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Executive Summary

For more than a decade, renewable energy certificates (RECs) have grown in use, becoming a common way to track ownership of the renewable and environmental attributes of renewable electricity generation. RECs are used widely, and are often required, to verify utility compliance with state renewable portfolio standards (RPS) and to substantiate claims made by voluntary purchasers of green power.

In recent years, however, questions have risen about the role RECs play in the decision to build new renewable energy projects. Critics point to the uncertain demand for and, in some cases, low prices of RECs as evidence that RECs do not make a meaningful contribution in favor of building a new project. Others counter that any revenue source, large or small, contributes to making new projects profitable and also attracts investment to the broader industry.

The two generic types of REC markets—one for compliance with state RPS and the other for supplying voluntary demand for clean energy above what is already required—are both growing strong. Compliance demand is expected to grow from 30 million MWh in 2009 to more than 100 million MWh in 2014 (Barbose 2010), while voluntary demand has grown at a compound annual rate of 37% between 2005 and 2009 (Bird and Sumner 2010). Although compliance demand is subject to policy changes, it is nevertheless relatively certain, whereas voluntary demand is less certain because it is not backed by force of law—in fact, it is subject to willingness to pay extra for the renewable and environmental attributes.

Information from a variety of market participants suggests that the importance of RECs in building new projects varies depending on a number of factors, including electricity market prices, the cost-competitiveness of the project, the presence or absence of public policies supportive of new projects, contract duration, and the perspective of different market participants.

Electricity market prices vary over time, frequently dependent on the price of natural gas. If the expected wholesale electricity price is low, RECs are more critical to make projects economically attractive; if electricity prices are high, the additional REC revenue may be less critical.

The economic feasibility of projects also depends on the quality of the renewable resource and the cost of the project. If the project is very cost-competitive, the importance of REC revenue may be diminished in the build versus no-build decision, but if the project is small, lacking economies of scale, or relies on more expensive technologies or faces other cost challenges, then RECs will be more important in the project decision. The availability of financial incentives—including RECs—for new projects makes a difference in the same way, by bridging the gap between project costs and revenue available from energy sales.

Available evidence of the role RECs have played in project development indicates that the importance of RECs often depends on one’s perspective. Project developers and owners welcome all revenue, large or small, because they wish to maximize profit, and they may not know for sure how profitable the project will be until its useful life is at an end. They generally plan for a REC revenue stream, although the amount will vary from one market to another. Investors and lenders, on the other hand, want to minimize risk to their capital and therefore want as much certainty about revenues as is reasonably possible. They will not recognize REC revenue in their financial decision unless a contract is in place with a creditworthy counterparty. This is true in compliance markets as well as in voluntary markets.

Long-term contracts are generally available in traditionally regulated electric markets, but they may be more difficult to obtain in restructured states where load-serving entities face more uncertainty about future loads and RPS obligations than traditionally regulated utilities do. Although there are exceptions, long-term contracts are generally not signed in voluntary markets because the future is too uncertain for both wholesale and retail voluntary market participants.

Another useful insight is that REC prices, as reported by brokers (the most available source of price information), tend to reflect short-term markets and may not reflect REC prices under long-term contracts. To judge the importance of RECs solely by short-term market pricing may be misleading.

While there is no single answer to the role that RECs play in developing new renewable energy projects, there are situations in which REC revenues are essential to project economics, as well as some where REC revenues may have little impact.

To strengthen the role RECs play in both compliance and voluntary markets, there are a number of options that could be considered. Each option could be implemented in several ways. These options include:

- Encourage long-term contracts for RECs. Long-term contracts can offer the security and certainty that many projects need to obtain financing.
- Host periodic auctions for medium- to long-term contracts with smaller projects. Smaller projects need a more standardized market, and auctions also increase REC market liquidity and price transparency.
- Adopt a REC price floor. This ensures a minimum level of support and reliable revenues for new project decisions.
- Increase renewable energy targets. Increased demand leads to stronger REC prices.
- Limit eligibility of supply. Restricting eligible supply tends to increase REC prices.
- Support greater price transparency. Price transparency increases confidence in current and future REC prices and could lead to a greater recognition for RECs as a potential revenue stream.
- Contribute funds for project development. Primarily an option for the voluntary market, having incremental costs funded up front reduces the risk for projects that are above-market.
- Take an equity position in new projects. Direct investment in itself is strong evidence of making new projects happen and has several other advantages. This approach could work for utility-scale projects or for installation of on-site distributed generation.

In compliance markets, lawmakers or regulators would have to adopt measures that strengthen the role of RECs in the development of new projects, while in voluntary markets, it would be up to program leaders and market participants themselves to implement measures.

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1 Introduction

The contribution of renewable energy to U.S. electricity supply has grown significantly over the last 10 years.[1] From 2000 to 2009, construction of new renewable energy capacity (excluding hydropower) more than tripled, from 16,491 MW to over 53,000 MW. Wind and solar photovoltaic (PV) capacity are the fastest growing renewable energy technologies. In 2009, wind capacity installations increased by 39% and solar PV grew nearly 52% from the previous year (U.S. DOE 2010).

Simultaneous with this growth has been the widespread adoption of renewable energy certificates (RECs) as a means to track the ownership of the environmental attributes of renewable energy. RECs are created with every megawatt-hour produced by renewable energy generators and are the basis of all renewable energy claims. RECs are used to demonstrate compliance with state renewable energy standards and to substantiate claims in voluntary markets where businesses and consumers purchase RECs to meet their environmental goals. These applications have created trade in RECs, resulting in monetary value.

The sale of RECs produces revenue for the owners of renewable energy generators and enhances the profitability of these projects. In theory, this profitability should attract new development. But do RECs play a direct role in new project development? The value of RECs varies, and in recent years, and in some markets, REC prices have been as low as one dollar. As a result, some have argued that RECs cannot possibly be important to new projects (especially in voluntary markets), while others argue that all revenue, large or small, contributes to making new projects profitable.

Neither position can likely be proven as there are multiple factors that must be weighed in any investment decision, and each project is different. Secondary revenue streams are useful to any business, not just on a project-by-project basis but also when entire industries compete for investment capital. This paper reviews and assesses relevant data and seeks insights on this important question from a variety of sources.

The answer may also depend on one's perspective. Viewpoints can vary according to one's position in the market (developer, investor, lender, or marketer), a project developer's size, whether the electricity market is subject to traditional regulation or is restructured, and relative dependence on all revenue flows to make a given project financially viable. For example, project sponsors welcome all revenue, large or small, because they wish to maximize profit, and they may not know exactly how profitable the project will be until its useful life is at an end. Investors and lenders, on the other hand, want to minimize risk to their capital and therefore want as much certainty about revenues as is reasonably possible.

Fundamentally, a project has to be financially viable to be built, and RECs should be viewed in the context of revenues and costs driving that build versus no-build decision. Investors or lenders have to be convinced that the project's return on investment compares favorably to other investment opportunities. Returns include income from the sale of energy and RECs, financial incentives such as tax credits or grants, and depreciation.

State and federal incentives or subsidies may be big or small depending on applicable policies, but that revenue source is usually considered stable once a project qualifies. Depreciation is predictable because it follows generally accepted accounting rules. In contrast, revenue from the sale of energy and RECs

[1] As a percent of the total electric sector, however, renewables (excluding conventional hydropower) still account for only 4.7% of nameplate capacity and 3.6% of net generation (U.S. DOE 2010).

can be extremely variable. Both are subject to market forces and changing public policies. Energy revenue may depend (all or in part) on spot market prices, which can fluctuate with the price of natural gas, a fuel that is often on the margin for electricity generation.

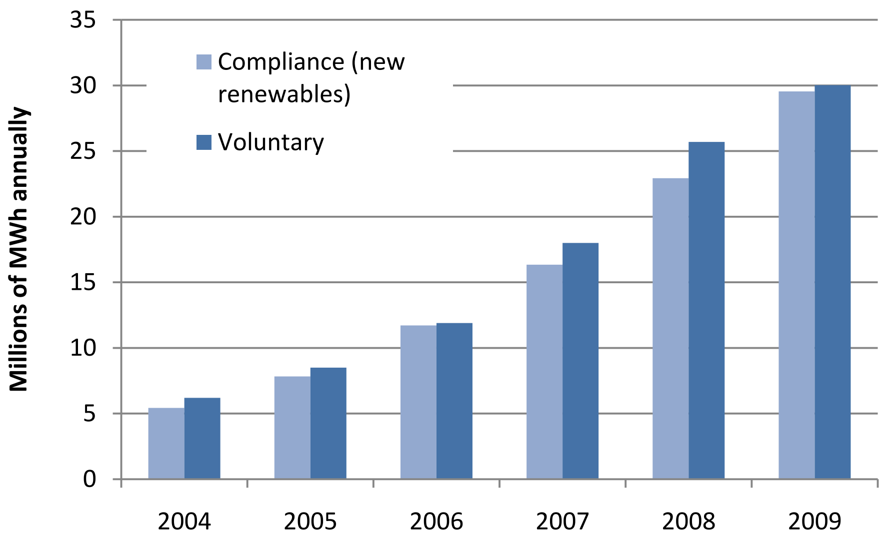
In this paper, the authors focus on the role of RECs in helping new projects reach economic feasibility. Do they contribute to new project development, or is REC revenue too small or uncertain to make a difference in project development decisions? To answer this question, Section 2 describes the role of RECs in markets. Section 3 addresses the challenges to RECs playing a strong role in project finance. Section 4 provides perspectives gained from interviews conducted with market participants and data collected by the National Renewable Energy Laboratory's (NREL's) Renewable Energy Finance Tracking Initiative (REFTI) and the Environmental Protection Agency's (EPA's) Green Power Partnership. Section 5 identifies and assesses options that could be pursued to strengthen the role of RECs in supporting new project development. Finally, Section 6 offers conclusions.

2 Background on the Use of RECs in Renewable Energy Markets

To investigate the importance of RECs to new project development, this paper starts by looking at the U.S. market demand for RECs, REC prices and factors that influence them, and the relative contribution of RECs to overall project revenues.

2.1 Demand for RECs

Demand for RECs comes from both state renewable portfolio standards (RPS) (“compliance demand”) and from end-use consumers that voluntarily choose to buy renewable energy (“voluntary demand”). Both compliance and voluntary markets have been growing, as shown in Figure 1.



Source: Bird and Sumner 2010
Note: Figure shows state RPS demand for new renewable energy generation.

Figure 1. Estimated compliance and voluntary markets’ support for renewable generation, 2004–2009

As a consequence of growing renewable energy markets, demand for RECs is expected to increase over time. In 2009, state RPS policies collectively called for approximately 30 million MWh of new renewable energy production, and these requirements are projected to grow to more than 100 million MWh in 2014[2] (Barbose 2010). Although energy generated by older renewable energy facilities may be eligible to meet state RPS requirements, many states mandate that eligible renewable energy be produced by new generating facilities, with “new” defined by various dates (Wiser and Barbose 2008). Perhaps more important, the annual increase in RPS targets means that new capacity must be added to the grid.

All RPS states except Iowa and Hawaii allow or require the use of RECs to demonstrate compliance with RPS targets, and Arizona requires RECs for compliance but requires that they be bundled with electricity. (For an explanation of bundled and unbundled RECs see Text Box 1.) In most states, therefore, RECs serve both as an instrument of compliance and as a policy tool to provide financial support for renewable energy projects.

[2] The compliance market was estimated to require approximately 90 million MWh of total renewable energy production (including existing renewable energy) in 2009.

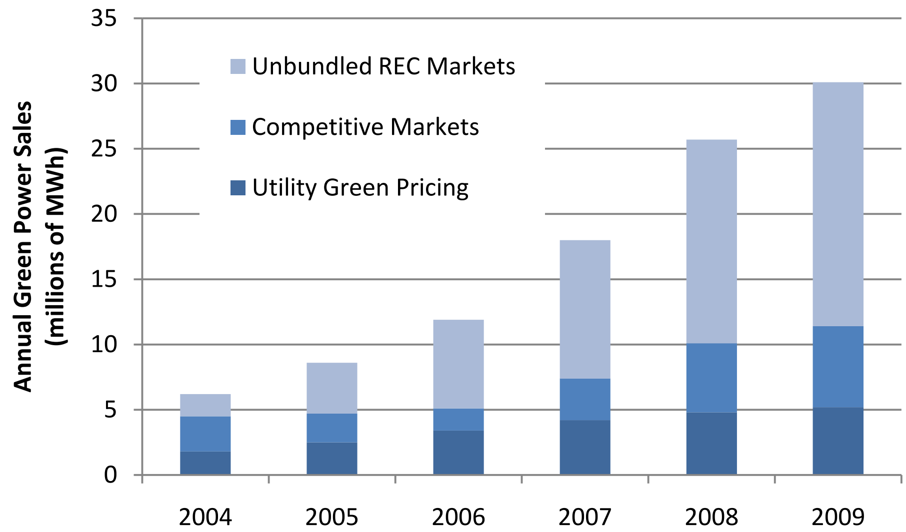
Text Box 1: Bundled and Unbundled Renewable Energy Certificates

RECs can be sold "bundled" with the sale of electricity—or "unbundled" (i.e., sold separately from electricity). If sold unbundled, the electricity and the RECs may be sold to two different parties. Unbundling RECs from electricity creates a fungible product that is useful for a variety of reasons:

- It relies on market forces to distribute benefits to those who value them most, particularly if the energy buyer does not want the RECs.
- It monetizes the value of attributes (selling bundled RECs also adds value, but that value is not usually specified separately).
- It overcomes geographic constraints such as long transmission distances.
- It eliminates the temporal mismatch between the generation schedule and demand, within REC eligibility constraints.

