National Renewable Energy Laboratory
Innovation for Our Energy Future

Energy Analysis

Fact Sheet Series on Financing Renewable Energy Projects

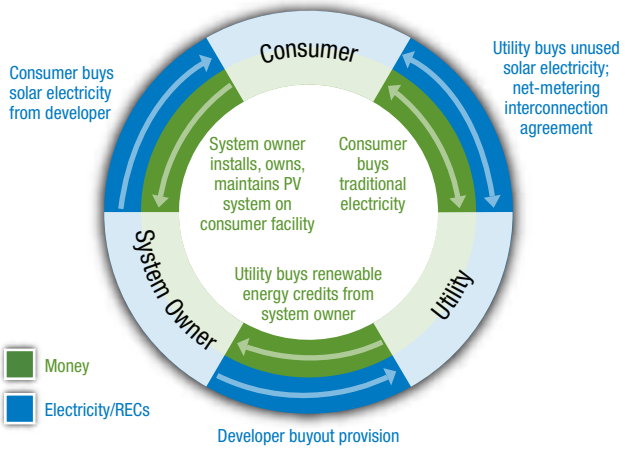
Power Purchase Agreement Checklist for State and Local Governments

This fact sheet provides information and guidance on the solar photovoltaic (PV) power purchase agreement (PPA), which is a financing mechanism that state and local government entities can use to acquire clean, renewable energy. We address the financial, logistical, and legal questions relevant to implementing a PPA, but we do not examine the technical details—those can be discussed later with the developer/contractor. This fact sheet is written to support decision makers in U.S. state and local governments who are aware of solar PPAs and may have a cursory knowledge of their structure but they still require further information before committing to a particular project.

Overview of PPA Financing

The PPA financing model is a "third-party" ownership model, which requires a separate, taxable entity ("system owner") to procure, install, and operate the solar PV system on a consumer's premises (i.e., the government agency). The government agency enters into a long-term contract (typically referred to as the PPA) to purchase 100% of the electricity generated by the system from the system owner. Figure 1 illustrates the financial and power flows among the consumer, system owner, and the utility. Renewable energy certificates (RECs), interconnection, and net metering are discussed later. Basic terms for three example PPAs are included at the end of this fact sheet.

Figure 1
Contracts and Cash Flow in Third-Party Ownership/PPA Model



Source: NREL

The system owner is often a third-party investor ("tax investor") who provides investment capital to the project in return for tax benefits. The tax investor is usually a limited liability corporation (LLC) backed by one or more financial institutions. In addition to receiving revenues from electricity sales, they can also benefit from federal tax incentives. These tax incentives can account for approximately 50% of the project's financial return (Bolinger 2009, Rahus 2008). Without the PPA structure, the government agency could not benefit from these federal incentives due to its tax-exempt status.[1]

The developer and the system owner often are distinct and separate legal entities. In this case, the developer structures the deal and is simply paid for its services. However, the developer will make the ownership structure transparent to the government agency and will be the only contact throughout the process. For this reason, this fact sheet will refer to "system owner" and developer as one in the same.

While there are other mechanisms to finance solar PV systems, this publication focuses solely on PPA financing because of its important advantages:[2]

1. No/low up-front cost.
2. Ability for tax-exempt entity to enjoy lower electricity prices thanks to savings passed on from federal tax incentives.
3. A predictable cost of electricity over 15–25 years.
4. No need to deal with complex system design and permitting process.
5. No operating and maintenance responsibilities.

[1] Clean renewable energy bonds (CREBs) are also available to municipalities and other public entities as an alternative means of benefiting from federal tax benefits.

[2] For a full discussion of alternative financing mechanisms, see Cory et al. 2009.

High-Level Project Plan for Solar PV with PPA Financing

Implementing power purchase agreements involves many facets of an organization: decision maker, energy manager, facilities manager, contracting officer, attorney, budget official, real estate manager, environmental and safety experts, and potentially others (Shah 2009). While it is understood that some employees may hold several of these roles, it is important that all skill sets are engaged early in the process. Execution of a PPA requires the following project coordination efforts, although some may be concurrent:[3]

Step 1. Identify Potential Locations

Identify approximate area available for PV installation including any potential shading. The areas may be either on rooftops or on the ground. A general guideline for solar installations is 5–10 watts (W) per square foot of usable rooftop or other space.[4] In the planning stages, it is useful to create a CD that contains site plans and to use Google Earth software to capture photos of the proposed sites (Pechman 2008). In addition, it is helpful to identify current electricity costs. Estimating System Size (this page) discusses the online tools used to evaluate system performance for U.S. buildings.

Step 2. Issue a Request for Proposal (RFP) to Competitively Select a Developer

If the aggregated sites are 500 kW or more in electricity demand, then the request for proposal (RFP) process will likely be the best way to proceed. If the aggregate demand is significantly less, then it may not receive sufficient response rates from developers or it may receive responses with expensive electricity pricing. For smaller sites, government entities should either 1) seek to aggregate multiple sites into a single RFP or 2) contact developers directly to receive bids without a formal RFP process (if legally permissible within the jurisdiction).

Links to sample RFP documents (and other useful documents) can be found at the end of this fact sheet. The materials generated in Step 1 should be included in the RFP along with any language or requirements for the contract. In addition, the logistical information that bidders may require to create their proposals (described later) should be included. It is also worthwhile to create a process for site visits.

