize the value of distributed generation in reducing transmission losses and the need for transmission investment. Value-based pricing also could consider the avoided external costs such as carbon emissions.

  A successful FIT program should never use a utility's "avoided cost" as the benchmark for setting tariff levels. These are too low to adequately cover the cost premium of renewable energy technologies over conventional power.[15] Similarly, a net-metered or retail rate is generally not sufficient to support higher-cost distributed renewables without other financial incentives.

- **Technology Advancement**: While FITs are never technology-neutral (providing the same price for all technologies), the pricing structure can be designed to accelerate the adoption of higher-cost or new technologies, in order to lower production costs and/or commercialize the technology.

15 This is what has occurred with the current California feed-in tariff system in which the tariff is benchmarked against the levelized cost of natural gas generation.

- **"Degression"**: The initial establishment criteria of FITs should include a schedule of planned tariff reductions for future projects. For example, if the anticipated cost reductions in a particular technology are estimated to be 5% per year, then the FIT for future projects can also reflect a 5% annual reduction. These scheduled reductions can also be used to drive desired cost and efficiency improvements.

TAX INCENTIVES

Tax incentives can be an effective way for states to support clean energy development independent of direct project support. Three prevalent tax options that states and local governments have used are 1) investment or production tax credits, 2) sales tax exemptions and 3) property tax exemptions. While tax incentives require neither a direct source of funding nor annual appropriation, they have real state budget impact which needs to be projected prior to passage.

INVESTMENT AND PRODUCTION TAX CREDITS

Investment tax credits (ITCs) and production tax credits (PTCs) provide a way for renewable energy system owners to reduce the cost of the system through a credit on their personal or corporate state income taxes. An investment tax credit represents a share of the system cost while a production tax credit is based on measured system output. While well-established at the federal level, a number of states have also implemented these tax credits. Credits on residential systems are frequently capped at low amounts (e.g., $2,000 in Utah) while commercial systems have caps that may range up to $10 million (Oregon). Some states such as Florida and Utah also offer production tax credits based on actual energy produced. Note that these tax credits do not impact the ability of a project to qualify for, nor do they reduce, available federal investment tax or production tax credits since they represent neither a grant nor below-market financing.

STRENGTHS

- **Easy to Administer**: Tax credits provide financial benefit to system owners without agency oversight or the need for a dedicated funding stream.

- **Easy to Modify**: Tax credit levels can be quickly modified to reflect changing market conditions and the availability of other state or federal support.

WEAKNESSES

- **Insufficient Tax Liability**: A project owner may have insufficient tax liability to utilize credits, limiting their appeal or effectiveness in driving project development; the tax credit may need to be structured so that it is tradable to entities that do have state tax liability.
- **Impacts on state Revenue**: Tax credits are open-ended and can have a greater than anticipated impact on state tax revenue.

EXAMPLES—Tax Incentive Programs

Oregon has had a Business Energy Tax Credit ("BET-C") for a number of years. BET-C allows any investor in a qualified commercial (not residential) energy efficiency or renewable energy project to take a state income tax credit of 50% of the installed cost of the system or project. The tax credit is capped at $20 million per project. If the project owner is not able to utilize the tax credit, it can be transferred to another Oregon taxpaying entity in exchange for a discounted cash payment. *http://www.oregon.gov/ENERGY/CONS/BUS/docs/betcbro.pdf*.

Florida recently established a state production tax credit of $0.01/kWh from qualified renewable energy technologies. However, the credit is limited to an aggregate amount of $5 million per year across all qualifying projects. *http://www.dep.state.fl.us/energy/energyact/incentives.htm*.

SALES TAX EXEMPTIONS

Twenty six states currently offer state sales tax exemptions on the purchase of renewable energy systems. These exemptions act as an upfront discount on the price of these systems.

STRENGTHS

- **Easy to Administer**: Sales tax exemptions provide financial benefit to system owners without agency oversight or the need for a dedicated funding stream.

WEAKNESSES

- **Not a Strong Incentive**: Sales tax exemptions alone are an inadequate incentive to support a renewable energy system purchase.

