BUYING GREEN POWER TODAY:

EMERGING OPTIONS FOR U.S. ELECTRICITY CONSUMERS

DECEMBER 2013

AMERICAN CLEAN SKIES FOUNDATION

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Abstract

This paper is intended to clarify the emerging options available to individuals and businesses who want to use their purchasing power to support green electricity.

Until recently, customers wishing to buy clean power were largely limited to either installing onsite systems or buying Renewable Energy Certificates (RECs), which are often used to "green" the "brown" (average grid mix, i.e., higher carbon) electricity actually delivered to an end-user.

Today, however, new options are being introduced to expand the scope for direct use of and investment in renewable electricity. These options are the focus of this report. They include: third-party financing, community shared projects, consumer Power Purchase Agreements (PPAs), renewable tariffs and innovative public capital investment vehicles.

Creating a lower carbon electricity grid with a larger share of renewable power will require a multi-decade effort. This paper suggests that emerging consumer-driven purchase and investment schemes could become an important part of that effort.

This is a working paper that will be updated as new developments merit.

Author

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About the American Clean Skies Foundation

ACSF is an independent nonprofit working for cleaner energy in the U.S. transportation and power sectors. The Foundation believes that renewables, natural gas and efficiency can all help to reduce harmful pollution and improve our country's energy security. It is essential, therefore, that natural gas be produced in a safe and environmentally responsible manner.

Much of ACSF's work focuses on large scale fuel switching in the electric power sector based on innovative regulatory and business initiatives. ACSF also promotes alternative fuel vehicles using public policy tools and demonstration projects. The Foundation's projects are supported by a wide range of educational programs, including white papers, workshops, videos and web sites.

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Introduction 1

The U.S. renewable electricity industry is nearing a critical turning point. While the installation of new wind and solar facilities has risen to record levels in the last five years, in coming years the traditional drivers (e.g., federal tax credits; state renewable purchase mandates) may no longer be effective.

In 2012 alone, the U.S. added 13.1 gigawatts (GW) of new wind energy capacity (reflecting 6,753 separate wind turbines) and 3.3 GW of solar photovoltaics (PV). That brought the installed base of wind projects to over 60 GW[1] and solar PV to approximately 7.2 GW.[2] Total nonhydropower renewables accounted for approximately 6% of U.S. electricity sales in 2012 – some 219 terawatt hours.[3]

One of the major challenges to renewable power's near term growth stems from its very success. As detailed by a recent industry report, in most states with renewable portfolio mandates, regulated utilities have or soon will reach their renewable energy procurement requirements.[5] This is true even in states such as Colorado and California which have comparatively high renewable purchase requirements for utilities. As a result, utility demand for new renewable generation projects is expected to drop dramatically. This trend is already evident in 2013 as witnessed by the declining number of utility PPAs being advertised, turbine factory closings and widespread layoffs among renewable generation companies.[6]

Given the declining role of tax credits and state mandates, it is likely that a substantial expansion of renewable power may depend on finding new pathways for capital to flow into the sector.

The majority of these renewable facilities (some solar PV excepted), are attributable to projects supported by existing electric utilities under long term power purchase agreements (PPAs) or from new facilities owned and operated by the utilities themselves.[4] Most of these facilities have been added to meet procurement mandates set by state Renewable Portfolio Standard (RPS) provisions. The remainder of new renewable facilities has come largely from electricity suppliers in competitive markets, known as merchant power producers, who construct wind and solar facilities at their own risk.

Additionally, the principal federal tax incentives for renewables will soon expire, and congressional extension seems doubtful. The federal Production Tax Credit (PTC) ends in 2013, and the Investment Tax Credit (ITC) will expire in 2017.[7]

Finally, natural gas abundance has driven wholesale power prices down dramatically, making near-term investment uneconomic in many new large scale merchant renewable power projects.