Renewable industry associations can help identify Web sites that accept RFPs. Each bidder will respond with an initial proposal including a term sheet specifying estimated output, pricing terms, ownership of environmental attributes (i.e., RECs) and any perceived engineering issues.

Step 3. Contract Development

After a winning bid is selected, the contracts must be negotiated—this is a time-sensitive process. In addition to the PPA between the government agency and the system owner, there will be a lease or easement specifying terms for access to the property (both for construction and maintenance). REC sales may be included in the PPA or as an annex to it (see Page 6 for details on RECs). Insurance and potential municipal law issues that may be pertinent to contract development are on Page 8.

Step 4. Permitting and Rebate Processing

The system owner (developer) will usually be responsible for filing permits and rebates in a timely manner. However, the government agency should note filing deadlines for state-level incentives because there may be limited windows or auction processes. The Database of State Incentives for Renewables and Efficiency (http://www.dsireusa.org/) is a useful resource to help understand the process for your state.

Step 5. Project Design, Procurement, Construction, and Commissioning

The developer will complete a detailed design based on the term sheet and more precise measurements; it will then procure, install, and commission the solar PV equipment. The commissioning step certifies interconnection with the utility and permits system startup. Once again, this needs to be done within the timing determined by the state incentives. Failure to meet the deadlines may result in forfeiture of benefits, which will likely change the electricity price to the government agency in the contract. The PPA should firmly establish realistic developer responsibilities along with a process for determining monetary damages for failure to perform.

Financial and Contractual Considerations

The developer's proposal should include detailed projections of all financial considerations. This section helps the government agency become a more informed purchaser by explaining key components that are needed for a complete proposal.

Estimating System Size

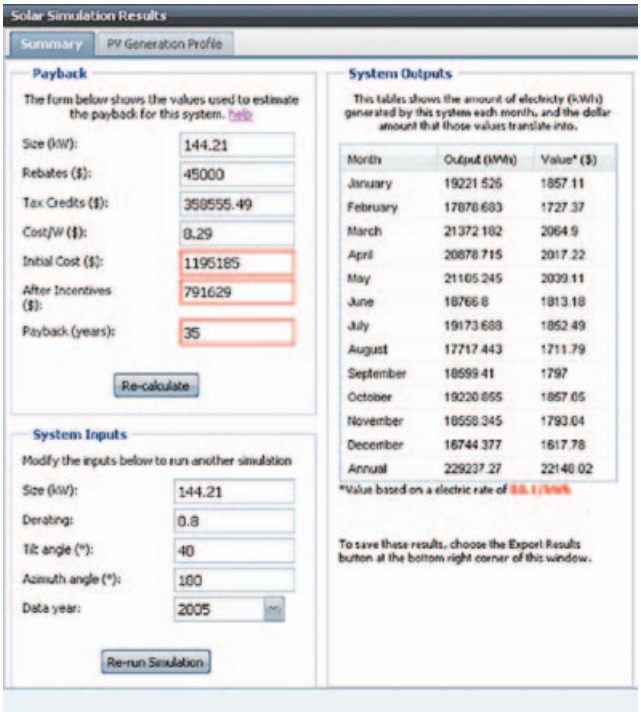
One of the first steps for determining the financial feasibility of a PPA is to estimate the available roof and ground space, and to approximate the size of the PV system or systems. NREL provides a free online tool called In My Backyard (IMBY) to make this assessment—the program can be found at http://www.nrel.gov/eis/imby/

[3] Adapted from a report by GreenTech Media (Guice 2008) and from conversations with Bob Westby, NREL technology manager for the Federal Energy Management Program (FEMP).

[4] This range represents both lower efficiency thin-film and higher efficiency crystalline solar installations. The location of the array (rooftop or ground) can also affect the power density. Source: http://www.solarbuzz.com/Consumer/FastFacts.htm

The IMBY tool, which uses a Google Maps interface, allows users to zoom-in on a particular building or location and trace the approximate perimeter of the potential solar array. From this information, IMBY simulates financial and technical aspects of the system; the results provide a first-level estimate and might not capture the exact situation (system performance, system cost, or utility bills) at a particular location (an example is shown in Figure 2). IMBY estimates the system size and annual electricity production as well as the monetary value of the electricity generated by the photovoltaic system. Users can adjust primary technical and financial inputs to simulate more specific conditions. The amount of electricity generated by the solar system can be compared to the facility's monthly utility electric bills to estimate potential offset capacity of the PV system.[5]

Figure 2
IMBY Example



Source: NREL

PPA Pricing

A key advantage of power purchase agreements is the predictable cost of electricity over the life of a 15- to 25-year contract. This avoids unpredictable price fluctuations from utility rates, which are typically dependent on fossil fuel prices in most of the United States. The approval of climate change legislation also may cause utility electricity rates to increase significantly; thus, the projected savings may be further accentuated. In a PPA, the electricity rates are predetermined, explicitly spelled out in the contract, and legally binding with no dependency on fossil fuel or climate change legislation.

The most common PPA pricing scenarios are **fixed price** and **fixed escalator**. In a **fixed-price** scheme, electricity produced by the PV system is sold to the government agency at a fixed rate over the life of the contract (see Figure 3 for an example of this scenario). Note that it is possible for the PPA price to be higher than the utility rate at the beginning. However, over time, the utility rate is expected to overtake the PPA price such that the PPA generates positive savings over the life of the contract. This structure is most favorable when there is concern that the utility rates will increase significantly.