Unbundled RECs have supported the growth of voluntary markets because of the simplified logistics of selling "green power." RECs, whether bundled or unbundled, also facilitate verification of compliance with RPS requirements. Occasionally there is discussion about stripping off a specific attribute and selling it separate from the REC. This is usually referred to as "disaggregation" of the attributes to distinguish it from "unbundling" the REC from electricity. It has been point-of-debate more than an actual practice and does not concern us here.

Voluntary renewable energy (or "green power") markets also create demand for RECs. Voluntary purchase markets include: (1) utility green pricing programs offered in regulated electricity markets; (2) green power marketing activity in competitive electricity markets; and (3) green power sold to voluntary purchasers in the form of unbundled RECs. Total sales of all voluntary renewable energy have grown at a compound annual rate of 37% between 2005 and 2009 (Bird and Sumner 2010). These markets have been growing largely as a result of purchases by businesses, governments, and other institutional customers that are buying unbundled RECs, first made available in the late 1990s. Most of the demand (62% in 2009) and most of the growth stems from the purchase of unbundled RECs, as shown in Figure 2. The unbundled REC market has grown at a compound annual rate of 48% between 2005 and 2009. This is a clear indicator that the voluntary market as a whole was significantly enabled by the advent of RECs.



Source: Bird and Sumner 2010

Figure 2. U.S. green power sales trends by market segment

Similar to compliance markets, voluntary markets emphasize new renewable generators; "new" is defined by two of the major voluntary market programs as a facility that began operation within the past 15 years.[3] Although future demand is likely to grow, its trajectory is uncertain because unlike compliance markets, voluntary demand is not backed by the force of law. An NREL projection of the voluntary market estimated that demand could grow from 30 million MWh in 2009 to between 63 million MWh and 157 million MWh in 2015, depending on the policy and market scenario (Bird et al. 2010). The significant difference in the projections primarily reflects market and policy uncertainty.

2.2 Influences on REC Prices

Two leading factors influencing the value of RECs in new projects are the relative competitiveness of each project and the developer's need to cover above-market costs. Competitiveness is determined by the project's levelized cost relative to the wholesale price of electricity. The cost-competitiveness of each project varies according to the quality of the energy resource as well as the technology and associated project development costs. For example, projects with good energy resources and resulting higher capacity factor with high wholesale electricity prices might have no incremental costs that need to be covered by REC sales, while projects with poorer energy resources or high technology costs in regions with low wholesale electricity prices might have large incremental costs that currently can only be covered by REC premiums or by other financial incentives. The difference between subsidized project cost, net of federal incentives, and what can be earned from electricity sales is what developers need to cover from REC sales—and they may or may not get it depending on market supply and demand for RECs.[4] Once the project is built, however, if the RECs are not pre-sold, REC prices are exposed to the forces of supply and demand.

[3] Green-e Energy, a voluntary green power certification program of the Center for Resource Solutions, and the Green Power Partnership, a voluntary program of the U.S. EPA that encourages organizations to buy green power as a way to reduce the environmental impacts associated with purchased electricity use, both use a 15-year moving window of eligibility as the definition of "new." For example, EPA states in its program requirements: "…effective January 1, 2012, the 'new date' will change to January 1, 1998 and advance one year each year thereafter. This 15-year 'new date' will help continuously drive the development of new renewables."

[4] This is true more so for wind and solar than for biomass, which also has to cover fuel cost.

In compliance markets, several factors affect supply and demand, which in turn influence REC prices. Demand is based on the absolute level of the renewable energy requirements and whether the targets are easy or challenging to meet relative to available resources. State rules for what resources are eligible to be used for compliance also affect supply. Eligibility can vary based on resource or technology used to produce the electricity, generator vintage, and generator location. Most states require that RECs used for compliance with an RPS be sourced from within a given region, or at least that energy is delivered to the region, and some requirements result in customer-sited generation being limited to in-state locations (DSIRE 2011). These rules result in different quantities of eligible existing or potential supply for each state relative to its RPS targets, influencing REC prices in the state and region.

For these reasons, the price of compliance RECs varies substantially among states and markets. For example, over the past 10 years, the price of non-solar compliance RECs has ranged between \$1/MWh and \$50/MWh, though in the last half of 2010, compliance RECs have traded in a narrower range between \$1/MWh and \$20/MWh. Solar REC prices in states with a solar set-aside[5] have ranged from \$150/MWh to \$680/MWh. As a result, the amount of revenue that a developer can receive for RECs can vary dramatically between markets and over time, as described in Figures 4 and 5.

REC prices in voluntary markets differ from compliance market prices and are usually lower. Voluntary RECs have typically traded in a range between \$1/MWh and \$10/MWh, as discussed in more detail in Section 3.3. Voluntary REC prices can be *influenced* by compliance markets, however (Bird and Lokey 2007). If compliance and voluntary demand overlap within the same region, they may compete for the same RECs, and where this competition drives up REC prices, voluntary demand may decline as voluntary purchasers of RECs tend to be more price-sensitive than utilities buying RECs to comply with an RPS mandate.[6] Unlike RPS-obligated entities, voluntary purchasers can purchase unbundled RECs from a national market because they are unconstrained by state REC eligibility rules. In this national market, there is a bigger pool of RECs, which are priced more competitively to find buyers and consequently result in lower prices than for compliance RECs.

2.3 RECs Compared to Other Project Revenue Sources

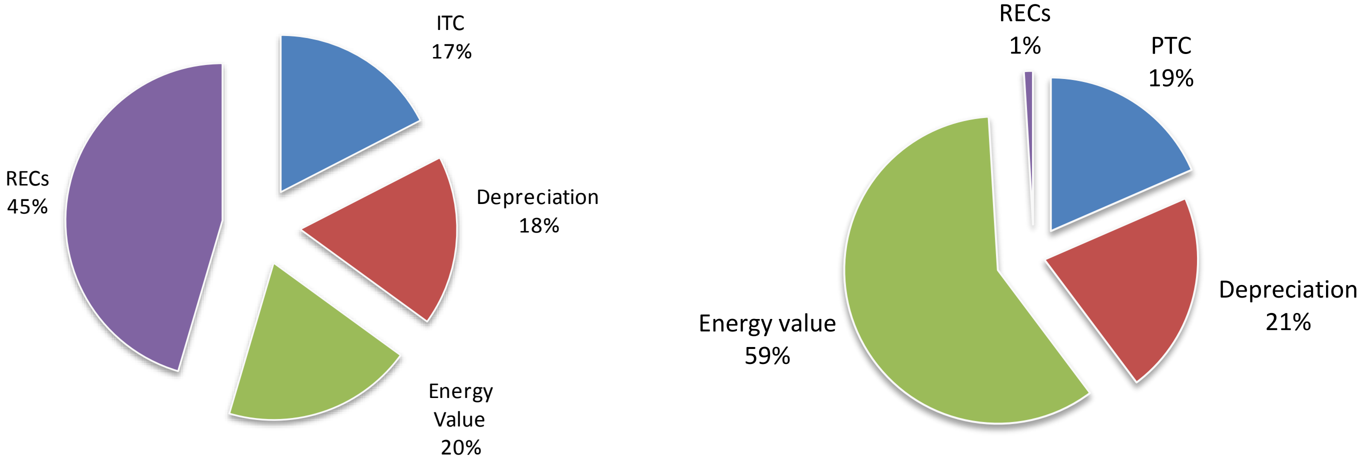
The role of REC revenue in a project's overall financial performance will vary depending on other incentives, the wholesale price of electricity, and the price of RECs. Using NREL's System Advisor Model (SAM), examples of the net present value of financial benefits for two hypothetical renewable projects were developed. SAM is a performance and economic model that calculates the cost of generating electricity based on a project's location, installation and operating costs, type of financing, applicable tax credits and incentives, and system specifications (NREL 2011). In Figure 3a, a 250 kW commercial PV project in New Jersey is represented. In this case, REC revenue represents 45% of total project financial benefits, based on a REC value of \$450/MWh for 10 years and an energy value of about \$140/MWh. In Figure 3b, a 100 MW wind project in Arlington, Wyoming, is represented, where REC revenue represents 1% of total project financial benefits, based on a REC value of \$1/MWh for 15 years and an energy value of about \$60/MWh.[7] These two examples likely represent the two

[5] In the context of state RPS programs, a set-aside refers to a mandatory target for a specific technology or technologies within the overall RPS. It is usually established for higher cost or newer technologies, such as solar or distributed generation, that would otherwise have a hard time competing with other eligible renewables and is sometimes also referred to as a carve-out.

[6] RPS rules also allow utilities (or competitive electricity suppliers) to pass along the incremental cost of RPS compliance to ratepayers, and this contributes to decreasing the utilities' price sensitivity.

[7] The examples provided here rely on default values in SAM model for system costs and performance. The energy revenues are assumed to increase with inflation. The project revenues are discounted at 10% over a 15-year period. REC revenues used in the examples here are based on recent values seen in their respective markets. The New Jersey Board of Public

opposite ends of the spectrum in terms of current available REC revenues. The example of Wyoming wind represents a case of a wind project that is not able to sell RECs for RPS compliance. New Jersey SREC prices have been among the highest in the country, so the New Jersey case shows perhaps the most optimistic scenario of the financial contribution of RECs to the project. Solar REC revenue is significant in other states with a solar set-aside as well.



3a. RECs used for solar RPS compliance **3b. RECs used for voluntary markets**

Figure 3. Illustrative revenue sources for two different projects

The REC revenue as a proportion of total revenue will vary from project to project, and the differences can be significant—it might be half of the total revenue a project receives in some compliance markets or closer to 1% in some other markets or scenarios. Projects that sell RECs bundled with electricity may not receive a separate and identifiable income from RECs, but the REC value, if any, will be bundled in the power purchase price.

Utilities approves bids for the purchase of 10-year solar RECs (SRECs) by three distribution utilities. In March 2010 and June 2010 solicitations, the average prices approved were $424/SREC and $466/SREC, respectively, for a 10-year contract (NJ BPU 2011). Voluntary wind RECs, in recent years, have traded around $1/MWh (see Figure 6).

2.4 Players in REC Markets

While most of this paper focuses on the perspective of new project developers and owners on the supply side and demand by RPS-obligated entities and retail customers, it should be noted that there are other active and important players in REC markets. These are the market intermediaries that buy and sell RECs or that facilitate transactions between buyers and sellers. REC wholesalers may purchase unbundled RECs from generators and sell them to utilities, other marketers, or directly to large commercial customers. REC marketers may buy and sell at wholesale but also are active in selling to retail customers, both large and small. They sometimes partner with utilities to sell RECs (rebundled with energy) to utility retail customers. REC brokers help match buyers and sellers, and earn a fee for their market knowledge and service.

3 Challenges to a Strong Role for RECs in Building New Projects

Questions about long-term REC value have recently given rise to a debate about the role RECs play in the build versus no-build project decision. Some point to the uncertain demand for and, in some cases, low prices of RECs as evidence that RECs cannot be counted on to make a meaningful contribution in tipping the balance in favor of building a new project (Gillenwater 2008; Trexler 2009). Others counter that any revenue source makes a difference to the broader industry and that in some cases REC values are significant (Cook and Karelas 2009; Harmon 2009; U.S. EPA 2010).

The major challenges with respect to using RECs to develop new projects are risk related to demand uncertainty, low or uncertain prices, and the difficulty, in some cases, of securing long-term contracts to reduce this demand and price uncertainty. In this section, each of these challenges is discussed in turn.

3.1 Demand Uncertainty

The uncertainty of future demand can limit RECs' ability to attract project financing and to encourage new project development. In compliance markets, the primary source of uncertainty is policy instability. Policy stability is important to project developers and investors because they risk their money based on assumptions about the fundamental long-term economic and policy outlook at the time of their decision. If those assumptions are not met, investors and lenders could lose money. Policy stability is also important to REC buyers, especially regulated utilities that may consider entering into long-term contracts.

Mandatory RPS markets generally ensure that the demand for renewable energy, and for the RECs needed to demonstrate compliance, will grow and be relatively certain over the lifetime of the project. Nevertheless, although these requirements are legally binding and enforceable with penalties, legislatures can change them, for example, by modifying targets or generator eligibility. Further, if rate impact caps that are included in many existing RPS policies are reached, utilities may be able to delay procurement of renewables, with consequent lower demand for RECs. Despite the risks of policy uncertainty, however, compliance markets generally provide enough certainty to enable utilities to enter long-term power purchase agreements (PPAs) for energy and RECs, at least in traditionally regulated electricity markets.

Future voluntary demand, however, is comparatively uncertain even though historically, demand has increased relatively steadily. Between 2003 and 2009, the compound annual average growth rate for voluntary demand was 40%. Voluntary demand is uncertain for a number of reasons. By definition, voluntary purchases are not mandatory, unlike compliance demand. Instead, voluntary demand is the collective result of many corporate and organizational decisions based on their willingness to pay a premium for green power. That willingness to pay, in turn, is subject to general economic conditions and the financial health of each organization, and within that context, green power purchase decisions compete with other organizational priorities.

While many entities have consistently procured RECs for a number of years, even increasing their purchases over time, most do so through short-term REC contracts (as discussed further later). Another contributing factor to voluntary uncertainty is that, although a buyer may enter into consecutive short-term contracts, the buyer may switch providers between contracts, which makes it harder for any one REC provider to develop a long-term demand curve.

3.2 Supply Uncertainty

In addition to demand uncertainty, market participants must also cope with supply uncertainty. If supply grows faster than demand, it can lower REC prices. There are many factors that could increase supply, including policy changes and the declining cost of some renewable technologies. For example, the availability of Section 1603 cash grants in lieu of tax credits during 2009 enabled nearly 10 GW of new wind capacity even while electricity demand remained stagnant or decreased during the recession (Einowski and Benson 2010). The rapidly declining cost of some renewable technologies also encourages supply and may mean that RECs have to cover a smaller cost premium. On the other hand, less supply than expected can lead to higher REC prices, such as if siting or financing barriers limit the ability of renewable energy projects to be built.