1. *2012 Wind Technologies Market Report.* August 2013. U.S. Department of Energy. Available: http://www1.eere.energy.gov/wind/pdfs/2012_wind_technologies_market_report.pdf. Note: number of installed turbines only includes turbines with a capacity larger than 100 kW.
2. *U.S. Solar Market Insight 2012 Year in Review.* March 14, 2013. Solar Energy Industry Association. Available: http://www.seia.org/research-resources/us-solar-market-insight-2012-year-review
3. *Net Generation by Energy Source*. July 22, 2013. Energy Information Administration. Available: http://www.eia.gov/electricity/monthly/xls/table_1_01.xlsx
4. *2012 Wind Technologies Market Report,* Chapter 6.
5. Piper, S. *Renewable Electricity —Tracking projects and progress in U.S. Renewable Portfolio Standards.* June 24, 2013. SNL Energy.
6. *Wind Turbine Manufacturers Closing With or Without PTC Extension.* October 5, 2012. Institute for Energy Research. Available: http://www.instituteforenergyresearch.org/2012/10/05/wind-turbine-manufacturers-closing/
7. The PTC is a per-kilowatt-hour tax credit for electricity generated by qualified energy resources which, for wind, is currently a 2.3¢/kWh credit. The ITC is a one-time, 30 percent tax credit for solar systems. If not extended, the PTC for wind will only apply for projects that begin construction during 2013, and the ITC for solar will expire after 2016.

Reflecting previous discussion, the 2013 outlook of the DOE's Energy Information Administration, states:[8]

> *Near-term growth is strong as developers build capacity to qualify for tax credits that expire at the end of 2012, 2013, and 2016. After 2016, capacity growth through 2030 is minimal, given relatively slower growth in electricity demand, low natural gas prices, and the stagnation or expiration of the state and federal policies that support renewable capacity additions. As the need for new generation capacity increases, however, and as renewables become increasingly cost-competitive in selected regions, growth in nonhydropower renewable generation capacity rebounds during the final decade of the Reference case projection from 2030 to 2040.*

EIA forecasts that renewables will grow to represent about 20% of U.S. generation capacity by 2040. However, because wind and solar facilities typically have lower capacity factors than conventional power plants (due to the intermittent nature of the resources), in 2040 renewables (including hydro) are projected to deliver only about 16.5% of the country's total electricity.[9,10]

In short, given the declining role of tax credits and state mandates, it is likely that a substantial expansion of renewable power may depend on finding new pathways for capital to flow into the sector. Likewise, emerging demand-side procurement options could underpin fresh investment for green power.

Buying Green Power Today: Emerging Options for U.S. Electricity Consumers examines the potential roles for these various consumer-driven schemes. It is organized as follows:

- The first section, **Traditional Options**, provides an overview of methods for customers to buy green power and considers the advantages and drawbacks for each.
- The paper then examines the opportunities and obstacles for individuals and businesses wishing to support renewable energy through various **New Options** emerging for green power procurement, including third-party solar financing, community shared projects, power purchase agreements and renewable energy tariffs.
- A final section of the paper looks at **Innovative Vehicles for Public Capital**, renewable electricity investment opportunities including solar securitization, renewable Master Limited Partnerships (MLPs)/Real Estate Investment Trusts (REITs), and crowdfunding.

8. *Annual Energy Outlook 2013,* p. 74. April 2013. U.S. Energy Information Administration. Available: http://www.eia.gov/forecasts/aeo/

9. *Annual Energy Outlook 2013*. Reference case Data Tables. April 2013. U.S. Energy Information Administration. Available: http://www.eia.gov/forecasts/aeo/data.cfm

10. It should be noted that a group of renewable energy advocates has urged the Energy Information Administration to adopt more aggressive renewables growth rates, though the Administration has defended its assessment and methodology and regardless is required by law to keep its forecasts independent of political considerations. See: http://www.eenews.net/assets/2013/09/25/document_gw_06.pdf

Traditional Options 2

Traditionally, electricity consumers have had two options for purchasing green power. They could either 1) install renewable generation on their property, or 2) sign-up for a REC-based option from their electric provider.