In a **fixed-escalator** scheme, electricity produced by the system is sold to the government agency at a price that increases at a predetermined rate, usually 2–5% (see Figure 4 for an example of this scenario). Some system owners will offer a rate structure that escalates for a time period (e.g., 10 years) and then remains fixed for the remainder of the contract.

Figure 3
Fixed-Price PPA

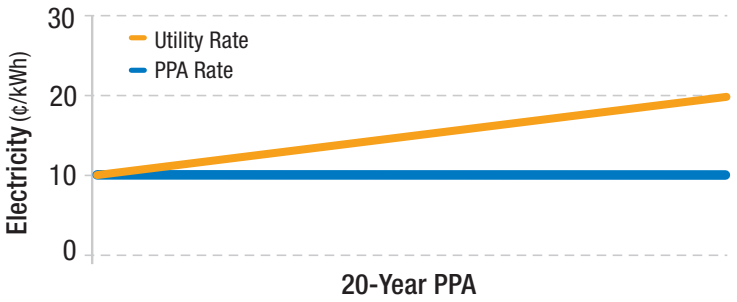
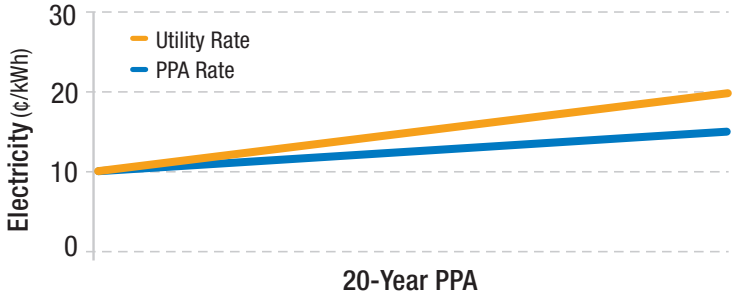
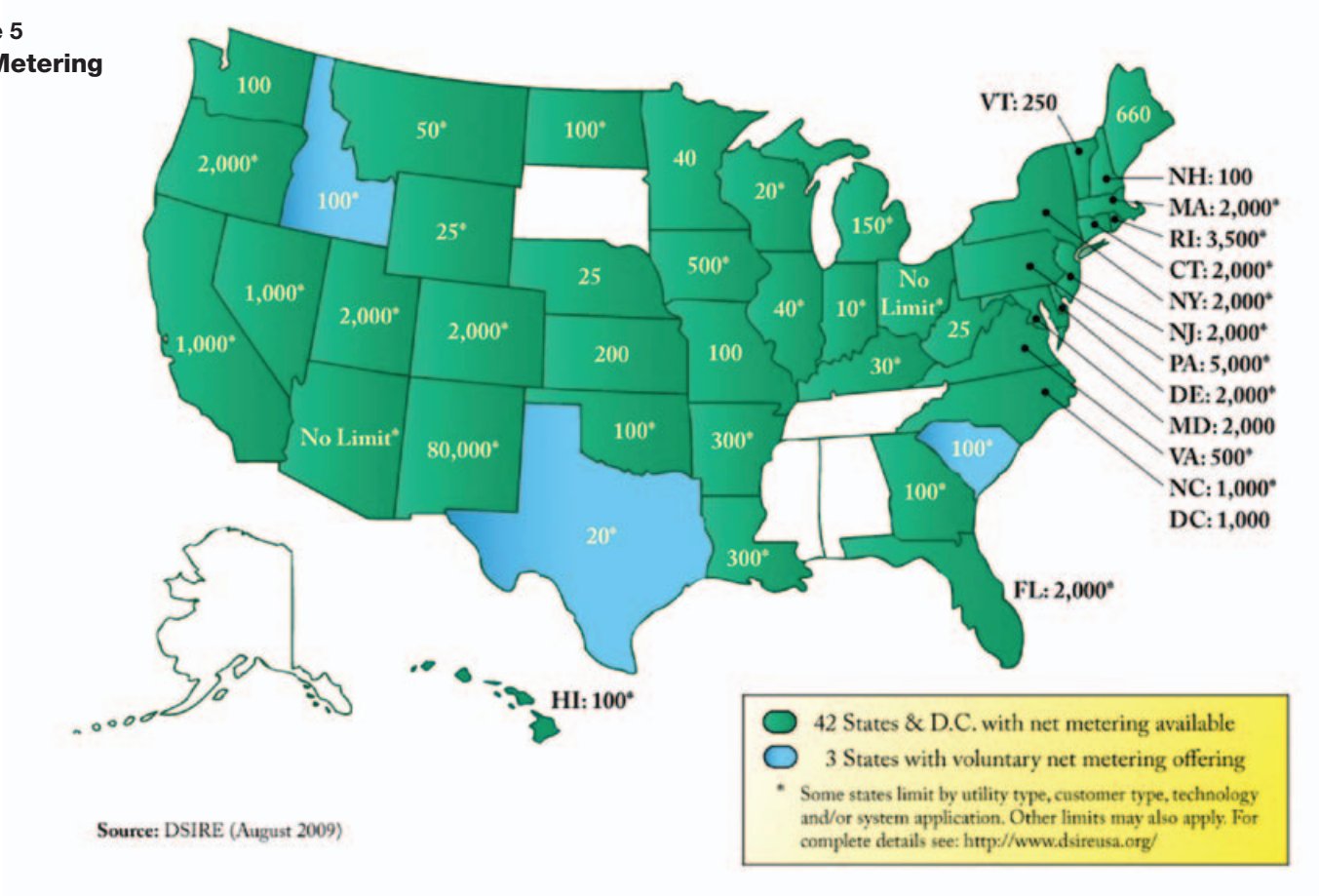


Figure 4
PPA Price Escalator



[5] It is important to be cognizant of any planned or potential changes to the facility that could affect the electrical demand (and, therefore, electricity offset) such as the additions to the facility.