There are numerous examples of states offering sales tax exemptions for both distributed and utility scale renewable energy systems. See the *www.dsireusa.org* website for examples.

PROPERTY TAX EXEMPTIONS

A number of states offer property tax exemptions on the installed value of a residential or commercial renewable energy system. These exemptions do not typically extend to utility-scale projects.

STRENGTHS

- **Easy to Administer**: Property tax exemptions provide financial benefit to system owners without agency oversight or the need for a dedicated funding stream.
- **Does Not Raise Tax Burden**: Installing a renewable energy system would not raise property valuations or real estate taxes for current or future owners.

WEAKNESSES

- **Not a Strong Incentive**: Property tax exemptions alone are an inadequate incentive to support a renewable energy system purchase.

The DSIRE website (www.dsire.org) lists over 30 states which offer various property tax incentives for renewable energy systems. Some of these simply give local governments the option to exempt these systems while other states offer a blanket exemption.

SUPPORTING POLICIES

To be effective, state financial incentive programs for renewable energy should be coupled with strong and consistent state policies which remove barriers to system installation. This report addresses the key policies briefly.

RENEWABLE PORTFOLIO STANDARDS

Twenty-nine states and the District of Columbia have implemented Renewable Portfolio Standards. Together with the federal production tax credit, RPS policies have been the predominant policy driver for large-scale renewable energy development in the United States. Because of their market-based approach which encourages utilities to acquire the least-cost resources, large-scale wind power has been the primary beneficiary of these RPS policies. Distributed energy technologies can benefit when RPS laws include a technology-specific set-aside. Evidence from states that have technology-

specific multipliers in their RPS policies (e.g., solar projects receiving triple credit) suggests that multipliers are not successful in encouraging these higher-cost technologies and projects.

INTERCONNECTION STANDARDS

Historically, utilities have made it difficult for distributed generation to connect to their distribution lines. They have done so both to protect their monopoly as well as through concern (legitimate or otherwise) about the safety of connecting independent power generation of any size to the grid. Utility policies have been inconsistent. Independent generators and system owners have often had to wait long periods of time and pay high, upfront fees in order to tie their systems into the distribution system.

In recent years, state legislatures and public utility commissions have passed interconnection rules which both standardize and simplify the process of interconnection. Thirty-seven states now have some form of statewide interconnection standards although the robustness of these standards varies considerably.[16] Among best practices for uniform interconnection standards are: 1) setting interconnection fees that are proportionate to a project's size, 2) adopting standard rules for residential-scale systems and 3) requiring utilities to process applications within a few days.

NET METERING

Closely tied to interconnection are policies which support net metering—the rules governing how a utility will compensate the owner of a distributed generation system for self-generated electricity which is consumed on-site or added to the distribution grid. The most effective rules provide for retail rate

16 Several reference sources outline interconnection "best practices." These include the Interstate Renewable Energy Council's "Model Interconnection Standards and Procedures for Small Generator Facilities" (*www.irec.org/index.php?id=87*) and the Solar America Board for Codes and Standards' "Comparison of the Four Leading Small Generator Interconnection Procedures" (*www.solarabcs.org/interconnection*). Another comprehensive source of information is the annual "Freeing the Grid" report (*www.newenergychoices.org/upload/freeing thegrid2008_report.pdf*).

credit for all surplus generation (total generation less total consumption). State net metering rules typically set limits on project size (that may range from as little as 40kW to as much as 2MW) and caps on the aggregate amount of capacity that a utility is required to net meter (generally a percentage of peak demand). The arguments that utilities have often used against net metering is that an independent generator is essentially using the distribution system as a "free battery"—drawing power from the utility when the renewable system is not operating and sending excess power back to the utility at any time regardless of the utility's need for that power. However, in practice, the collective generating capacity of these distributed systems is at this point so small as to have nominal impact on a utility's planning or distribution system.

Most interconnection and net metering standards are not applicable to municipal electric systems or rural electric cooperatives which fall outside the jurisdiction of the public utility commissions. However, it is important for legislatures to consider expanding these rules to include municipalities and co-ops so that these customers can also install and benefit from distributed generation.

Information on existing net metering programs can be found in the same references as those listed above for Interconnection.