Onsite generation

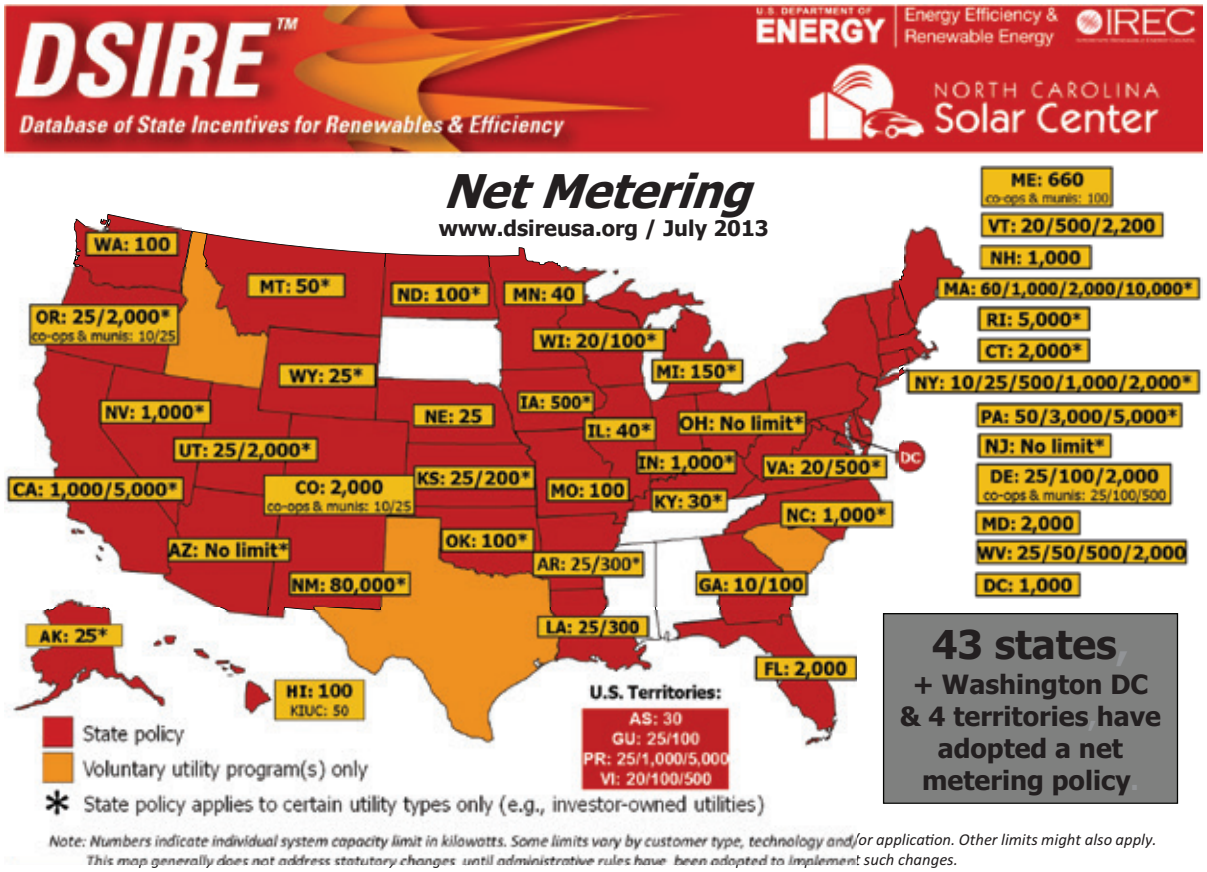
The oldest option for buying green electricity is to invest in building generation onsite. The most recognizable form of onsite generation is installing photovoltaic solar panels on one's roof. PV can be a good option because it is modular, allowing the capacity installed to be easily optimized to a site's typical electric load profile. In 2012, 1,531 GW of non-utility PV were installed in the U.S.[11] as compared to 175 megawatts (MW) of distributed wind (of which 138 MW were utility scale turbines [capacity greater than 1 MW]).[12] Besides PV and distributed wind turbines though, there are other renewable technologies, like fuel cells, biogas and biomass combined heat and power systems (CHP), which can also be utilized for onsite generation, particularly for larger commercial or industrial facilities.