Figure 5
Net Metering



A less common PPA pricing model involves the PPA price based on the utility rate with a predetermined discount. While this ensures that the PPA price is always lower than utility rates, it is complicated to structure and it undermines the price-predictability advantage of a PPA.

A recently emerging PPA structure has consumers either 1) prepay for a portion of the power to be generated by the PV system or 2) make certain investments at the site to lower the installed cost of the system. Either method can reduce the cost of electricity agreed to in the PPA itself. This structure takes advantage of a governmental entity's ability to issue tax-exempt debt or to tap other sources of funding to buy-down the cost of the project. Prepayments can improve economics for both parties and provide greater price stability over the life of the contract. Boulder County exercised this option by making investments to lower the project costs (see the table on Page 10, which provides examples of PPA pricing and structures from state and local government projects in California and Colorado).

Interconnection and Net Metering

Interconnection to the existing electrical grid and net metering are important policies to consider.[6] Interconnection standards vary according to state-mandated rules (and sometimes by utility), which regulate the process by which renewable energy systems are connected to the electrical grid. Federal policy mandates that utilities accept interconnection from solar power stations, but each utility's process varies. The system owner and utility develop an interconnection agreement, which spells out the conditions, equipment, and processes. Such conditions may include standby charges, which are fees that utilities impose on solar system owners to account for the cost of maintaining resources in case the solar system is not generating. Additionally, the project host and developer should consider utility tariff charges applicable to electricity purchased in backup mode—contact your local utility to fully comprehend the process of interconnection in the early stages of RFP development. The Interstate Renewable Energy Council has a report on state-specific interconnection standards, which is available at http://www.irecusa.org/index.php?id=86.

[6] The 2008 Edition of *Freeing the Grid*, issued by the Network for New Energy Choices, provides a listing of the best and worst practices in state net-metering policies and interconnection standards. Much of the report discusses the technical aspects, which your developer should be able to address. http://www.newenergychoices.org/uploads/FreeingTheGrid2008_report.pdf

Net metering is a policy that allows a solar-system owner to receive credit on his/her electricity bill for surplus solar electricity sent back to the utility. The electricity meter "spins backward," accurately tracking the excess electricity. Net-metering regulations vary by state but typically include specifications for the amount of excess electricity that the utility can count, the rate at which the utility can produce the credit, and the duration of the agreement (Rahus Institute 2008). States that do not have net-metering guidelines may require the system owner to install a second meter.

States differ on their net-metering pricing scheme, but they fall into three basic categories: (1) retail rate (the rate consumers pay), (2) the wholesale rate (market rate), or (3) the utilities' avoided-generation rate. Time of use (TOU) net metering is a system of indexing net-metering credits to the value of the power sold on the market during that time period. This is advantageous to solar power because it is strongest during electricity peak demand times (Rahus Institute 2008). Figure 5 shows the states with net-metering policies in place.

Sizing PV systems for specific locations/applications depends highly on energy demand schedules as well as net-metering laws. When sizing a PV system, it is important to avoid the potential for overproduction. If there are unanticipated changes in demand, or if electricity production is not coincident with electricity consumption at the site, the PV system may generate more electricity than the utility can credit the customer for—some net-metering laws cap this amount. The risk is overproducing and sending electricity to the grid without compensation. A facility can produce a disproportionate amount of energy during peak periods and may not make up for this discrepancy during off-peak periods (Pechman 2008).

Federal Tax Incentives for the System Owner

An important aspect of the PPA structure is that a system owner can take advantage of federal tax incentives that a tax-exempt entity cannot. The two most significant tax benefits are the investment tax credit (ITC) and accelerated depreciation. The ITC offers tax-paying entities a 30% tax credit on the total cost of their solar system.[7] Accelerated depreciation is an accounting practice used to allocate the cost of wear and tear on a piece of equipment over time – in this case, more quickly than the expected system life. The Internal Revenue Service (IRS) allows a five-year modified accelerated cost recovery system (MACRS) for commercial PV systems. Although a solar array may produce power during the entirety of a 20-year PPA, the system owner can take advantage of the entire tax benefit within the first five years. Both of these incentives alleviate a great deal of financial risk for system owners, encourage project development, and help make renewable energy an affordable alternative to fossil fuel energy sources.

The Value of Renewable Energy Certificates

Twenty-nine states and the District of Columbia have implemented renewable portfolio standard (RPS) policies. An RPS requires utilities to provide their customers with a minimum percentage of renewable generation by statutory target dates. Failure to meet these requirements usually results in compliance penalties. Figure 6 shows these RPS policies by state.

Utilities typically prove RPS compliance using renewable energy certificates (RECs), which represent 1 megawatt-hour (MWh) of electricity produced from a renewable source. In many states, RECs can be traded separately from the electricity. In these cases, the RECs represent the environmental attributes of renewable energy. In addition, some states offer carve-outs for solar renewable energy certificates (SRECs) or distributed generation (DG) (see Figure 6). These states create separate markets for these RECs (usually at higher prices) or offer multiple credits for each megawatt-hour. For example, a 3x multiplier allows the utility to count each REC from solar electricity as 3 MWh for compliance purposes.[8]

States with RPS policies are known as "compliance markets." In these markets, utilities can include purchased RECs in demonstration of compliance with state energy mandates. This can provide an important source of cash flow to PV system owners. In addition, states with carve-outs for solar or DG can realize even higher prices for SRECs.