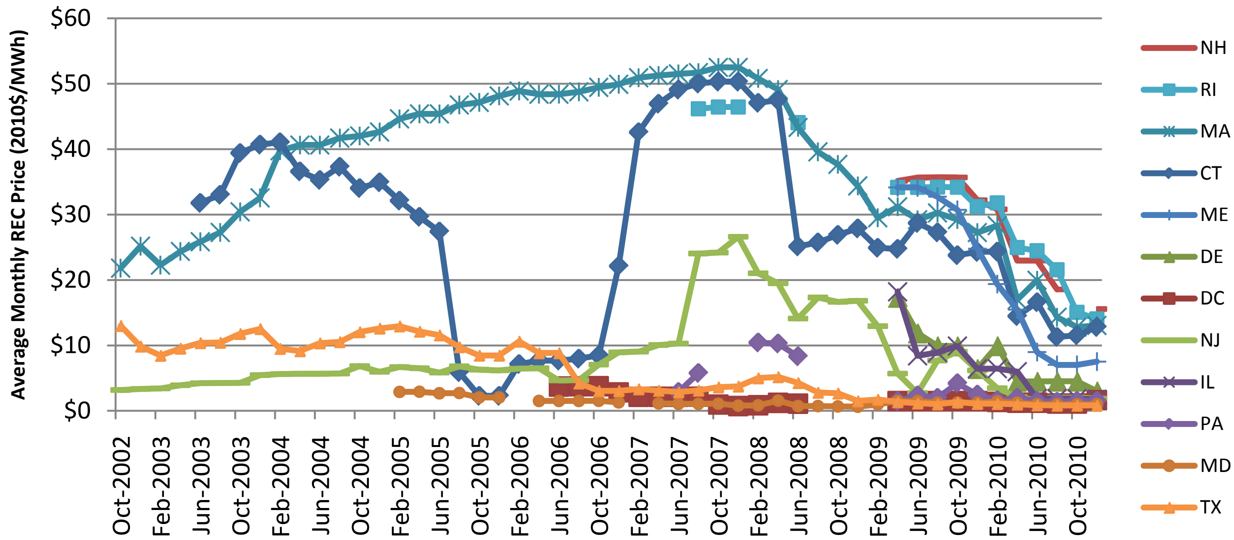
3.3 Price Uncertainty and Low Prices

The lack of certainty about future REC prices presents challenges for developers and investors seeking predictable future revenues when making investment decisions. If prices are uncertain, revenue and return on investment are uncertain. This risk results in higher cost of capital or higher expected returns on investment. Low prices mean that it will take longer for investors to recover their investment.

RECs sold in compliance markets are often seen in the category of a financial incentive, but because this incentive is market-based, the price is uncertain.[8] In compliance markets, the primary sources of REC price uncertainty are: (1) inability to predict accurately the amount and timing of new supply coming online, and (2) demand lagging projections, perhaps caused by relaxation in RPS targets in response to higher than expected costs of compliance or reductions in load to which the targets apply, for example, from an economic downturn.

As shown in Figure 4, compliance REC prices vary substantially from one state to another. REC prices have also varied over time within a single state; for example, in Massachusetts the price has ranged between $15 and $50 per REC in recent years. Fluctuations in price can be severe, as in Connecticut, where REC prices dropped precipitously when utility regulators determined that construction and demolition waste was eligible to satisfy the RPS and then rose rapidly when the legislature reversed that decision. Some states, such as Texas, have had consistently low compliance REC prices because of plentiful supply due to cost-competitive wind projects. These price differences are clearly dependent on movements in supply and demand.

[8] The market supports trading in future vintages of RECs, which reduces uncertainty to some extent, but future vintages typically only trade 1–2 years ahead.



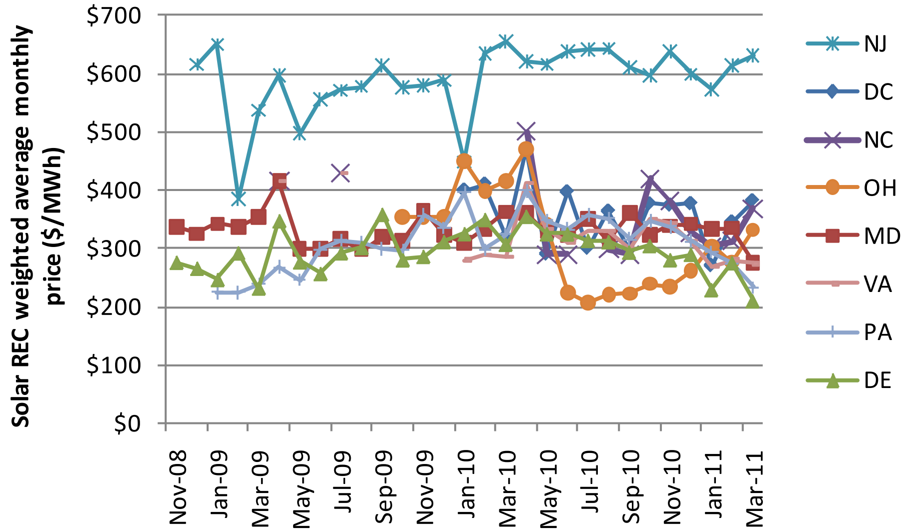
Note: Plotted values are the last trade (if available) or the mid-point of bid and offer prices for the current or nearest compliance year.
Source: Evolution Markets (2007) and Spectron Group (2011).

Figure 4. Compliance market (primary tier) REC prices, October 2002 to December 2010

One can infer from these different prices that REC price is not the only determinant of whether new projects get built. Some states with low prices, like Texas, have been successful in developing new renewable capacity, while states with higher REC prices, such as Massachusetts and Connecticut, have taken longer to stimulate new development in the region. The low REC prices in Texas are indicative of a combination of factors including large project size, low project cost, and high capacity factors—all of which determine the adequacy of cash flows.[9] In the Northeast, by contrast, smaller project size, higher project cost, and lower capacity factors mean that REC prices must be higher to ensure adequate cash flows and an economically viable project.

In the SREC market, prices have been significantly higher than prices for compliance market RECs. SRECs traded between November 2008 and March 2011 in Delaware, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, and Washington, D.C., have ranged from $200/MWh to $400/MWh in most markets, with SRECs in New Jersey selling for $400/MWh to $650/MWh (Figure 5).

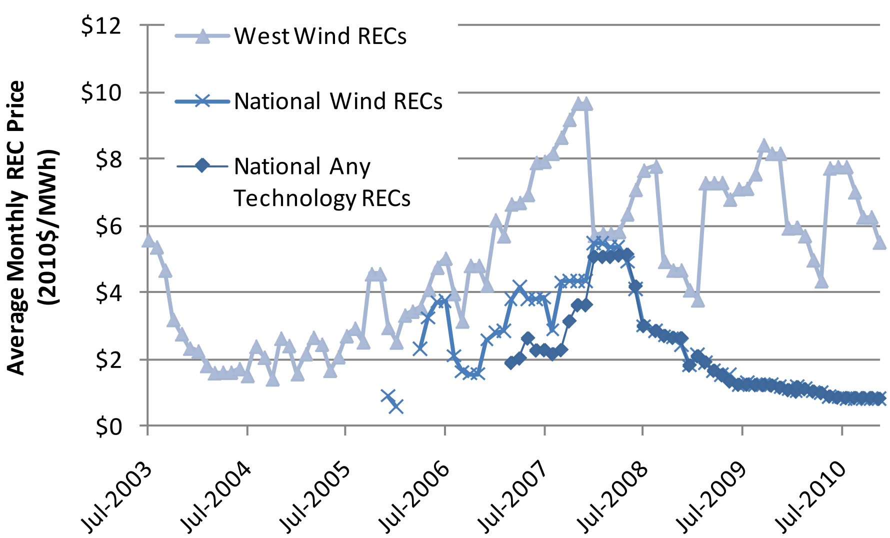
[9] Large project size leads to increased economies of scale. Low project cost is a result of the extent and complexity of permitting, contracting, and other administrative costs. The higher the capacity factor, the greater the output and the more revenues, since most revenues for electricity, RECs, and many incentives are based on production.



Source: PJM-GATS (2011)

Figure 5. Solar REC prices, November 2008 to March 2011

REC prices have also fluctuated over time in voluntary markets, as shown in Figure 6. Voluntary REC prices are subject to supply and demand but, unlike compliance RECs, are also affected by perceived value. If prices rise above consumer willingness to pay, demand will back down, maintaining a low price equilibrium. Another reason that voluntary REC prices are seldom as high as compliance REC prices is that the voluntary market tends to be more of a national market, with greater scope for competition among suppliers. Nevertheless, when RECs are procured from RPS-eligible regions, and thus compete with compliance demand, voluntary prices may converge with compliance prices.



Note: Plotted values are the last trade (if available) or the mid-point of bid and offer prices for the current or nearest compliance year.
Source: Evolution Markets (2007) and Spectron Group (2011).

Figure 6. Voluntary market REC prices, July 2003 to December 2010

The REC prices described above are not necessarily what would be paid for RECs in a long-term contract. Published prices represent deals reported by brokers, most often for short-term purchases, which reflect supply and demand more than they reflect what a project needs to cover the above-market costs. Long-term contracts are often for bundled energy and RECs, and the REC price is not broken out and reported. Even if a long-term contract is for unbundled RECs, the prices paid are under cover of contract and not usually disclosed, with limited exceptions where the transaction was facilitated by a broker.

3.4 The Role of Long-Term Contracts in Reducing Uncertainty

Long-term contracts can be a prerequisite for many sources of financing because they reduce risk to investors and lenders, who are more willing to support projects that have secure revenue streams (Bates 2006; Cory et al. 2008). Whether the contracts are for bundled electricity and RECs, for unbundled electricity, or for unbundled RECs, the increased revenue certainty and reduced risk can be significant in attracting financing to new projects. Long-term contracts also support access to financing at more favorable terms (such as lower expected rates of return or interest rates), especially if the contracts are with creditworthy counterparties. Inability to secure long-term contracts can exacerbate the higher cost of capital often associated with the credit ratings endemic to new and uncertain industries like renewable energy.

Developers often seek long-term contracts for both energy and RECs, but in some cases, developers may be able to proceed with a project by securing a long-term contract for energy only. Long-term contracts are needed for at least the larger revenue stream, which is usually energy. Developers may be willing to take the risk of merchant RECs,[10] especially if they predict higher REC prices in short-term contracts than in long-term contracts, but investors and lenders generally want to see RECs secured by long-term contracts in order to count REC revenue in their financing decisions (Cory et al. 2008; Redinger and Brown 2010). Although tax equity investors may be hesitant to finance projects based on anticipated REC value, JP Morgan Capital Corporation has structured a number of wind deals in the Northeast to specially allocate the RECs to a developer or another source of capital that is willing to place higher value on the RECs than a tax equity investor or bank would (Eber 2011).

Ideally for developers, the contracts would be long enough to amortize the capital investment, return on investment, and debt service, which is usually 10 to 20 years. Generation developers and owners would generally prefer the contracts to be 20 or 25 years or the expected life of the project. Buyers, on the other hand, might prefer contracts of 10 years or less because the price that looks reasonable today may turn out to be higher than market price in a decade. Tax equity investors care about contract length only for as long as they have a stake in the project; if that is 10 years or less, a 10-year contract will be sufficient to satisfy their need for security. Generally, debt lenders prefer a contract length that is 1–3 years longer than their investment commitment, but some will lend as long as the PPA (Cory et al 2008). If contracts are less than 10 years, new projects would have to rely on merchant energy prices and spot REC prices for later years. According to Wind on the Wires and the Environmental Law Policy Center (intervenor organizations in an Illinois Commerce Commission case reviewing a statewide resource procurement plan), in such a case, it would be difficult to reduce risk during the second half of a project's life because prices are too uncertain that far into the future. The uncertainty would increase the cost of capital, leading to higher prices at which the electricity would have to be sold (ICC 2009).

Long-term contracts are not always available to project developers for either the energy or the RECs, however. In restructured electricity markets, competitive energy suppliers will not or cannot sign long-term contracts because their future load requirements are uncertain and their future RPS obligations are

[10] Merchant RECs are those that have no pre-committed buyer and are therefore subject to the vagaries of short-term supply and demand.

therefore unknown.[11] They may also be insufficiently creditworthy to support such contracts (Toomey and Thumma 2010). Occasionally, new projects are undertaken on a merchant basis or partly merchant basis, but "arguably at higher ratepayer cost because investors in such projects require inflated returns to compensate for the added risk" (Wiser and Barbose 2008, 28).[12]

In voluntary markets, long-term contracts for retail purchases are rare. End-use consumers and large companies that drive the voluntary market are uncertain about their future business strategies more than 5 years into the future, and they do not want to risk locking in a long-term price only to see general market prices fall. Even if these consumers are willing to execute a long-term deal, generators may not be that interested because selling their RECs to end-use customers would require multiple buyers, which would increase transaction costs. REC marketers can help overcome this hurdle by aggregating demand and contracting long-term with the generator, but then they must assume the risk that comes with a customer's desire for short-term contracts. They also have to worry about the creditworthiness of these retail customers.

[11] Electricity restructuring is active to some degree in Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts Michigan, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, and Texas (U.S. EIA 2010). These states collectively represented 37% of U.S. retail electricity sales in 2009 (U.S. EIA 2011), but not all load in these states is subject to retail competition.

[12] A very large developer with a strong balance sheet may be able to build a wind project on a merchant basis and then seek one or more long-term contracts after the project is up and running, and it may refinance the project with debt a year or two after the project is operating, to free up its balance sheet for new development. Such developers may not incur higher costs, but they are strong enough and confident enough to take the risk.