FEDERAL INCENTIVES

Federal tax credits, grants and loan guarantees for renewable energy play an important role in leveraging state resources. The extension of and modifications to these incentive programs in the recently-passed ARRA further strengthen their value. At the same time, utilization of certain state incentives can impact the value of the federal incentives.[17] A detailed discussion of these federal incentives is beyond the scope of this toolkit; however, the principal incentives are described briefly below:

INVESTMENT TAX CREDITS

Solar systems (both PV and water heating), small wind systems (under 100kW) and fuel cells can claim a 30% investment tax credit (with no dollar limit) for projects placed in service through 2016. The ARRA extends the eligibility for this tax credit to commercial-scale wind projects through 2012 and to geothermal, biomass and marine energy projects placed in service through 2013 if the owner elects not to take a production tax credit instead.

CASH GRANTS

The ARRA allows renewable energy system owners to temporarily take a 30% cash grant in lieu of a tax credit. This provision was included to respond to the reduced tax liability of corporations which invest in renewable energy projects. To be eligible for these cash grants, wind energy projects must be completed by 2012, biomass and geothermal projects by 2013 and solar and fuel cell projects by 2016.

PRODUCTION TAX CREDITS

Commercial wind, geothermal and closed-loop biomass facilities (selling power to a 3rd party) continue to be eligible for a federal production tax credit (currently $0.021/kWh) for systems placed in service by the end of 2012 (2013 for geothermal and biomass). Open-loop biomass projects (including anaerobic digesters) receive a PTC of $0.01/kWh. The PTC runs for 10 years from the date a facility is placed in service.

ACCELERATED DEPRECIATION

Solar, wind and geothermal projects placed in service in 2009 are eligible for "bonus depreciation", allowing the project owner to depreciate 50% of the project cost in the first year of operation. These projects are also subject to Modified Accelerated Cost Recovery System (MACRS) depreciation which allows depreciation over 5 years, far shorter than these project's useful lives. There is no "placed in service" deadline for MACRS. The time-value of money makes these favorable depreciation rules a significant incentive for tax-paying entities.

DEPARTMENT OF AGRICULTURE RENEWABLE ENERGY GRANTS AND LOAN GUARANTEES

This competitive program, administered through USDA Rural Development, provides up to $500,000 in grant assistance (maximum of 25% of project cost) or $25 million in loan guarantees per qualified project. The program will also fund project feasibility studies. Assistance is available only to agricultural producers, rural small businesses and rural electric cooperatives. This program can further leverage state programs and is also useful in states where state clean energy funds cannot support projects in the service territories of municipal electric or rural cooperative utilities since the federal program has no such restriction.

DEPARTMENT OF ENERGY LOAN GUARANTEE PROGRAM

Title XVII of the Energy Policy Act of 2005 established a loan guarantee program to support early commercial deployment of advanced energy technologies. The authorized funding for this program was significantly expanded in 2009 through the ARRA, specifically to support renewable energy ($8.5 billion) and grid modernization. In the near future, this program may shift the responsibility for making loan guarantee decisions out to "designated lending authorities", commercial banks and possibly state finance authorities at the state level. Information on this program can be found at *www.lgprogram.doe.gov*.

17 For detailed discussions of the interactions between state and federal incentives, see, for example, the recent LBL/CESA case study, "Shaking Up the Residential PV Market: Implications of Recent Changes to the ITC," November 2008, available at *www.cleanenergystates.org*.

CONCLUSIONS

Among the array of financing and policy tools presented in this Toolkit, there is no one best tool. Rather, each tool has merit, depending on the specific financial and administrative resources available, the targeted technologies and project sizes, the underlying energy markets and regulations in a state, the objectives of a clean energy program, and the market price and acceptance of a given technology. States should adopt a portfolio of tools to support a variety of technologies and projects. At the same time, states should avoid a "shotgun" approach in offering too many programs which are insufficiently targeted, inadequately funded and/or cannot be administratively supported or marketed. Finally, programs need to have staying power. While programs can and should be modified to reflect changing market conditions, programs require several years to mature and build market awareness. Just as in a stock portfolio, program managers should avoid "churning" program offerings.