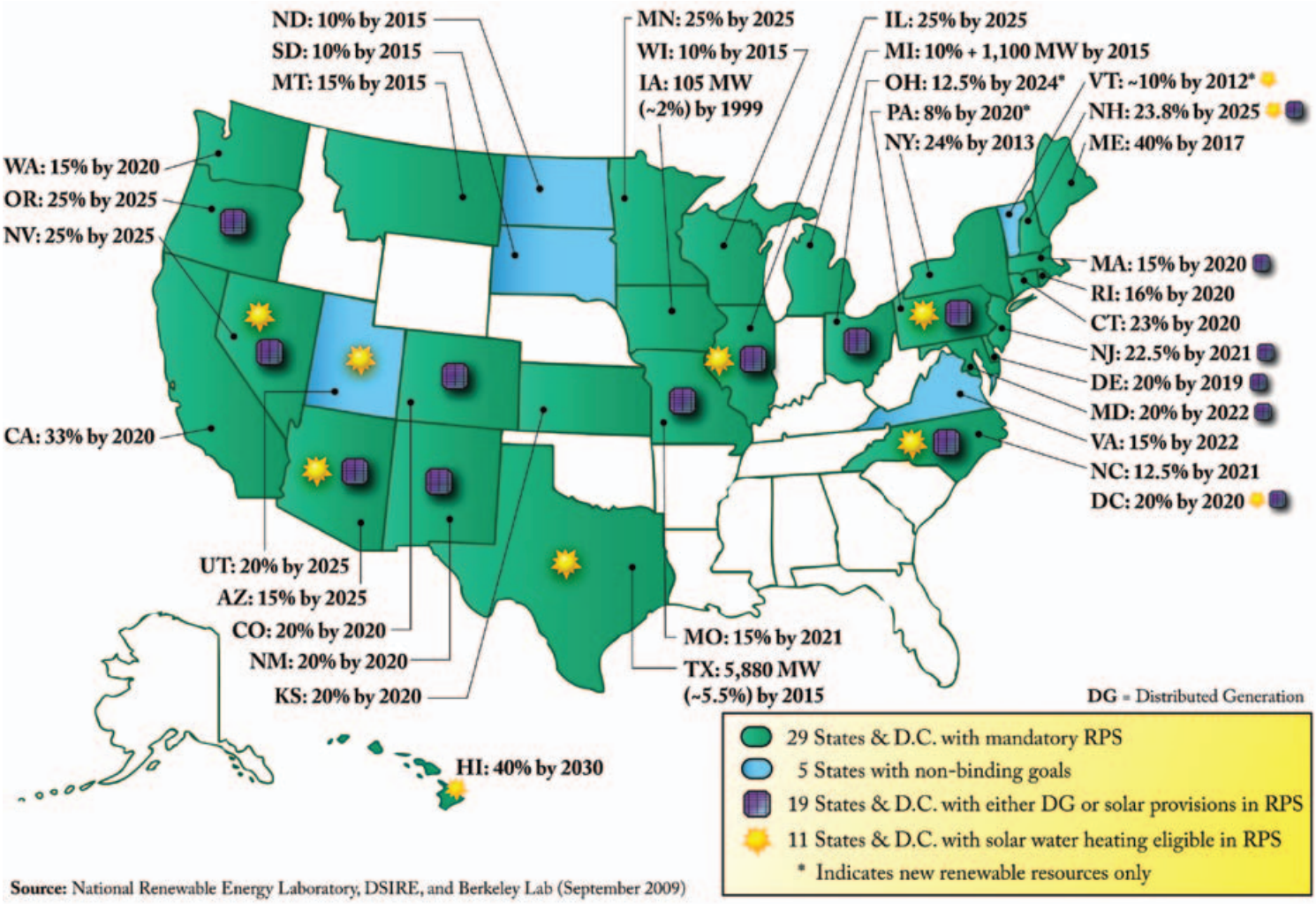
"Voluntary markets" also exist in which residential, commercial, and industrial consumers can buy SRECs from system owners to claim their energy is produced from renewable technologies. The advantage is that consumers do not have to develop renewable projects but still can claim the environmental benefits (Cory 2008).

In general, PPAs are structured so that the RECs remain with the system owner. However, the host can negotiate to buy the RECs along with the electricity. This will drive up the price per kilowatt-hour in the PPA to compensate the system owner for the RECs. If the host does not buy the RECs, it is important to manage the claims made regarding the PV system. The government agency can say it is hosting a renewable energy project but it cannot say that it is powered by renewable energy. One option is an SREC swap. In this case, the host would decide against buying the solar RECs from the PPA provider and instead buy cheaper replacement RECs (wind or biomass, for example) in the voluntary market (Coughlin 2009). REC prices in the voluntary markets are substantially

[7] Under the American Recovery and Reinvestment Act (Recovery Act), tax-paying entities can elect to recover the ITC using a Department of Treasury grant, once project construction is complete. This is expected to improve the financial benefits of the incentive.

[8] Under the Waxman-Markey bill (as of July 2009), Congress is considering a federal solar multiplier of 3x for all distributed generation projects.