In general terms, installation of onsite generation requires sizable upfront capital costs that the owner will eventually recoup in their reduced electricity bills over the life of the system. Since PV is intermittent and will not generate electricity at night, the availability of net metering to offset a customer's back up power costs can have a decisive impact on onsite solar markets. Net metering allows a user to sell excess generation back to the local electric utility for a credit against the user's electricity bill, and is available for PV systems in most locations in the U.S. However, regulations, like maximum capacity limits, vary widely by state and utility. Figure 1 provides an overview of net metering policies by state.[13,14]

A variety of other financial incentives are likely available for installing onsite renewable generation, but these again will vary widely by location.[15] Residential and commercial PV systems also qualify for a 30% federal tax credit for installation costs.

11. *U.S. Solar Market Insight 2012 Year in Review.* March 14, 2013. Solar Energy Industry Association. Available: http://www.seia.org/research-resources/us-solar-market-insight-2012-year-review
12. *2012 Market Report on U.S. Wind Technologies in Distributed Applications.* August, 2013. Pacific Northwest National Laboratory. Available: http://energy.gov/wind-report
13. *Net Metering Policies.* July 2013. Database of State Incentives for Renewables and Efficiency. Available: http://www.dsireusa.org/documents/summarymaps/net_metering_map.pdf
14. Net metering policies have come under increasing scrutiny in recent years, and, with the extraordinary growth in rooftop solar, this trend is likely to continue. Some utilities are becoming concerned that net metered customers may be overcompensated, as it can allow them to significantly reduce or eliminate their utility bill despite still relying on the utility's infrastructure and energy to provide power when renewable sources are not generating sufficient electricity. At the same time, solar advocates have argued that distributed generation provides additional capacity, transmission, and externality benefits to the system that are not being properly compensated. This debate is creating momentum to replace net metering with a more comprehensive 'value of solar tariff.' For more information, see: Keyes, J. and K. Rábago. *A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation.* October 2013. Interstate Renewable Energy Council. Available: http://www.irecusa.org/wp-content/uploads/2013/10/IREC_Rabago_Regulators-Guidebook-to-Assessing-Benefits-and-Costs-of-DSG.pdf
15. For more information, see: http://www.dsireusa.org/summarymaps/

Figure 1.
Net Metering Policies by State



There are hundreds of solar installation companies around the U.S., and a good place to start is to check the Solar Energy Industry Association's directory for installers in your area [http://www.seia.org/directory].

Onsite Renewable Generation Customer Advantages

Clear additionality
In this context, additionality refers to the extent to which green power purchases result in greater amounts of renewable electricity output to the grid than would have otherwise occurred. A large benefit of installing onsite renewable generation is its clear additionality. Whereas the impact of off-site generation may be more abstract, the customer can easily see the result of its investment in an onsite system and can compare how much its monthly utility bill drops.

For commercial and industrial customers the visibility of onsite generation can be an added bonus, as it helps demonstrate to patrons their environmental commitment and the impact of their green power investment.

Long-term cost stability and hedging value of resource
Electricity prices are highly dependent on the costs of fuel inputs. Wind and solar power offer price certainty and unlike coal or natural gas, the fuel is free. Thus, once an onsite system is installed, the customer has an excellent hedge against possible increases in energy prices.