4 Market Evidence of the Role of RECs in New Project Decisions

Determining how important RECs are to new project development is difficult, as there can be significant variability in REC markets and among specific projects. Perspectives about the importance of REC revenue can also change over time as market conditions vary. For example, in 2004 and 2008 developers were noting the importance of REC premiums. One developer stated in 2004 that "Most utility-scale wind power projects in the East are fundamentally uneconomic without REC premiums," and "based on the economics of wind energy in the eastern U.S., projects are generally not being built without buyers stepping up to the REC premiums necessary for wind power project financing" (Beerley 2004, p. 38). In 2008, a project attorney said that it is very difficult to justify the added cost of renewables without the production tax credit and RECs (Siegel 2008).

More recently, a developer acknowledged that current REC prices are insufficient to support new projects and that REC values must ultimately reflect the incremental cost of new renewables above the wholesale power price. He pointed out that today's low REC prices reflect the spot market and oversupply from projects already built and not the economics of new or even existing projects. He also emphasized that RECs, particularly when bundled with energy in a long-term purchase agreement, are still "critically important" to the economics of new projects, especially in the current low natural gas price environment (Toomey 2011).

This section examines market evidence on these issues through interviews with market participants, project data collected by NREL's REFTI, and data on REC contract length provided by EPA's Green Power Partnership. The perspectives presented here highlight some of the challenges that were presented in Section 3.

4.1 Interviews

For this report, interviews were conducted with 16 market participants, primarily developers, but also project development advisors and an investor, to gain their perspective on the use of RECs in renewable energy project development. Participants were selected in order to achieve a sample that included experience in different regions of the United States and with different renewable energy technologies. Standardized questions were used, although additional questions were added during the interviews in order to enhance understanding. Although the number of interviewees is small, they represent large and diverse project portfolios with respect to development location and region of the country, technology, project size, and the financing arrangement (e.g., balance sheet or project finance). Responses varied based on these factors in many instances.

Next, we summarize interview responses with respect to the role of RECs in project financing, typical contract structures, the availability of and need for long-term contracts, the importance of RECs in developing new projects, the valuation of RECs, and REC price transparency.

4.1.1 Project Financing

Most projects are financed by debt (loans from banks) and equity (investment by institutions with an interest in tax credits and depreciation). Interviewees agreed that banks are risk averse and will loan money only based on the contracts that a project has in place. One interviewee noted that they would not waste time asking lenders for financing without contracts in place. Several interviewees also said that the creditworthiness of an off-taker (or buyer) is important to lenders and investors.

A few of the larger developers mentioned that they have done balance sheet financing for a few projects. In this case, instead of seeking outside financing, they use their own money or equity and debt from a parent company. This gives them more freedom to base decisions on a forward price curve for RECs—something that banks will not accept. Thus, a project may not have to be fully secured by long-term contracts. It is not the standard business model, but it allows large, established developers to build some projects without contracts in place when other market conditions are right.

One developer's company built merchant plants in the past but is unlikely to do so today because electricity prices are low, making return on investment more risky. This might change again, but it will be a few years.

4.1.2 Contract Structure

Contracts are typically structured as a bundled PPA, meaning that energy and RECs are sold together for a single price. This is typical for wind, geothermal, and new biomass projects. One interviewee called it the "base case." Another stated, "Normal business today is bundled REC and power contracts," and that most developers prefer this structure if they can get it.

According to one interviewee, even when the utility (buyer) does not have an RPS compliance obligation, most PPAs will nevertheless convey the RECs also. But others indicated that buyers sometimes want the energy only, in which case developers have the option to look for REC buyers.[13] One developer provided information suggesting that 15%–25% of the capacity in its portfolio had RECs available separately.

With small projects, such as solar rooftop, it is common for RECs to be sold unbundled to a third party. In this case, the developer may sell the RECs to a REC aggregator, a retail REC marketer, or an RPS-obligated entity in states with a specific solar RPS requirement (set-aside or carve-out). The owner might also choose to keep the RECs to support environmental claims.

4.1.3 Long-Term Contracting

The importance of long-term contracts is acknowledged by market participants, and according to our interviewees, long-term contracts are standard for new utility-scale renewable energy projects. One interviewee noted that long-term contracts take price risk off the table, and it is simply prudent business practice to seek and enter such contracts. In addition, others confirmed that lenders and equity investors generally insist on long-term contracts for large projects.

One developer stated it looks for 20-year PPAs but will accept 10-year contracts. Contract duration may depend on how certain the buyers are about how long the state RPS will last and how risky a long-term deal appears to the buyer.

There are exceptions to the long-term rule, however, particularly in compliance markets operating in competitive states with retail choice and in voluntary markets. In competitive markets, contract durations may be shorter because a competitive electricity supplier is uncertain whether it will have compliance load in 10 years. One developer stated that it makes a significant effort to find a long-term buyer for Massachusetts compliance RECs. Finding a long-term buyer has "huge value," since it could mean a 10-year REC deal for \$20–\$30/MWh. Yet for some projects it works with 5-year contracts. It needs to have sold the RECs for at least 5 years to start construction. One developer complained that it is hard to sell a REC contract for anything longer than a 3- or 5-year deal in competitive markets.

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[13] In a bundled contract, buyers are still paying for RECs even if the precise amount is not broken out. If the buyer wants only the energy, the sale of RECs to a third party can be instrumental to project development because even a low price for RECs gives the developer a secondary revenue stream that may tip the balance towards a build decision.

On the solar side, one interviewee stated that it can be more important to lock in REC value than electricity value in states with compliance solar REC (SREC) markets. If contracts are unbundled, they want the SRECs under contract and the energy can be merchant.

In voluntary markets, end-use buyers are typically large customers. According to one interviewee, long-term contracts were somewhat common a few years ago but are much less so today because of uncertainty in the market. It sold some 10-year contracts in 2000–2001, but that is now pretty rare. Several interviewees agreed that contract durations now tend to range from 1–3 years, and "long-term" now means 5 years, although one interviewee's company sold RECs to a large institutional buyer on a 15-year contract.

4.1.4 Importance of RECs

Interviewees had mixed views on the importance of RECs. One developer said that it needs to cover its costs and return and whether the revenue comes from RECs or not is a secondary consideration.

Another developer offered a general impression that compliance RECs absolutely drive new projects, while voluntary RECs do not, but hedged by saying it depends on the nature of the market. Other interviewees agreed that more weight is attributed to compliance RECs than to voluntary RECs, although this varies according to the price and whether contracts are in place.

A third developer gave a higher opinion of the role of RECs. In New England, he asserted, projects are not economic without RECs, and if RECs went away in Massachusetts, wind development would stop. He stated that they have abandoned development projects when the REC price was not high enough to make the projects profitable. This interviewee argued that before big capital commitments can be made, they have to have a really good idea of where RECs and power will be sold.

Several opinions were more nuanced. For example, one developer noted that voluntary RECs can enable or accelerate projects that may be motivated more by an anticipated future compliance obligation. In that case, voluntary RECs help build the project, but they are not a critical driver. He gave an example of projects being built in western states (in the Western Electricity Coordinating Council, or WECC) almost exclusively for compliance markets. Because voluntary RECs are competing in the same space, voluntary REC prices are up around \$7–\$10/MWh—not inconsequential to a project. But when prices are only \$1/MWh, he continued, it is hard to argue that is a big factor compared to the total cost of \$50–\$100/MWh.

One interviewee hesitated to assert that all REC sales lead to new development but believed that REC sales are key for some of the projects with which it is involved. He suggested that this is especially true for smaller projects, where REC sales can push project economics beyond the threshold for returns.

Another interviewee acknowledged that the importance of RECs in project finance varies depending on the role they play in the revenue stream, citing one project where energy sales alone were sufficient to support the project. But he also noted that if a project would not pay for itself with energy revenue, then REC revenue becomes more critical because most lenders will not let projects go merchant. For lenders to close on the financing, they want to see REC revenue locked up for as long as needed to make the project viable.

One interviewee noted that in states with solar set-asides, such as New Jersey, solar RECs are material—the equivalent of a state incentive. In these situations, solar REC revenue is more important than energy revenue.

Finally, from the point of view of a buyer, one interviewee commented that purchasing a significant quantity of RECs rather than developing an on-site project, a purchaser has more impact on the grid and REC markets. An expensive on-site system will not have this market pull effect.

4.1.5 REC Valuation

According to interviewees, REC revenue is included in project financial models used by project developers to evaluate projects, even if a contract is not in place for the RECs. The value can vary greatly depending on the market. On the other hand, interviewees noted that equity investors and lenders will not include REC revenue in their analysis of project feasibility, absent a contract with a creditworthy party. They are unwilling to risk their money on potential but unsecured revenues. Lenders in particular will size a loan only against contracted project cash flows, including RECs.

One interviewee stated in bundled PPAs, it is “very rare” that there is a separate price for RECs and energy. Figuring out what value to attribute to RECs is difficult, but developers do not really care because “money is money.” One developer confirmed this, saying that they would just look at the bundled price and compare how competitive the project is against their next one. But another developer stated that they would model a discrete REC value even for a bundled contract.

In a bundled PPA, a REC value can be imputed. One interviewee suggested that in a market where natural-gas-generated electricity is selling for $43/MWh, and the bundled PPA counterparty is paying $53/MWh, the difference is the value of the REC.[14]

When project developers evaluate merchant projects for which there is no long-term contract for RECs, they base the REC value on a forward price curve (discounted to reflect uncertainty) or on their internal knowledge or independent forecasts for the specific market. They also consider fundamentals of supply and demand, and the volume, price, and term of current REC markets. In discussing future REC prices, some interviewees highlighted the uncertainty about RPS policies, proposed legislative changes, and their effect on the reliability of forward price curves.

4.1.6 Price Transparency

For the most part, interviewees agreed that there is a lack of price transparency in REC markets and that more transparency is better. One interviewee explained that transparency would reduce risk in markets. Another said that the more transparency, the easier it is to attribute value to RECs, both in the near term and the long term. Still another argued that without transparency, there is limited liquidity, and it is harder to get deals done.

One developer stated that more price information is always better, but it would have to be in real time to be really useful to him. He was satisfied to receive REC broker price data via instant messaging. Another interviewee observed that price transparency is improving, but, because the bulk of compliance RECs are transacted through bundled PPAs, it will still be hard to determine REC prices.

Another interviewee felt that SREC auctions in several mid-Atlantic and northeast states are providing useful price information, but it is limited to solar projects up to 500 kW. They would also like more frequent price updates than the quarterly auctions provide because they have to do a lot of upfront design and preliminary engineering for each project they bid in, without knowing if the project will be competitive.

[14] This approach is not clear-cut, however. The difference could also represent the greater perceived value of the generation; for example, a premium paid for long-term price stability rather than for RECs.

4.1.7 Summary of Interviews

Overall, the interview responses indicate that there is no single view on the role of RECs in developing new projects. Interview participants stressed that there are significant differences among markets in terms of the importance of RECs—some market segments may benefit more from REC revenue than others. For example, REC revenue from smaller projects can in some cases push project economics over the threshold margin for return. Compliance RECs are more firm than voluntary RECs, meaning that compliance RECs can drive project development, whereas voluntary RECs generally do not by themselves; however, it depends on the nature of the market. Interviewees agreed that lenders will not recognize REC revenues unless they are based on signed contracts with creditworthy counterparties. Thus, long-term contracts are highly desirable and often available, except in restructured electricity markets, where they are not required by law, and in voluntary markets. Generally, interviewees noted that REC revenues are included in project financials even if a contract is not in place. Also, interviewees agreed that there is a current lack of price transparency in REC markets and that in general more transparency would be beneficial.

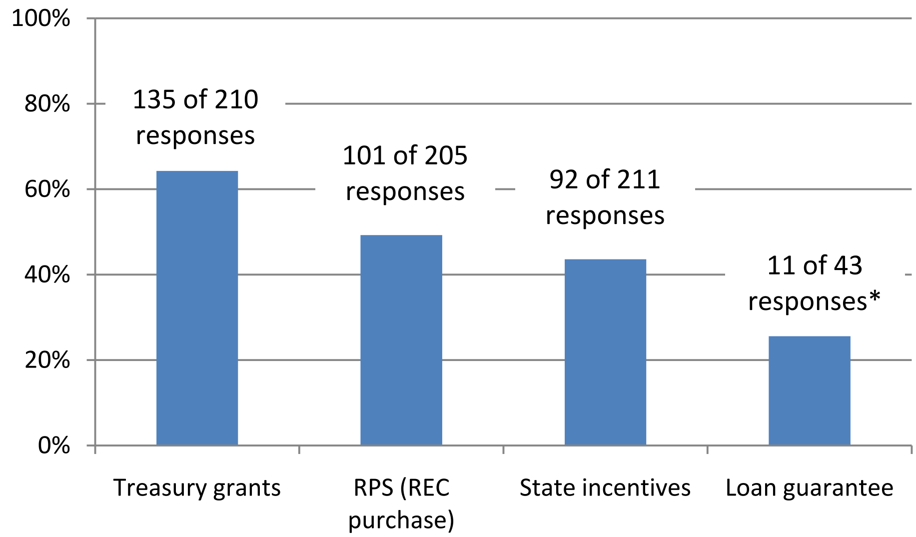
4.2 Renewable Energy Finance Tracking Initiative REC Data

REFTI, launched by NREL in December 2009, is designed to track renewable energy project financing information by conducting quarterly questionnaires of market participants.[15] To date, the primary respondents to the REFTI questionnaire are project developers and consultants. REFTI includes some data on the importance of RECs and RPS policies, REC contract availability, and contract length. Between 100 and 350 market participants have responded to the questionnaire each quarter, though the responses to the questions discussed below has typically ranged from 20 to 60 participants per quarter. It should be noted that data from REFTI is not representative of the entire U.S. renewable market. There are potential concerns over duplicate data, definitions of "financial closure" (since respondents are asked to provide data on projects with financial closure), and the small sample size. The REFTI responses are collected each quarter and the questions relevant to RECs are summarized next (Mendelsohn 2011).[16]

4.2.1 Policy Importance

When asked to *"Please comment on the importance of different incentive programs to developing your projects...,"* 49% of respondents ranked RPS/REC purchases as "extremely important" compared to treasury grants (64% ranked "extremely important"), state incentives (44% ranked "extremely important"), and the loan guarantee program (26% ranked "extremely important"), (Figure 7).[17,18] Because the REFTI questionnaire lumps RPS policy and REC purchases together, however, it is unclear whether respondents are indicating the importance of the RPS policy itself or the ability to contract for RECs or REC revenue. The ambiguity in the question means that the answers should be treated cautiously.