Figure 6
States with Renewable Portfolio Standards (indicating solar/DG set-aside)



lower than in the compliance market. This REC swap would allow the host to claim green power benefits (but not solar power because the replacement RECs were not SRECs).

State and Utility Cash Incentives

Other important state-level programs are those that provide cash incentives for system installation. These programs (often called "buy-down" or "rebate" programs) come in two varieties. The capacity-based incentive (CBI) provides a dollar amount per installed watt of PV. Incentives can also be structured as performance-based incentives (PBI). They do not provide up-front payments, but rather provide ongoing payments for each kilowatt-hour of electricity produced over a time period (e.g., five years). Consumers will normally prefer CBIs because of the up-front cash. However, some states prefer PBIs because they encourage better performance. The downside of these more recent programs is that the government agency must finance a large part of system costs (if not under a solar PPA) and incur performance risk (Bolinger 2009).

Approximately 20 states and 100 utilities offer financial incentives for solar photovoltaic projects. Depending on the state and local programs, these incentives can cover 20-50% of a project's cost (DSIRE 2009). Specifics for individual state programs can be found on the Database of State Incentives for Renewables and Efficiency (http://www.dsireusa.org/). Additional government incentives include state tax credits, sales tax exemptions, and property tax exemptions, which can be important under the solar PPA model.

System Purchase Options

If the host prefers, the solar PPA can include provisions for a consumer to buy the PV system. This can occur at any point during the life of the contract but almost always after the sixth year because of tax recapture issues related to the ITC. The buyout clause is phrased as the greater of fair market value (FMV) or some "termination" value (that is higher than the FMV). This termination value often includes the present value of the electricity that would have been generated under the remaining life of the PPA. Buyout options are more readily available in third-party PPAs in which the investors are motivated by the tax incentives rather than long-term electricity revenues. A different set of investors may have a longer-term investment horizon and may be less likely to favor early system-purchase options.

When issuing RFPs and evaluating bids, it is important to understand the project goals of the potential developers and decide which most closely align with those of your organization. From the government agency's point of view, there are both benefits and responsibilities that come with owning the system. The obvious benefit is that the electricity generated by the PV system can now be consumed by the host at no cost (financing charges notwithstanding); the costs and responsibilities revolve around the need to operate and maintain the PV system. Owner's costs include physical maintenance (including inverter replacement, which can be costly) and monitoring, as well as financial aspects such as insurance.

Although PPAs are inherently structured as a contract by which a government agency can buy electricity, system ownership may be a viable option at some point. If the buyout option is not available or not exercised by the end of the contract life, the government agency can purchase the system at "fair market value," extend the PPA, or request the system owner remove the system (Rahus 2008). Government hosts may want to consider requiring (in the RPF and the PPA) that the system owner pay for the cost of equipment removal at contract maturity.

Logistical Considerations

Appropriate roof or land areas must be identified, and there are also important logistical requirements to consider. The issues discussed in this section should be included in the RFP because they will allow the developer to provide a firmer bid with less assumptions and contingencies.

Rooftop Mounted Arrays

After the RFP, the winning bidder will conduct a structural analysis to determine whether the roof can sustain the load. By documenting the condition in the RFP, you may avoid potential adjustments. It is important to assess the following information:

- **Roof structure and type** (flat, angled, metal, wood, etc.) – determines the attachment methods that may be used.
- **Orientation of the roof** – especially important if it is a sloped roof. Southern facing roofs are ideal but not necessarily mandatory.
- **Roof manufacturer's warranty** – usually lasts a minimum of 10 years but can extend over 20 years. Before installing solar panels, it is important to ensure that the solar installation will not void the warranty. Systems that do not penetrate the roof surface or membrane are usually acceptable, but it is important to obtain this allowance in writing prior to moving forward with the solar project.
- **Planned roof replacement** – if it is to be scheduled within a few years, it a good idea to combine projects, which will cut costs and minimize facility disturbance.
- **Potential leak concern** – if this exists, you may opt for a formal roof survey to assess and document the condition of the roof prior to the solar installation.
- **Obstructions on the roof** – items such as roof vents and HVAC equipment can hinder the project.
- **Shade from adjacent trees or buildings** – can reduce solar potential.

Ground-Mounted Systems

Ground-mounted photovoltaic systems are advantageous in some situations because they can be cheaper and easier to install and can be scaled-up more easily. This reduces the cost per kilowatt-hour and translates into cheaper energy costs for the consumer. Additionally, ground systems offer flexibility in the type of technology that can be used. For example, the project may have tracking technologies, which can result in higher energy output and better project economics. One of the key logistical issues for ground-mounted systems is the wind speed the system is designed to withstand, which depends primarily on the location of the project site (e.g., hurricane risks); the soil type and strength characteristics are also important. To obtain more accurate bids, consumers often will have a third-party conduct soil sample tests prior to issuing an RFP. Wind and soil conditions can greatly influence the design and cost of a project. Perimeter fencing and site monitoring should be specified in the RFP to ensure security, safety, and compliance with local codes.

General Logistical Considerations

Electrical upgrades or changes may affect the system design and potential interconnection to the electrical grid. Any planned changes should be documented within the RFP.

For proper maintenance, accessibility to the inverter and solar array will be important to the system owners throughout the life of the project.

Fire departments will have building accessibility requirements, particularly for roof-mounted systems. Some jurisdictions formally specify these standards and will confirm that the system meets the requirements during the permitting phase and final approval process. In states that do not have such requirements, it is important for the government agency and the system owner to gain fire department approval early in the process.