The tens of thousands of renewable energy projects that have been supported by state clean energy funds through grants and rebates over the past decade is an indication of the success of these incentives in driving renewable energy markets.[18] Furthermore, the recent grants to state energy offices through the American Recovery and Reinvestment Act give states the seed capital to begin to develop sustainable clean energy financing programs. By using the tools described in this report to address financing, market and regulatory gaps, states and their constituents can build a long-term market transformation for renewable energy.

18 See *http://www.cleanenergystates.org/Publications/cesa-database_summary_v8.pdf*

APPENDIX: LISTING OF STATE CLEAN ENERGY FUNDS

Clean Energy States Alliance (CESA) is a nonprofit organization comprised of members from 16 clean energy funds and two state agencies; it provides information and technical services to its members and works with them to build and expand clean energy markets in the United States. Clean Energy States Alliance member funds have many years of experience in establishing these programs and utilizing these financing tools. They know what has been successful (and unsuccessful) in moving clean energy markets and continue to experiment and innovate as markets, available funding, policies and program objectives change. CESA members frequently share their experience with each other and are also willing to assist new states as they design and implement clean energy programs. For more information or to join CESA, visit *www.cleanenergystates.org* or call 802-223-2554.

Below is a listing of current CESA members.
See *http://www.cleanenergystates.org/Funds* for more information.

Alaska Energy Authority
Arizona Department of Commerce—Energy Office
California Energy Commission
Colorado Governor's Energy Office—Renewable Energy Programs
Connecticut Clean Energy Fund
District of Columbia Department of the Environment—Energy Office
Illinois Clean Energy Community Foundation
Maryland Energy Administration
Massachusetts Renewable Energy Trust
Minnesota • Xcel Energy Renewable Development Fund
New Jersey BPU Clean Energy Program
New York State Energy Research and Development Authority (NYSERDA)
Ohio Department of Development—Ohio Energy Office
Energy Trust of Oregon
Sustainable Development Fund of The Reinvestment Fund (PA)
West Penn Power Sustainable Energy Fund
Vermont Clean Energy Development Fund
Wisconsin Focus on Energy

SELECTED REFERENCES

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- M. Bolinger, G. Barbose and R. Wiser, "Shaking Up the Residential PV Market: Implications of Recent Changes to the ITC," November 2009
- M. Sinclair and Peregrine Energy Group, "Mainstreaming Solar Electricity", April 2008

National Renewable Energy Laboratory Reports (*available at www.nrel.gov/publications*):

- K. Cory, T. Couture and C. Kreycik, "Feed-In Tariff Policy: Design, Implementation and RPS Policy Interaction," 2009
- J. Coughlin and K. Cory, "Solar Photovoltaic Financing: Residential Sector Deployment," 2009
- T. Couture and K. Cory, "An Analysis of Renewable Energy Feed-In Tariffs in the United States," 2009
- E. Lantz, "Renewable Energy Rebates," 2009

Other Publications

- North Carolina Solar Center, "Directory of State Incentives for Renewables and Energy Efficiency," available at *www.dsireusa.org*.
- Network for New Energy Choices, "Freeing the Grid-2008 Edition," available at *www.newenergychoices.org/uploads/freeingthegrid2008_report.pdf*.




Clean Energy States Alliance

Clean Energy States Alliance (CESA) is a national nonprofit coalition of state clean energy funds and programs working together to develop and promote clean energy technologies and markets. CESA provides information sharing,technical assistance services and a collaborative network for its members bycoordinating multi-state efforts, leveraging funding for projects and research, and assisting members with program development and evaluation.

Many states across the U.S. have established public benefit funds to support the deployment and commercialization of clean energy technologies. Eighteen states make up the core base of CESA membership. Though these clean energy funds, states are investing hundreds of millions of public dollars each year to stimulate the technology innovation process, moving wind, solar, biomass, and hydrogen technologies out of the laboratory and toward wider use and application in business, residential, agricultural, community and industrial settings. State clean energy funds are pioneering new investment models and demonstrating leadership to create practical clean energy solutions for the 21st century.

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