[15] In general, data presented here covers Q4 2009 through Q3 2010. Some questions were not asked in all quarters; this has been noted where applicable.
[16] The REFTI project data can be found at http://financere.nrel.gov/finance/REFTI.
[17] The loan guarantee incentive was introduced to the questionnaire in Q3 2010.
[18] In addition, the percent of respondents ranking each option as "very important" in Q4 2009 to Q3 2010 was as follows: treasury grants (10%), RPS/REC purchase (14%), state incentives (18%), and loan guarantee (Q3 2010 only) (19%).



* The loan guarantee incentive was introduced to the questionnaire in Q3 2010

Figure 7. Percent of respondents Q4 2009–Q3 2010 ranking the incentive program as "extremely important"

4.2.2 REC Sales

When asked to "*Provide the typical expected method of REC Sales, REC Type, and REC Contract Duration, by technology...,"* REFTI respondents noted that REC contracts are currently readily available to market participants: 75% reported availability of REC contracts, with availability primarily divided between bundled contracts (30%), REC-only contracts (27%), and merchant sales (12%).

When participants were asked about the typical expected method of REC type for their projects, half of the respondents noted that they expected to sell SRECs (49%), followed by compliance REC (25%)[19] and voluntary REC (13%) (Figure 8). The large share of respondents selling into SREC markets reflects the fact that a majority (62%) of respondents are developing solar PV projects; the REFTI participant sample is not representative of the country at large.

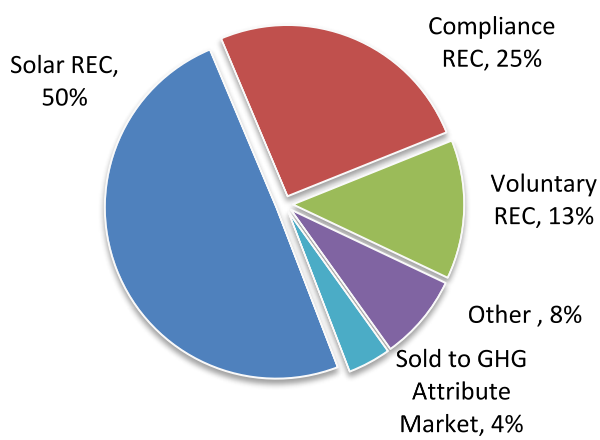


Figure 8. Form of REC sales reported by REFTI participants, Q4 2009–Q3 2010

[19] In the REFTI questionnaire, SREC and compliance REC options are mutually exclusive.

4.2.3 Long-Term Contracts

REFTI participants are primarily operating in compliance markets, and about half (52%) of all REFTI participants had long-term contracts (5 years or more) for their projects. Contracts of 20 years or more were reported by 29% of respondents (Figure 9). Generally, contract length does not appear to be correlated with technology type, with the exception of concentrating solar projects, which have for the most part reported contract length of 20 years or more. Some of the REFTI projects may be operating in states that have attempted to address the disincentives for utilities to provide long-term contracts (see Appendix A).

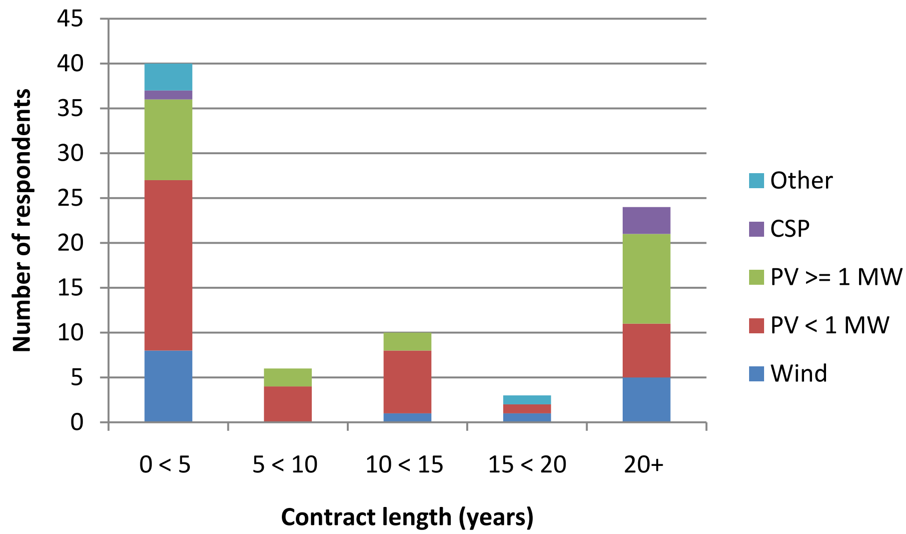
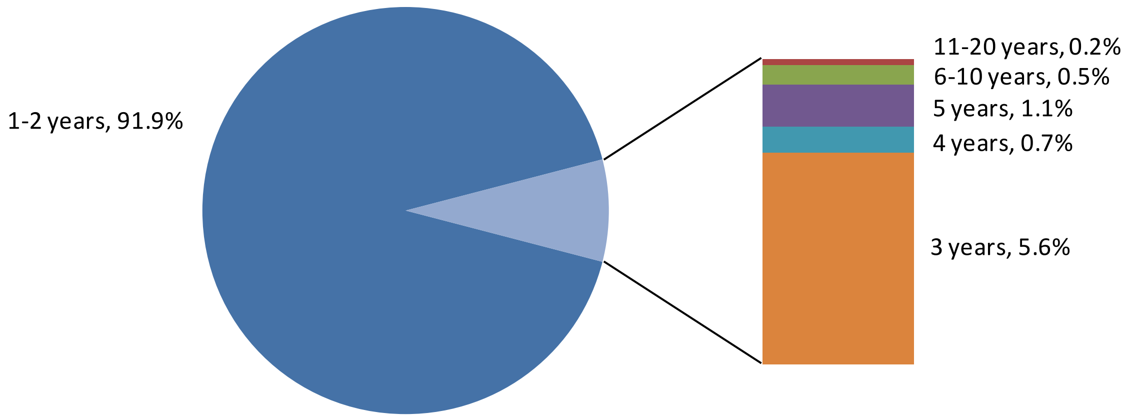


Figure 9. Contract length reported by REFTI participants, Q4 2009–Q3 2010

4.3 EPA Voluntary Purchasing Contract Data

The EPA's Green Power Partnership, a voluntary program that supports business and organization procurement of renewable energy, collects data from its 1,300 partner organizations regarding renewable energy purchase size and contract length. Partners represented approximately 60% of voluntary market sales in 2009. Participating organizations in the Green Power Partnership include businesses, local, state, and federal governments, universities, and other institutions that procure green power on a voluntary basis. Partners report annually to EPA about their annual energy use, green power purchase size, resource type, whether their purchase is of bundled energy and RECs or of unbundled RECs, contract length, and other factors.

Partners report very few long-term contracts for their voluntary green power purchases. Approximately 100 partners (about 7% of partners) have contracts that are 3 years or greater in length, while roughly 1,200 partners (about 92%) are purchasing RECs on a bundled or unbundled basis in 1–2-year increments (Figure 10) (U.S. EPA 2011).



Source: U.S. EPA 2011

Figure 10. Voluntary market contract duration for EPA Green Power Partners

The short-term nature of most of these voluntary purchases reflects the uncertainty many purchasers feel about future REC prices and the intrinsic value of buying RECs. For buyers, the downside of a long-term commitment is that market prices might fall after the contract price has been set. Currently, however, with REC prices so low, that risk may not be great, but then sellers may be reluctant to offer a long-term contract at historic low prices. Another uncertainty facing voluntary buyers stems from criticisms about whether buying RECs really helps build new projects and debate about whether buying RECs enables the organization to claim emission reductions in a GHG inventory.

4.4 Case Studies of REC Purchasing in the Voluntary Market

Case studies are presented as anecdotal information to illustrate how voluntary REC purchases can influence new project development. The following is a list of examples of businesses, governments, utilities, and marketers that have entered into long-term contracts for RECs (on a bundled or unbundled basis) to help drive new renewable energy projects, often locally.

- In 2011, Google Energy, LLC, an entity formed in December 2009 to allow Google to procure large volumes of renewable energy by participating in the wholesale market, signed a power purchase agreement for wind energy from a 100.8 MW facility in Oklahoma set to open in late 2011. Google will purchase the energy and RECs from NextEra Energy Resources, retain the RECs, and then sell the power back to the grid at the local, wholesale price. In a policy document explaining Google's purchase strategy, Google explained that "…instead of taking the risk of selling into the power market on a short-term basis, Google is providing the seller with a guaranteed revenue stream for 20 years. This is something the developer can literally take to the bank" (Google 2011, p. 4).[20]
- The U.S. State Department signed a 20-year agreement in 2011 to purchase renewable electricity from Constellation Energy, a competitive power marketer. The estimated 120,000 MWh/year will come from a wind power project planned in Pennsylvania and a $50 million solar energy project Constellation plans to build in New Jersey (Constellation Energy 2011).

[20] The applicability of this approach may be limited, however, because reselling the power required Google to seek approval as an energy marketer. Long-term contracts may have wider appeal if the buyer has the ability to use the energy or purchases RECs as a hedge against fluctuating electricity prices by paying a price that varies inversely with the price of electricity (Aulisi and Hanson 2004).

- In 2009, the state government and University System of Maryland committed to 20-year power purchase agreements to buy electricity from four projects expected to be built over a 4-year period. The projects include a 55 MW wind farm in West Virginia, a 10 MW wind project in Maryland, a 55 MW offshore wind project in Delaware Bay, Delaware, and a 13 MW solar project in Maryland (Maryland Office of Governor 2009).
- In 2008, Steelcase agreed to purchase all of the RECs from the Wege Wind Energy Farm in Panhandle, Texas, for a 5-year period. The wind project consists of eight turbines and generates up to 35,000 MWh/year, which is equivalent to 20% of Steelcase's electricity use for its North American operations. What is different about this purchase is that Steelcase made a commitment to an individual wind farm (not just any wind RECs), provided a long-term contract in the financing stage of the project (5 years with a 3-year option to extend), and earned sponsorship rights (naming, branding, and marketing rights) because of its long-term commitment. The project developer has stated, "Without a doubt, the sponsorship rights played a vital role in that project moving forward and being constructed" (Steelcase 2009, p. 6).
- In 2007, DTE Energy (Michigan) signed a 10-year agreement with Michigan-based Heritage Sustainable Energy, LLC, to supply RECs for DTE Energy's voluntary green power program, GreenCurrents. The agreement allowed Heritage Sustainable Energy to begin constructing the Stoney Corners Wind Farm. DTE Energy Vice President Trevor R. Lauer noted that, "A key element of the GreenCurrents program is to encourage development of renewable energy projects in Michigan" (DTE 2007).

Despite the fact that long-term REC contracting is not the norm for voluntary markets, these examples highlight how some developers and purchasers have attributed voluntary REC sales to the success of their projects. If customers are big enough or confident enough in future demand, they can take actions that drive new projects, and others could emulate them.

4.5 Summary

Based on our interviews with market participants, REFTI data, Green Power Partnership experience, and anecdotal information, the significance of RECs in developing new projects varies according to the project, the participant, and the specific market.

Generally, lenders will not recognize REC revenue in their financial decision unless a contract is in place with a creditworthy counterparty; thus, long-term contracts are important. On the other hand, project developers and owners welcome all revenue, large or small, because they wish to maximize profit, and they may not know for sure how profitable the project will be until its useful life is at an end. They generally plan for a REC revenue stream in project financials even without contracts in place, although the amount will vary from one market to another.

The importance of REC revenues varies considerably based on the project and market. For example, REC revenue from smaller projects can in some cases push project economics over the threshold margin for return. Compliance RECs are more firm than voluntary RECs, meaning that compliance RECs can drive project development, but voluntary RECs generally do not by themselves; however, it depends on the nature of the market and whether a contract is in place.

Long-term contracts are generally available in traditionally regulated electric markets, but they may be more difficult to obtain in restructured states where load-serving entities face more uncertainty about future loads and RPS obligations than traditionally regulated utilities do. Although there are exceptions, long-term contracts are generally not signed in voluntary markets because the future is too uncertain for both wholesale and retail voluntary market participants.

The differences among REC markets, electricity markets, and energy resources and projects makes it difficult to generalize conclusions and suggests that remedies to strengthen the role of RECs in new project development should be tailored to the situation. Possible remedies are addressed in Section 5.

5 Options to Strengthen the Role of RECs in New Project Development

The role of RECs in new project development could be strengthened if strategies were pursued to increase the certainty of demand and the certainty of REC prices. In this section, several options that have been utilized by policymakers and market participants or influencers are discussed. After describing each option, we give an example and summarize relevant advantages and disadvantages. Options are presented first for compliance markets and second for voluntary markets, as summarized in Table 1. Some of the options presented for the two markets are the same, but implementation would be different depending on the type of market.