Contractually, operation and ongoing maintenance of the solar system is typically the responsibility of the system owner unless otherwise specified.

Insurance[9]

While many governmental entities may be able to self-insure, it is important to investigate the minimum insurance required by your utility's interconnection rules. The requirements may necessitate additional coverage through private insurance.

Unfortunately, insurance underwriters charge fairly high premiums for PV installations. These premiums can represent approximately 25% of the annual operating budget and may be as large as 0.25% to 0.50% of the project installed costs. According to discussions with developers, the cost of insurance can increase energy pricing by 5–10%. The high premiums are due to two underlying reasons: 1) Insurance underwriters still view PV as a risky technology due to its lack of long operating history, and 2) the relatively low number of projects do not allow underwriters to average risk across a large number of installations (i.e., "the law of large numbers"). Until recently, Lloyds of London was the only underwriter for PV in the United States; however, Munich Re, AIG, Zurich Insurance Group, ACE Ltd., and Chubb are also actively pursuing renewable energy policies. Reportedly, a fifth underwriter is developing a PV product, but no public announcements have been made (Kollins et al., forthcoming).

In general, insurance is the responsibility of the system owner (developer). At a minimum, the system owner should be expected to carry both general liability and property insurance. Additional considerations may be given to separate policies for location-specific risks (e.g., hurricane coverage in Florida), property-equivalent policies (which cover engineering), and environmental risk (inclusive of pre-existing conditions). If covered by the system owner, the cost of insurance will be factored into the PPA cost of electricity and not passed through separately. Thus, a fairly recent realization is that it may be cheaper for the government agency to insure the system directly, although they don't actually own the system. Then, the system owner is named as an additional insured party on the policy and agrees to reimburse the government agency for the premiums. Insurance companies have agreed to this in previous PPAs (Boylston 2008). Because this can reduce overall project costs, this arrangement deserves further investigation with a provider.

One final note concerns indemnification for bad-acts and pre-existing structural or environmental risks. Whether contractual or not, the government agency may want to acquire its own insurance to protect itself from the potential of future liabilities.

Potential Deal Constraints Embedded in Municipal Laws[10]

Municipal laws were written before PV installations were even a remote consideration. While each jurisdiction operates under its own unique statutes, this section lists some common constraints that may be encountered. Listed below are the categories that may require investigation. More detail on the following specific issues is provided at the end of this fact sheet:

1. **Debt limitations** in city codes, state statutes, and constitutions
2. Restrictions on **contracting power** in city codes and state statutes
3. **Budgeting, public purpose**, and **credit-lending** issues
4. **Public utility rules**
5. Authority to **grant site interests** and **buy electricity**

[9] Much of this section is adopted from a forthcoming NREL paper: "Insuring Solar Photovoltaics: Challenges and Possible Solutions"; Speer, B.; Mendelsohn, M.; and Cory, K.

[10] Much of this section is adapted from the transcript of a June 12, 2008, NREL conference call led by Patrick Boylston of Stoel Rives LLP.

Conclusions

Financing solar PV through a power purchase agreement allows state and local governments to benefit from clean renewable energy while minimizing up-front expenditures and outsourcing O&M responsibilities. Also important, a PPA provides a predictable electricity cost over the length of the contract.

This fact sheet is a concise guide that will help states and municipalities with the solar PPA process. The following five steps are recommended to formally launch a project (and are described in this brief):

Step 1: Identify Potential Locations

Step 2: Issue a Request for Proposal (RFP) to Competitively Select a Developer

Step 3: Contract Development

Step 4: Permitting and Rebate Processing

Step 5: Project Design, Procurement, Construction, and Commissioning

The U.S. Department of Energy (DOE) can help facilitate the process by providing quick, short-term access to expertise on renewable energy and energy efficiency programs. This is coordinated through the Technical Assistance Project (TAP) for state and local officials.[11] More information on the program can be found at http://apps1.eere.energy.gov/wip/tap.cfm.

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[11] TAP currently has a focus on assisting programs that are related to Recovery Act funds.

Power Purchase Agreement Checklist

Sample Terms of Executed Power Purchase Agreements (PPAs)

Government Level	State	County	City
Name	Caltrans District 10 Solar Project	Boulder County Solar Project	Denver Airport Solar Project
Location	Stockton, California	Boulder County	Denver, Colorado
Customer	California Department of Transportation	Boulder County	Denver International Airport
Utility	Pacific Gas & Electric	Xcel Energy	Xcel Energy
Size (DC)	248 kW	615 kW	2,000 kW
Annual Production	347,407 kWh	869,100 kWh	3,000,000 kWh
Type	123 kW rooftop, 125 kW carport	570 kW rooftop, 45 kW ground	Ground-mount, single-axis tracking
Location	Maintenance Warehouse Maintenance Shop Parking Lot Canopy	Recycling Center Courthouse Clerk and Recorder Addiction Recovery Center Justice Center Walden Ponds (ground-mount) Sundquist	Ground of the Denver International Airport
Area	22,200 sq ft	8 county buildings	7.5 acres
Developer	Sun Edison, LLC	Bella Energy	World Water & Solar Technologies
Owner	Sun Edison, LLC	Rockwell Financial	MMA Renewable Ventures
PPA Terms	20 years, 5.5% discount from utility rates	20 years, fixed-price 6.5 ¢/kWh for first 7 years, renegotiate price and buyout option at beginning of year 8	25 years, fixed-price 6 ¢/kWh for first 5 years, buyout option at beginning of year 6 or price increases to 10.5 ¢/kWh
Status	Completed September 2007	Completed January 2009	Completed August 2008
Contact	Patrick McCoy (916) 375-5988 patrick.mccoy@dgs.ca.gov	Ann Livington (303) 441-3517 alivingston@bouldercounty.org	Woods Allee (303) 342-2632 woods.allee@flydenver.com

Source: NREL

Potential Deal Constraints Embedded in Municipal Laws

This table lists potential constraints posed by municipal laws. Not all issues will pertain to your jurisdiction; however, this table can serve as a short checklist for use in your investigation. The request for proposal (RFP) issue column is meant to qualify each issue as to whether it needs to be highlighted in the RFP.

Category	RFP Issue?	Issue	Implication	General Findings and Next Steps
1. Debt Limitations in City Codes, State Statutes, and Constitutions	No	Is PPA debt or contingent liability?	Debt would require public vote for approval. Contingent liability is allowed under purchasing authority without a vote.	Most states see as purchasing only what is consumed. Thus, a vote not is required. PPA agreements usually called "energy services agreement" to avoid any appearance of debt. Must be wary of "take or pay provisions" in PPA requiring payments regardless of use. Also, be careful to size so as to not over-produce based on net-metering rules
	No	Is system purchase option debt?	A vote will be required to approve debt for system purchase.	It is important that the PPA deems the purchase as optional at fair market value so that a vote is not needed until the option is exercised.
2. Restrictions on Contracting Power in City Codes and State Statutes	Yes	Contract Tenor statutes (e.g., limited to 10 yrs or 15 yrs)	May limit choice of developers based on investment goals.	Research of local rules and precedents may be required.
	Yes	Ability to buy/sell RECs	When codes and statutes were created, RECs were not envisioned. May determine where beneficial REC ownership is assigned in PPA.	Each jurisdiction will be different. Research of local rules and precedents is required. Is there enough general authority under electricity purchases (or other) to justify REC trading?
	Yes	Public bidding laws	May preclude RFP process unless there is an applicable exemption to public bidding laws.	Research of local rules and precedents may be required. Developer will ask for representation and warranty that the contract is exempt from public bidding rules.
3. Public Purpose and Lending of Credit Issues	Yes	Pre-paying for electricity	Is this a grant to a for-profit LLC that owns the PV system?	In most states, authority exists (such as in the opinion of attorneys general) that it is permissible if the entities are fulfilling a government purpose. Research may be required if pre-payment is envisioned.
4. Public Utility Rules	Yes	How many entities will be buying electricity (i.e., city, county, and/or other government entities occupy site)?	Most state laws and/or rules clarify that if you are selling electricity to a certain number of consumers, then you are a utility and subject to Public Utility Commission (PUC) regulation.[12] This can be prohibitively expensive for the developer.	Developers will generally want to contract only with a single entity that owns the meter. The costs can then be divided among various entities. If the entities are all behind the meter, then they would not be subject to PUC regulations.
5. Authority to Grant Site Interests and Purchase Electricity	No	Lease or easement?	A lease can have problems with disposal and interest in public property, which may require a public-bidding or offering process.	Framing the document as an "easement" instead of a "lease" has worked well. Works much like a lease except without ability to transfer it—except in accordance with agreement (usually restricted).

Source: Boylston 2008

[12] The threshold is set differently by each state. Most are in the two-five range.

Power Purchase Agreement Checklist

Sources for Sample Documents

Samples of requests for proposals can be found using simple Web searches—the links below will get you started in your search.

NV Energy (Nevada Power Company) is a good source for documents which have been previously tested in the marketplace:
http://www.nvenergy.com/company/doingbusiness/rfps/

Oregon University System
http://www.ous.edu/bapp/contractfiles/20090522_1545_Photovoltaic%20Power%20Purchase%20Agreement/RFP%202009-06%20Solar%20PPA.doc

City of Santa Ana
http://www.ci.santa-ana.ca.us/pwa/documents/RFP-SolarProjectandGuideline.pdf

The U.S. Navy recently released an RFP that is very thorough in its specifications:
http://www.allenmatkins.com/emails/Renewable/Img/NAVY.pdf

Example RFPs from several California municipalities:
http://www.lgc.org/spire/rfps.html

A current federal government RFP:
https://www.desc.dla.mil/DCM/DCMSolic.asp?SolicID=1533

Other Useful Documents:

The documents below are more detailed, in-depth solar financing guides.

The Customer's Guide to Solar Power Purchase Agreements, by the Rahus Institute
http://www.californiasolarcenter.org/sppa.html

Solar Photovoltaic Financing: Deployment on Public Property by State and Local Governments, by Karlynn Cory, Jason Coughlin, and Charles Coggeshall. This NREL report (May 2008) examines ways that state and local governments can optimize the financial structure of deploying solar PV for public uses. It can be accessed at http://www.nrel.gov/docs/fy08osti/43115.pdf

Solar Photovoltaic Financing: Residential Sector Deployment, by Jason Coughlin and Karlynn Cory. This NREL technical report (March 2009) can be accessed at http://www.nrel.gov/docs/fy09osti/44853.pdf.

Solar Photovoltaic Financing: Deployment by Federal Government Agencies, by Karlynn Cory, Charles Coggeshall, Jason Coughlin, and Claire Kreycik. This NREL technical report (August 2009) can be accessed at http://www.nrel.gov/docs/fy09osti/46397.pdf

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NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/FS-6A2-46668 • October 2009

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.