Table 1. Strategies to Strengthen the Role of RECs in New Project Development, by Market Type

Compliance Markets	Voluntary Markets
1. Encourage long-term contracts	1. Encourage long-term contracts
2. Host periodic solicitations for RECs	2. Contribute funds for project development
3. Adopt a minimum price floor for RECs	3. Purchase strategically to drive new renewables
4. Increase renewable energy targets	4. Take an equity position in new projects (offsite)
5. Limit eligible REC supply	5. Own or host on-site projects
6. Support greater price transparency	

5.1 Compliance Market Options

5.1.1 Encourage Long-Term Contracts

At least 15 states have some form of long-term contracting requirement (see Appendix A) for regulated utilities to provide certainty of demand and price for new projects under development. Requirements have been or could be implemented through a standard offer, a feed-in tariff, or a competitive bid process.

For example, Maine and New Jersey direct the regulated distribution utilities to act as the agent or intermediary and either sell or assign those contracts to default service providers or sell the energy into the wholesale electricity market through periodic competitive auctions or other means available (MPUC 2009; Wiser et al. 2010). The utilities are allowed to recover in rates the net cost, if any, of the contracts. Maine law, for example, provides for utility regulators to direct investor-owned transmission and distribution utilities to enter into long-term contracts for capacity resources, associated energy, and RECs (MRSA).[21]

In response to this law, the Maine Public Utilities Commission directed two investor-owned utilities to enter into 20-year contracts with a new wind project. The contracts were structured as a discount off market prices but contain a price floor to protect the project owner and a price ceiling to protect

[21] As noted in Appendix A, other restructured states (Connecticut, Illinois, Massachusetts, Maryland, New York, Pennsylvania, and Rhode Island) also have long-term contracting requirements, and some of them rely on distribution utilities to play an intermediary role.

ratepayers. Essentially, "the contracts provide a ratepayer hedge against a future of higher than expected market prices" (MPUC 2009, p. 7).[22]

Advantages:

- Long-term contracts reduce risk to investors and lenders, leading to lower cost of financing.
- Utilities are generally credit-worthy off-takers.
- Offering long-term contracts could be viewed as a powerful economic development tool for the state and region, assuming that energy must be delivered to the contracting utility.

Disadvantages:

- Mandating long-term contracts may be objectionable in principle in some states or considered too market-intrusive in others.
- The economics of long-term contracts depend on projections of future energy prices, and there is a risk that future market prices may be lower than the contracted price.
- If the requirement applies to all development projects, it could be too costly, and it could depress electricity or REC prices necessary to make projects profitable, but states could incorporate caps on the quantity that would be contracted each year or lower the price paid.
- Final contract language can be problematic due to the diverging interests of regulators and developers and a lack of bargaining power on one side or the other (depending on the circumstances).

5.1.2 Host Periodic Solicitations for RECs

To reduce reliance on short-term spot markets and to increase REC price certainty, some states have required utilities to host periodic solicitations for RECs only or energy bundled with RECs. These solicitations can be reverse auctions in which sellers (generators) bid the lowest prices they will accept for RECs, or they can be standard auctions in which sellers offer RECs to the highest bidders. To provide greater price certainty, the solicitations could be for medium- to long-term contracts. To maintain focus on helping new projects get built, eligible sellers could be limited to projects not yet built. Eligibility for the solicitation could also be targeted to more expensive technologies or to project sizes that may be less competitive.

In an example of the reverse auction, the California Public Utilities Commission has directed the state's three largest investor-owned utilities to procure at least 1,000 MW of RPS-eligible renewables, each project no greater than 20 MW in capacity. The utilities will purchase energy and/or RECs for a bid price and a fixed term. Each utility has its own target within the 1,000 MW, and each is to solicit at least 25% of its target in four auctions over 2 years. The three utilities will hold their auctions simultaneously (CPUC 2011).

One benefit of the auction is the standardization of the procurement process: projects will be selected based only on price, with least-cost bids selected first. The contracts offered will also be standardized (non-negotiable): this will reduce the administrative burden associated with these projects. RECs will be transferred to the utility for the energy that is purchased; bidders can choose whether to sell all energy produced (and all RECs) or whether to sell only excess energy (and associated RECs). Projects

[22] The first contracts did not include RECs because they were undertaken before RECs were authorized as part of the long-term contracts. The law has since been amended to allow the Commission to direct long-term contracts for RECs as well.

will have 18 months from contract execution to begin commercial operation or lose eligibility, subject to one 6-month extension, provided the seller can prove a regulatory delay. Program rules do not specify the length of the contract, but the duration will be standardized (CPUC 2010).

Another example involving long-term contracts comes from New Jersey, which has a specific RPS target for solar electric generation. Electricity providers obligated under the RPS are required to satisfy the solar requirement by acquiring SRECs, which are created by the production from solar electric systems connected to the distribution grid serving New Jersey. The revenue from the sale of SRECs is supposed to help investors or customers pay for their solar systems.

The New Jersey Board of Public Utilities (BPU) ordered four distribution utilities to develop solar financing programs to help customers "securitize" their anticipated SREC payments. Two different program models emerged. Three of the utilities offer 10- to 15-year contracts for the purchase of SRECs from net-metered systems of 500 kW or less capacity, with projects selected through periodic competitive solicitations. The fourth utility, Public Service Electric and Gas (PSE&G), offers customers a loan for a portion of the costs of a PV system, and the customer can repay the loan either in cash or in the form of SRECs generated by their PV system over a 10–15 year term. For purposes of loan repayment, SREC prices are equal to the greater of the prevailing market price for SRECs or a pre-established floor price that varies by customer segment and by loan origination date (NJCEP 2011).

Because the distribution utilities are not retail electricity suppliers and therefore are not obligated under the RPS, they have no need for the SRECs. Consequently, all four utilities serve an intermediary function, offering the SRECs for sale to the highest bidders in periodic, coordinated standard auctions to retail electricity suppliers that have an RPS compliance obligation. The utilities use the revenue from such sales to offset the costs of their programs (Wiser et al. 2010).

Advantages:

- Auction-determined contract prices provide reasonable price certainty for the purposes of project economic evaluation and subsequent cash flow for cost recovery.
- As a means of pricing RECs over the medium- or long-term, solicitations provide a way to balance public objectives of competitive pricing with project proponent need to cover above-market project costs.
- The standardized bidding procedure streamlines the contracting mechanism, and using a standard contract reduces transaction costs.
- Auctions are well-suited to smaller projects that might have a hard time competing with larger projects and that do not know potential buyers or have the skills to do bilateral deals.
- Frequent auctions create some liquidity and price transparency in the market.
- With supervision, or conducted by an independent third party, auctions provide operational transparency and support for documentation and reporting of results.

Disadvantages:

- Auction services alone do not provide price certainty for new projects unless coupled with medium- or long-term contracts.
- Large generators are sophisticated businesses and generally know their potential buyers and may prefer negotiated contracts, so they may not need auction services.

- Each RPS state has different eligibility rules, making REC markets thin and less profitable to auction services.
- Even within a limited range of project size (e.g., up to 20 MW), reverse auctions may favor larger projects as more cost-effective, to the disadvantage of smaller projects.
- Reverse auctions can lead to overly aggressive bidding and subsequent contract failure.

5.1.3 Adopt a REC Price Floor

To create greater price certainty, states could establish a price floor for RECs, allowing them to trade within a range between the floor and a ceiling imposed by the alternative compliance payment. To the extent that market prices would have been below the floor price, retail electricity consumers would pay the extra cost in the prices charged by their utilities (for whom costs would be recoverable) or their competitive electricity providers.

The Massachusetts solar carve-out program provides an example. Although Massachusetts encourages solar system owners to sell their SRECs on the open market, the Department of Energy Resources (DOER) will operate an annual Solar Credit Clearinghouse. The Clearinghouse is a special auction for SRECs and is intended as a market of last resort.[23] If project owners choose to participate in the auction, they must deposit their SRECs into a special auction account. For the purposes of this summary, we omit a description of additional details, but DOER or its agent will conduct an auction of these SRECs at a fixed price of $300/MWh, equal to half of the 2010 solar alternative compliance payment of $600/MWh. Bids will be only for the quantity of SRECs that bidders are willing to buy at the fixed auction price. If all the SRECs are not sold at the fixed price after three auctions, they will be returned to the solar system owner and will continue to be eligible to satisfy the RPS solar carve-out for 3 subsequent compliance years (Massachusetts DOER).

Advantages:

- A price floor reduces risk of REC revenue to generation owners and financiers by providing certainty of a minimum price.
- By allowing higher prices, investors can realize the “up side” of their investment, which could draw more capital to invest in renewable projects

Disadvantages:

- Policymakers may consider adopting a floor price too intrusive to market operation.
- Any added cost (e.g., from higher prices) would result in higher electricity prices to all consumers.
- Muting the market signal from really low prices could result in an oversupply of RECs.
- Demand uncertainty is still present to some extent because there is no long-term contract.
- There are few examples, and no known examples that apply to RECs generally, so there may be unforeseen issues that arise because of the limited policy experience.

5.1.4 Increase Renewable Energy Targets

Managing the demand for renewable energy is one way to apply market pressure to build more renewable energy facilities. Increasing RPS targets keeps pressure on demand and creates a need to

[23] The Solar Credit Clearinghouse auction for Compliance Year 2010 will be held before July 31, 2011.

build new resources. States can also create set-asides for specific technologies, which create additional demand depending on the level of the target. A few states have rules that automatically adjust demand within the set-aside when certain conditions are met. Massachusetts and New Jersey again serve as examples.

New Jersey has established a mechanism for automatically increasing the solar set-aside targets in the event of a SREC surplus and declining SREC prices in 3 consecutive years, with the intent of increasing revenue certainty for solar project developers and investors (Wiser et al. 2010), but targets may also be delayed if cost caps are breached.

Massachusetts has also sought to encourage SREC price certainty by setting annual solar carve-out targets. The solar target is calculated each year based on prior years' performances such that a surplus of SRECs will tend to increase the solar target in subsequent years, and a shortage of SRECs will tend to reduce the target. This approach is intended to reduce the likelihood of prolonged periods of depressed or inflated SREC prices, thereby creating greater price certainty (Wiser et al. 2010).

Advantages:

- Increasing targets at a predetermined rate helps provide general market certainty of demand.
- Annual adjustments in targets based on actual market conditions encourage REC price stability.
- A more consistent price signal helps avoid boom and bust cycles while keeping pressure on markets to respond with more new renewables.

Disadvantages:

- Annual adjustments in targets based on actual market conditions weaken demand certainty—developers do not know the precise targets beyond a year.
- With a self-adjusting target mechanism, RPS rules and administration are more complicated.
- Without a long-term contract, new projects may still face barriers to finance.
- Unforeseen issues may arise because of limited policy experience.

5.1.5 Limit the Eligibility of REC Supply

Managing the supply of eligible renewable energy is another way to apply market pressure to build more renewable energy facilities. In general, making supply scarcer tends to increase the value of RECs. This could be done, for example, based on generator vintage, resource type, or geographic location; although most RPS states already limit geographic eligibility, and states that do so should be careful not to run afoul of the U.S. Constitution's Commerce Clause (Elefant and Holt 2011).

Both New Jersey and Massachusetts manage supply by limiting generator eligibility for their solar carve-outs based on generator vintage. New Jersey solar facilities are eligible to produce SRECs for 15 years, termed the "qualification life," and thereafter may be issued Class I RECs, but not SRECs. This moving window of eligibility prevents the accumulation of excess SRECs (avoiding the price-depressing results) and continues support for the development of new solar projects.

Massachusetts uses a more complicated mechanism to the same effect. New facilities receive a statement of qualification that specifies a term, in calendar quarters, of the eligibility of these units to participate in the Solar Credit Clearinghouse Auction. For 2010 this term is 40 quarters or 10 years. If the SREC market is oversupplied (as determined by how much of the year's compliance obligation is deposited into the auction account), the term for new projects applying for qualification will be reduced following a formula. If the SREC market is undersupplied, the term of eligibility for new projects will be increased, but no longer than 10 years (Massachusetts DOER).

Advantages:

- Using generator vintage criteria focuses attention on the priority to support newer projects.
- A rolling window of eligibility for new projects provides time to recover investment costs while encouraging new project development and ensures that new projects will continue to be needed even if the targets remain flat at the end of the project eligibility period.
- Annual adjustments in targets based on actual market conditions create greater price stability.
- A more consistent price signal helps avoid boom and bust cycles while keeping pressure on the market to respond with more new renewables.

Disadvantages:

- With a self-adjusting target mechanism, RPS rules and administration are more complicated.
- Without a long-term contract, new projects may still face barriers to finance.

5.1.6 Support Greater Price Transparency

Price transparency is helpful to recognize the value of RECs because it leads to greater confidence in the market and in the revenue from REC sales. To the extent that price transparency supports the development of forward price curves, it will help investment decisions. There are several ways that price transparency could be supported. The options include:

1. Requiring RPS-obligated entities to report publicly the total cost expended for compliance RECs, which could yield an annual, after-the-fact reporting of average REC prices. This type of requirement exists, for example, in Maryland, Pennsylvania, and the District of Columbia.
2. Requiring market participants to enter price data in the REC tracking systems when a state-eligible certificate is transacted. New Jersey requires that account holders transacting SRECs enter the SREC price before the transaction can be completed. This enables semi-automated, monthly public reports of the range of prices and the weighted average price.
3. Encouraging or designating an exchange or trading platform for unbundled REC transactions that reports all bids and offers in real time. The Flett Exchange and the Chicago Climate Futures Exchange operate two such trading platforms that report prices in real time (CCFE 2011; Flett 2011).

Advantages:

- Price transparency encourages greater confidence in current and future REC prices, supporting recognition of RECs as a potential revenue stream.

- It would be technically easy to automate reporting of aggregate price data by building price reporting into the certificate tracking systems as a condition of transferring RECs between account holders.
- Public price discovery helps market participants know if their prices are reasonable.
- Price discovery supports competition and lower prices.
- Price transparency could support market innovations, such as "future strips"—where future production of RECs could be sold for multiple future years. The length of these strips will increase with market confidence with this mechanism.
- Price transparency narrows bid and offer spreads, making markets more efficient.
- Price indexes help regulators monitor markets.

Disadvantages:

- Price transparency is helpful but does not provide the same level of security as a long-term contract.
- Many transactions will still take place via PPAs in which the RECs are bundled with the energy sale; REC value may not be identified in these contracts, and as customized agreements they are not suitable to be traded on exchanges.
- Prices reported could be a mix of short-term and long-term deals, creating some uncertainty about the price transparency gained.
- Market exchanges typically support a spot market, and sometimes short-term contracts up to 5 years, but rarely longer.
- Long-term contracts, especially for large projects, usually require bilateral negotiations and are generally not supported directly by market exchanges.

5.2 Voluntary Market Options

Many of the options for encouraging new project development in voluntary markets are the same or similar to those described above for compliance markets, but the context and implementation details differ. By definition, there are no mandates in voluntary markets, but organizations and programs central to the voluntary market may set standards that can influence behavior of voluntary actors, as described in Appendix C. In this section, options that increase certainty of demand for RECs are presented first, and those that would tend to increase REC prices are presented second. These are followed by a couple solutions that would likely do both simultaneously. It would be up to program leaders and market participants to decide whether to implement these solutions.

5.2.1 Enter into Long-Term Contracts with Projects

As described above, long-term contracts are very important to financing new large projects, but voluntary purchasers, unlike utilities faced with fixed RPS targets, are less certain of their long-term plans and are leery of commitments longer than 5 years. Also, they can be concerned about locking into high prices today. Nevertheless, if the right off-takers can be found, long-term contracts provide a certain revenue stream for project developers, whether from energy, RECs, or both energy and RECs bundled.

A number of organizations including Google, the University System of Maryland, and the U.S. State Department (see Section 4), have entered into 10- or 20-year contracts for the output of renewable energy projects. If 10- to 20-year contracts are not practical for most voluntary purchasers, a medium-term (5-year) purchase of RECs may be more suitable for these buyers, and yet still be helpful in providing security for financing. For the strongest evidence that they are helping new projects get built, purchasers would limit their interest to projects not yet built.

Developers or owners might be put off by having to negotiate contracts with multiple buyers, but they could contract with a REC marketer that aggregates retail buyers' demand, thereby reducing their transaction costs significantly. Alternatively, now that several new market platforms for RECs have been launched, buyers and sellers could pursue contracts through exchanges or auctions.[24]

Advantages:

- Long-term contracts reduce risk to investors and lenders, leading to lower cost of financing.
- Long-term contracting gives developers and producers the incentive and the means to build more renewable energy capacity.
- Large corporations may be creditworthy off-takers.
- Long-term contracting for energy and RECs gives the purchaser a physical hedge against rising electricity prices.

Disadvantages:

- Some large organizations (and many smaller ones) may not have the counterparty creditworthiness a developer's lender requires to support the financing.
- Purchasers face the risk that future electricity or REC prices may be lower than the long-term contracted price.
- The higher transaction costs of dealing with multiple small or medium buyers may discourage developers from pursuing this model, in the absence of a REC marketer or aggregator.

5.2.2 Contribute Funds for Project Development

Some voluntary green power programs encourage buyers to pay money now for new energy to be produced later. Funds that accumulate prior to construction demonstrate a critical role in building new projects and increase certainty of financing. In the early years of green power programs, utilities allowed customers to contribute to a fund for new renewable projects, but these programs sometimes took a long time to accumulate enough money, resulted in only small projects, and were not for the most part very successful because the value proposition—essentially a charitable donation—was weak. In recent years, new approaches have been offered.

EarthEra, a program of NextEra Energy Resources, enables customers to buy RECs from its national fleet of existing renewable energy generators, and the money paid (100%) goes into the EarthEra Renewable Energy Trust (EarthEra 2011). For example, Dow Corning purchased 28,000 MWh of RECs for 2010 and 2011 through the EarthEra program (Dow Corning 2010). Funds from the EarthEra Trust can only be used to build new renewable energy facilities that will be owned by NextEra Energy Resources. Marketing, administrative, and other overhead expenses are paid by NextEra Energy

[24] These trading platforms include the Flett Exchange (a live, online trading platform that is open for business all the time); the Chicago Climate Futures Exchange (which trades futures contracts up to 5 years in duration); and auction platforms such as SRECTrade, PJM EnviroTrade, or World Energy Solutions. Some of these services focus primarily on solar RECs but include some regular RECs, and others trade regular RECs. Most of them currently trade only compliance RECs, although they could be used to satisfy voluntary market demand.

Resources. The Trust is overseen by an independent trustee and a panel of outside advisors. The Trust had $39 million in contributions committed as of May 2011 and a portion of these proceeds are being used to develop a large solar project in New Jersey that will be announced in summer 2011 (Noble 2011).

The New England Wind Fund, sponsored by the Mass Energy Consumers Alliance, provides a different example. Customers donate money to the fund, usually to offset electricity use, and the fund uses the money to buy RECs from new small-scale wind farms in New England. Mass Energy states on its website, "We are able to help wind projects make it from the planning stage to execution because we sign long-term contracts to buy the Renewable Energy Certificates from them. These contracts help the projects get the financing they need" (NEWF 2011). The New England Wind Fund retires the RECs from the contracted facilities on behalf of the customer.

Advantages:

- Contributing funds to project development through these types of programs is a way to directly support new projects.
- Directing the money to new projects supports stronger environmental claims of making a difference or creating additional GHG reductions than otherwise would have occurred.

Disadvantages:

- It may be unclear when project(s) will be built and what project(s) is supported.
- Although support for new projects is clear, the value proposition for the current purchase may be less clear if the payment is in exchange for existing renewables that have no other market.
- Depending on how the funds are administered, expenditures for resulting projects may have little transparency.
- Directing 100% of payment to new projects requires subsidy from sponsoring entity for marketing and administration and for existing RECs.
- Depending on the size of the fund, this approach may tend to support small projects.

5.2.3 Purchase RECs Selectively and Strategically to Drive New Renewables

As a voluntary variant on compliance option 5 (limit eligible supply), purchasers could choose to buy RECs from newer facilities or for longer terms. Purchasers could also buy from smaller projects, which tend to face more challenging economics than utility-scale projects, or from regions with relatively few projects, where the price signal might encourage more development. These choices would go beyond what is required by Green-e or the Green Power Partnership, for example, although voluntary programs could also adopt more stringent REC eligibility criteria.

The decision criteria would be up to individual purchasers and would depend on the purchaser's location and judgment about likely effects. For example, at least one REC marketer sources RECs exclusively from compliance markets based on the rationale that it helps create scarcity, forcing RPS-obligated entities to buy more renewable energy (Village Green 2011).

In addition to purchasing selectively, buyers could simply increase the size of their purchase. Some voluntary programs encourage this by providing incentives for purchases that more clearly drive new renewables. For example, U.S. EPA's Green Power Partnership distinguishes its recognition for

Partners, who must buy green power at minimum levels, and for the Green Power Leadership Club, whose members must purchase at levels 10 times the minimums. Similarly, the U.S. Green Building Council's Leadership in Energy and Environmental Design recognizes Certified, Silver, Gold, and Platinum new construction projects based on points accumulated for increasing sustainability. Appendix C provides more information on these program standards.

Advantages:

- Targeting support to newer projects, projects with higher costs, or regions with less development, will send a stronger market signal to developers.
- A high-profile campaign by voluntary programs could educate purchasers about the added value of newer renewable facilities.
- Stronger recognition could be implemented more easily than changing eligibility criteria or program requirements.

Disadvantages:

- If left to individual purchasers, this approach has less certainty of success.
- Seeking out more expensive opportunities conflicts with the usual cost-minimization goals of most organizations.
- It is uncertain whether purchasers would find the incremental benefits from a tiered recognition program to be sufficient to motivate them to act accordingly.
- Adopting a tiered recognition program may call into question whether the lower tier is credible.

5.2.4 Take an Equity Position in New Projects

Because equity investors and debt lenders are typically reluctant to count REC revenue unless it is backed by long-term contracts, consumers could address this challenge by investing their own money, not just as a passive investment opportunity, but as an active owner seeking return through the sale of energy and or RECs or using the RECs themselves for their own purposes. The consumer's investment would thus be integral to the decision to move forward with a new project.

Instead of a long-term contract for RECs, a large company could invest in a new project as a part owner, and that ownership yields a return. Part of that return could be in the form of RECs. For example, Customer First Renewables (CFR) is a new company that tries to match direct user investment to utility-scale projects. CFR claims that a customer-investor would be able to:

- Produce its own energy and RECs over the next 20 years, sized and located to the customer's needs
- Profit by using its generation to offset current purchases and/or sell the output in the wholesale market
- Offset future increasing electricity costs, since income generated by energy sales would increase as the price of electricity rises
- Benefit from pooling its share of capacity with other CFR customers, mitigating future cost and operating and technology risks (CFR 2011).

Advantages:

- The consumer's investment is directly tied to the decision to build a new project.
- An ownership share grants proportionate control of RECs and associated environmental claims.
- The strong relationship to the project supports the consumer-owner's brand by demonstrating environmental stewardship.
- Direct investment provides a physical hedge against rising electricity prices, allowing the customer-owner to benefit from rising electricity prices (unless the electricity has already been contracted at pre-established prices).
- Electricity not used by the customer-investor may be sold, reducing net electricity costs compared to conventional electricity supply.

Disadvantages:

- For utility-scale projects, the investment model works mainly for large customers with significant electricity use and costs and with significant financial resources.
- Large businesses with adequate financial resources may prefer to pursue other opportunities that are more closely related to their core business.
- Even if a company would consider owning a share of an energy project, the investment would have to compete with other business opportunities that may offer a higher return.
- The consumer bears the risk if a project does not come online; depending on the size of the project relative to the consumer's demand, this may have a substantial impact on the consumer's overall environmental strategy.

5.2.5 Own or Host On-Site Projects

When customers decide to install on-site renewable energy projects, uncertainty about demand, supply, price, and creditworthiness is resolved in one fell swoop. If the customer is the project owner, the customer makes a new project happen by direct investment rather than by purchase of energy or RECs. If the customer hosts an on-site project owned by another entity, the customer makes the project happen by offering the site and by contracting for the energy for the project. The customer can keep and retire the RECs to support environmental claims about the project or can sell them to accelerate recovery of costs. In both cases, the customer decision creates the momentum to move forward with a new project.

Utilities could also be encouraged to provide a standard offer for energy and RECs from on-site projects, as described in Appendix B. The revenue from the sale of excess energy and RECs helps new projects get built. Spurred by these incentives, customer on-site investment is occurring more and more frequently. For example, the Sierra Nevada Brewing Company installed a fuel cell system at its Chico, California, brewery, powered by natural gas and supplemented by digester gas from the treatment of brewing wastewater. The 1.2 MW of electricity, combined with 1.9 MW solar panels, supplies about 90% of the brewery's overall power requirements, and the waste heat is used for the brewing process as well as other heating needs (U.S. DOE et al. 2010).

An alternative model that is common, especially for solar photovoltaic generation, allows consumers to host an on-site generating system that is owned and installed by a separate company. In this case, the consumer agrees to provide the site for the installation and enters into a long-term power purchase agreement (PPA) with the solar designer and installer, who also owns and maintains the system.[25] The installer-owner puts up the money to build the on-site generator, so the host consumer does not have any capital at risk (Solar Power Partners 2008).

In one of many examples of a solar PPA, Kohl's Department Stores signed a solar PPA with SunEdison in 2007, which has resulted in over 100 solar power systems on its stores in California, Oregon, Colorado, Wisconsin, Connecticut, New Jersey, and Maryland. The systems will provide about 40% of each store's power (Kohl's 2011). Kohl's also buys RECs to cover 100% of its stores' electricity use.

Advantages:

- Owning or hosting an on-site project provides direct support for building new projects, and the RECs, whether used to make claims or sold for revenue, are a direct result of that decision.
- On-site installations work for both small and large electricity consumers, although the transaction cost of negotiating a PPA favors larger installations. Nevertheless, smaller installations have been done through a PPA.

Disadvantages:

- Although there is a direct customer connection to the new project decision, the importance of RECs in that decision may still be unclear. On-site installations are not possible for consumers who rent or lease, unless they can convince the owner of the property.
- PPA arrangements may not be as desirable in states where financial incentives exist, especially for solar installations.

[25] Alternatively, the solar company may design, install, and maintain the system, but it may be owned by a third-party financing firm.

6 Conclusions

Information from many different sources suggests that the importance of RECs in building new projects varies depending on a number of factors, including wholesale electricity prices, the cost-competitiveness of the project, the presence or absence of public policies supportive of new projects, contract duration, and the perspective of different market participants. Technology type, project size, and source of financing also play a role in the relevance of RECs.

Electricity market prices vary over time, frequently dependent on the price of natural gas. If the expected wholesale electricity price is low, RECs are more critical to make projects economically attractive; if electricity prices are high, the additional REC revenue may be less critical.

The economic feasibility of projects also depends on the quality of the renewable resource and the cost of the project. If the project is very cost-competitive, the importance of REC revenue may be diminished in the build versus no-build decision, but if the project is small, lacking economies of scale, or relies on more expensive technologies or faces other cost challenges, then RECs will be more important in the project decision. The availability of financial incentives—including RECs—for new projects makes a difference in the same way, by bridging the gap between project costs and revenue available from energy sales.

The importance of RECs also depends on the perspective of different market participants. It is clear that developers value RECs in their financial models and that RECs contribute to their assessment of project viability, while investors and especially lenders do not value RECs (or the associated energy for that matter) without the security of long-term contracts.

One of the most consistent themes of this research is that long-term contracts are important to getting new projects built. Contracts need to be at least for energy and preferably for bundled energy and RECs. For solar projects in states with a solar RPS, contracts need to be at least for the solar RECs.

Long-term contracts are generally available in traditionally regulated electric markets, but they may be more difficult to obtain in restructured states where load-serving entities face more uncertainty about future loads and RPS obligations than traditionally regulated utilities do. Although there are exceptions, long-term contracts are generally not signed in voluntary markets because the future is too uncertain for both wholesale and retail voluntary market participants.

There are a number of options available for consideration for purchasers, marketers, and policymakers that could strengthen the role of RECs in both compliance and voluntary markets. There are examples of these options, but each option could be implemented in several ways.

- Encourage long-term contracts for RECs. Long-term contracts can offer the security and certainty that many projects need to obtain financing.
- Host periodic solicitations for medium- to long-term contracts with smaller projects. Smaller projects need a more standardized market, and auctions also increase REC market liquidity and price transparency.
- Adopt a REC price floor. This would ensure a minimum level of support and reliable revenues for new projects decisions.
- Increase renewable energy targets. Increased demand would lead to stronger REC prices.

- Limit eligibility of supply. Restricting eligible supply also tends to increase REC prices.
- Support greater price transparency. Price transparency increases confidence in current and future REC prices and could lead to a greater recognition for RECs as a potential revenue stream.
- Contribute funds for project development. Primarily an option for the voluntary market, having incremental costs funded up front would reduce the risk for projects that are above-market.
- Take an equity position in new projects. Direct investment in itself is strong evidence of making new projects happen and has several other advantages. This approach could work for utility-scale projects or for installation of on-site distributed generation.

In compliance markets, lawmakers or regulators would have to adopt measures that would strengthen the role of RECs in the development of new projects, while in voluntary markets, it would be up to program leaders and market participants themselves to implement measures.

While there is no single answer to the role that RECs play in developing new renewable energy projects, there are situations in which REC revenues are essential to project economics, as well as some where REC revenues may have little impact. To increase the influence of RECs on decisions to invest in new renewable energy projects, policymakers and market participants could consider individual or multiple policy options, as some options may be more effective taken in concert with others.

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Appendix A. Compliance Markets' Long-Term Contracting Requirements

Many states with compliance markets have adopted long-term contracting requirements, as summarized in Table A-1. In general, these requirements reflect a desire to ensure that RPS targets can be met and an understanding that long-term contracts are important to getting new projects financed and built. These requirements enable RECs to assist in new project development by satisfying lender requirements and increasing the likelihood of obtaining debt financing. In states with restructured electricity markets, it can be more difficult to encourage long-term contracts because competitive electric service providers are unable to play the role in long-term resource planning that has traditionally been played by regulated utilities. In these states, policymakers have to balance the benefits of competitive wholesale electricity markets, which tend to focus on short-term prices, against the benefits of long-term resource planning and investment, including a policy preference, in many cases, for cleaner and more diverse sources of supply. Policymakers and regulators in restructured states have therefore had to be especially creative in placing requirements on regulated distribution companies even though the distribution companies are no longer in the supply business.

Table A-1. State Long-Term Contracting Requirements

State	Contract Requirement
CA	10+ years
CO	20+ years
CT	150 MW, 10–20 years
IA	ownership or long-term contract
IL	central procurement with up to 20-year contracts
MA	10–15 years
MD	solar, 15+ years
ME	10+ years
MI	contract term to be specified in bids
MT	10+ years
NV	10+ years
NY	central procurement, 10-year terms for RECs
NC	solar, sufficient length to stimulate development
PA	good faith effort includes seeking long-term contracts
RI	10–15 years

Source: Wiser and Barbose 2008, with additions and updates.

The requirements summarized in Table A-1 do not necessarily apply to any and all renewable energy contracts entered into by utilities. The requirement may apply to a minimum amount of capacity or a fixed number of solicitations. Some are limited to solar generation (MD and NC) or smaller projects (CT) that may involve higher cost resources. In other cases, states themselves may take a direct role in long-term planning and contract solicitation (IL) or in REC procurement for RPS compliance (NY).

Utility regulators in other states without a long-term contracting requirement, such as Indiana and Oklahoma, have also approved long-term contracts (ICC 2009).

There are other models that strengthen support for new project development through price or long-term security. New Jersey, for example, has two programs that provide long-term support for new projects. In the first, operated by three utilities, customers are offered 10- to 15-year contracts for the purchase of SRECs, with the projects selected and prices set by competitive solicitations. In the second approach, operated by Public Service Electric and Gas (PSE&G), customers are offered loans for a portion of the upfront cost of a PV system, and the customer repays the loan either in cash or in the form of SRECs generated by their PV system over a 10–15 year term. To provide some price security, SRECs are worth the greater of the prevailing market price for SRECs or a pre-established floor price. Because the utilities are not obligated under the state's RPS, they turn around and sell the RECs at auction to entities that need them for compliance (Wiser et al. 2010).

Appendix B. State and Utility Programs Offering Fixed Payments

A number of utility and state programs offer fixed payment programs for energy and/or RECs as a way to provide demand and price certainty. These programs have a similar effect on new project development as described in Appendix A for long-term contracting requirements for RPS compliance, but they differ from those requirements in several ways.

- They support smaller projects that are usually not as cost-competitive as utility-scale projects that are the focus of the long-term contracting requirements described above.
- They tend to be standard offer programs, with well-defined eligibility criteria and standard contracts, rather than negotiated contracts.
- The purpose of the programs varies, and the RECs may be used either for compliance or voluntary markets; some are in states without an RPS.

Table B-1 provides a summary of many of these programs. Some, like the Tennessee Valley Authority, are in states that do not have an RPS; the motivation in TVA's case is to demonstrate environmental leadership, raise market awareness of renewables, promote new resources in the service area, and supply TVA's voluntary green power product. Others, such as We Energies and PNM, are in states with an RPS but the programs were undertaken to support distributed energy and resource diversity. In all but one case (the Washington State program), the RECs are purchased by the utility and may be used by the utility for RPS compliance or for sale to customers in a voluntary green power program.

Table B-1. Programs Supporting Long-Term Contracts for Small Projects

	Solar PV	Wind	Hydro	Biomass	Project Cap	Program Cap	Contract Duration	Comments
Gainesville (FL) Regional Util.	X				1 MW	2.7 MW in 2011	20 years	Payment is for both electricity and RECs.
Georgia Power	X				100 kW	2.5 MW	5 years	Payment is for both electricity and RECs.
Madison Gas & Electric	X				10 kW	1 MW	10 years	Payment is for both electricity and RECs. Customer must participate in green power program.
NC Green Power	X	X			5 kW solar; 10 kW wind	Depends on GP sales	5 years with option to renew	Payment is additional to energy price. Program owns/retires the RECs
Progress Energy	X				500 kW	5 MW annually	20 years	Non-res systems only. Payment is for both electricity and RECs.
Public Svc Co of New Mexico	X				1 MW		12 or 20 years	Payment is for RECs only; net-metering pays for energy. Contract length depends on size of system.
TVA Generation Partners	X	X	X	X	200 kW	200 MW	10 years	Payment is for both energy and RECs
TVA Standard Offer	X	X		X	201 kW - 20 MW	100 MW	10, 15 or 20 years	Payment is for both energy and RECs
We Energies				X	2 MW	10 MW	15 years	Payment is for both electricity and RECs. Anaerobic digesters only.
Xcel (WI)		X		X	1 MW wind 800 kW biomass	0.25% of retail sales	10 years	Payment is for both electricity and RECs; prices for other renewables may be negotiated.
California Feed-In Tariff	X	X	X	X	3 MW	750 MW	10, 15 or 20 years	Payment is for both electricity and RECs. Customers receiving payments may not participate in other state incentive programs, including net metering.
Oregon Pilot Solar Volumetric Incentive Rates & Payments Program	X				500 kW	25 MW	15 years	Payment is for both electricity and RECs, but is reduced by retail rates because systems are net-metered. Customers receiving the payment may not also receive state tax credit and rebate.
Vermont Standard Offer for Qualifying SPEED Resources	X	X	X	X	2.2 MW	50 MW	15 to 25 years	Payment is for both electricity and RECs. Utility owns RECs (except for farm methane generators)
Washington Renewable Energy Production Incentives	X	X		X	none	none	Annual payments until 6/30/2020	Payment is for electricity only; customer keeps the RECs

Source: DSIRE, February 2011.

Appendix C. Voluntary Market Programs Encouraging New Renewable Energy

Several of the most influential voluntary programs have adjusted their standards for eligible renewable projects over time to encourage more new renewable energy. In the early days of voluntary markets, there was little new renewable energy available. Early utility green pricing programs allowed consumers to make donations to a fund for new projects, which were mostly small due to the limited funds. Some competitive marketers in newly restructured electricity markets tried to differentiate their products as environmentally preferable, but because few new renewables were available, they were forced to rely on existing renewables such as hydropower. The consumer expectation of supporting new renewables was unfulfilled, and such products were criticized as green-washing and not making any environmental difference (Holt and Fang 1997; Rader 1998).

In response, government and non-governmental organizations developed renewable energy product certification standards, recognition programs for purchasers of renewable energy, and benchmarks for government agency purchasing. As renewable energy supply has increased, the sponsors of these programs have increased their expectations, especially relating to updated definitions of "new" renewables (Lieberman 2006), higher purchasing benchmarks, and the introduction of contracting requirements. Limiting eligible supply and increasing demand both tend to increase REC prices, sending a stronger price signal to developers.

Efforts by voluntary market programs to adjust the "new" date and increase demand for renewables are detailed below:

- *Green-e Certification.* In 1997, the Center for Resource Solutions launched a renewable energy product certification program called Green-e, establishing environmental product, marketing, and consumer protection standards. One of the environmental criteria was the amount of new renewables that had to be included in any Green-e certified product. Because little new renewable energy generation was available at the time, Green-e initially specified a minimum of 5% new renewables, with "new" being defined as any eligible generator that began operation on or after January 1, 1997. Recognizing that supply availability varied by region, the minimum requirements for new renewables in 2003 ranged from 5% to 50%, and by 2006, the minimum requirements ranged from 25%–50%. In 2007, the national Green-e Energy standard began requiring 100% new renewables in certified products.

  More recently, Green-e Energy concluded that generators that began operation in 1997 were losing credibility as new renewables, and in 2010 the program adopted a moving 15-year window of eligibility, effective July 15, 2011, so that projects that began operation in 1997 will lose their eligibility after 2011, and projects that began operation in 1998 will lose their eligibility after 2012. The 15-year window of eligibility was selected because many projects need 10–20 years to amortize their investment cost or to pay off debt (CRS 2010a, 2010b).

- *Green Power Partnership.* The U.S. Environmental Protection Agency's Green Power Partnership, a voluntary program that encourages business and other organizations to purchase renewable energy, similarly has updated its requirement for new renewables since its inception in 2001. EPA adopted program requirements calling for 100% new renewable energy and recently announced its intent to use the same 15-year moving window of eligibility that Green-e adopted, effective January 1, 2012 (U.S. EPA 2010). This is significant because in 2009, the Partnership accounted for roughly 77% of non-residential purchases, which comprise 76% of voluntary market purchases of renewable energy.

Also in 2010, EPA announced that it was increasing the minimum purchase levels for participation in the Green Power Partnership from between 2% and 10%, based on annual electricity use, to between 3% and 20%. The minimum purchase requirements for the Green Power Leadership Club also changed from between 20% and 60% to 30% and 100%.

- *Leadership in Energy and Environmental Design.* The U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) program provides recognition for building construction that meet high environmental standards for energy use. The existing rating standard allows participants to earn up to six points for contracting for renewable energy or RECs for a 2-year period from projects that came online on or after January 1, 1997, depending on the project type and the percent of renewable energy that is purchased.[26] The standards are currently under review to extend the contract length and online dates for eligible renewable resources. USGBC has proposed increasing the contract length requirement to a minimum of 5 years and restricting eligible renewable energy generators to those that have come online since January 1, 2005 (USGBC 2010).
- *Federal Government Purchasing.* Federal agency requirements to purchase renewable energy have increasingly moved toward requiring purchases from new renewable energy facilities. On June 3, 1999, President Clinton signed Executive Order 13123 calling for the federal government to "strive to expand the use of renewable energy within its facilities and its activities by implementing renewable energy projects and by purchasing electricity from renewable energy sources." Implementation guidance allowed renewable energy purchased from facilities installed after 1990 to count toward federal renewable energy goals. However, the implementation guidance encouraged agencies to purchase from projects installed after the EO13123 was signed (FEMP n.d.). Further, EO13123 encouraged agencies to consider the Clinton Administration's goal of "tripling nonhydroelectric renewable energy capacity in the United States by 2010" when evaluating options for complying with the order (EO 13123).

  The Energy Policy Act of 2005 established targets requiring federal agencies to procure renewable energy for their electricity needs, starting with 3% of electricity consumption in 2007, 5% in 2010, and 7.5% in 2013 and thereafter. While EPACT 2005 placed no restrictions on the installation date of the renewable energy used to meet the targets, Executive Order 13423, signed by President Bush on January 24, 2007, reinforced the EPACT 2005 renewable energy goals and added a requirement that at least half of renewable energy used by the federal government must come from new renewable sources, defined as in service after January 1, 1999 (U.S. DOE 2008).

These examples demonstrate that voluntary renewable energy markets have adapted to changing expectations and market conditions. Moreover, they are not merely illustrations of market adaptation; they are also dominant programs that account for the vast majority of purchasing in voluntary markets.

[26] LEED requirements do not mandate vintage matching of RECs to energy use, only that 2 years' worth of energy is matched. For example, a LEED project could purchase enough 2011 RECs to meet 2011 and 2012 demand. If LEED were to require REC vintage matching, this would create a clearer signal for demand growth.