Since onsite renewable systems typically have useful lives of at least 20 years [warranties of 20 or 25 years are common for PV panels], customers can be insulated from potential jumps in electricity prices, even decades after the system is installed.

Onsite Renewable Generation Customer Challenges

Upfront capital costs

According to the most recent U.S. Solar Market Insight quarterly report, the average installed cost for residential PV systems have fallen to $4.81 per watt for residential systems and $3.71 per watt for larger commercial installations (though installed costs can vary greatly by project to project and region to region).[16] For an average-sized residential PV system this equates to a cost range of $15,000-20,000 or more. And while costs for PV modules have fallen dramatically in recent years, up to 50% of the expense of installing PV systems now result from costs that are additional to purchasing the necessary hardware (such as permitting, installation, and maintenance).[17] Moreover, in recent years these other non-module costs have held relatively flat and the average cash-value of incentives has plummeted, offsetting much of recent decline in hardware costs.[18] Traditionally the total cost of these installations would need to be self-financed through home equity, other private loans or cash.

Long payback periods

Payback periods for onsite solar systems can vary widely but are generally 7-10 years or longer. One Block Off the Grid, claims that payback periods in many states can average as little as 7 years or take as long as 20 years for homeowners in less competitive locations.[19] Given long, multi-year payback periods, purchasers may be less inclined to pursue onsite solar if viewed purely as a financial investment.

A tax-driven market

Because of the importance of tax incentives on project economics, individuals or organizations that wish to install onsite generation will want to have sufficient tax liability to fully utilize the available credits. For this reason, owning onsite renewable generation is far less desirable for public sector and non-profit entities.

Other market limitations

Even if the value proposition is attractive, there are a number of physical barriers that can eliminate or severely limit the applicability of onsite renewable generation. For example, installing onsite generation is largely not an option for non-property owners [the U.S. homeownership rate in single-family homes is roughly 58%[20]]. Beyond site ownership, PV systems are only appropriate for roofs with an adequate amount of roof space, angle, and orientation to the sun. Heavily shaded areas are poor candidates, and older roofs may need to be reinforced or replaced before being suitable for housing solar panels. Ground-mounted installations can be a good alternative, but this option requires availability of enough adjacent land.

As a bounding exercise, a Navigant Consulting report concluded that 22-27% of U.S. residential rooftop area and 60-65% of commercial and industrial rooftop area could be available for PV systems.[21] It is important to note that this attempt to quantify available roof space was not intended as a measure of the share of roof space that is economically suitable for PV installations.

Installing onsite renewable generation can be a great option, but many customers will prefer to purchase green energy from an off-site alternative.

16. *U.S. Solar Market Insight Q2 2013. September 2013.* Solar Energy Industry Association. Available: http://www.seia.org/research-resources/solar-market-insight-report-2013-q2
17. *Innovation and Success in Solar Financing.* July 10, 2013. Department of Energy. Solar Action Webinar Series. Available: http://www1.eere.energy.gov/solar/sunshot/solar_action_2013.html
18. Barbose G., N. Darghouth, S. Weaver, &R. Wiser. *Tracking the Sun VI: An Historical Summary of the Installed Price of Photovoltaics in the United States from 1998 to 2012.* July 2013. Lawrence Berkeley National Laboratory. Available: http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf
19. *How Much Does Solar Cost?* February 2012. One Block Off the Grid. Available: http://1bog.org/blog/infographic-how-much-does-solar-cost/
20. *General Housing Data - All Housing Units (NATIONAL),* 2011 American Housing Survey. December 2012. U.S. Census Bureau. Available: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2011_C01AH&prodType=table
21. Paidipati, J., L. Frantzis, H. Sawyer, & A. Kurrasch. *Rooftop Photovoltaics Market Penetration Scenarios.* 2008. Navigant Consulting. Available: http://www.nrel.gov/docs/fy08osti/42306.pdf

Renewable energy certificate options

Defining RECs

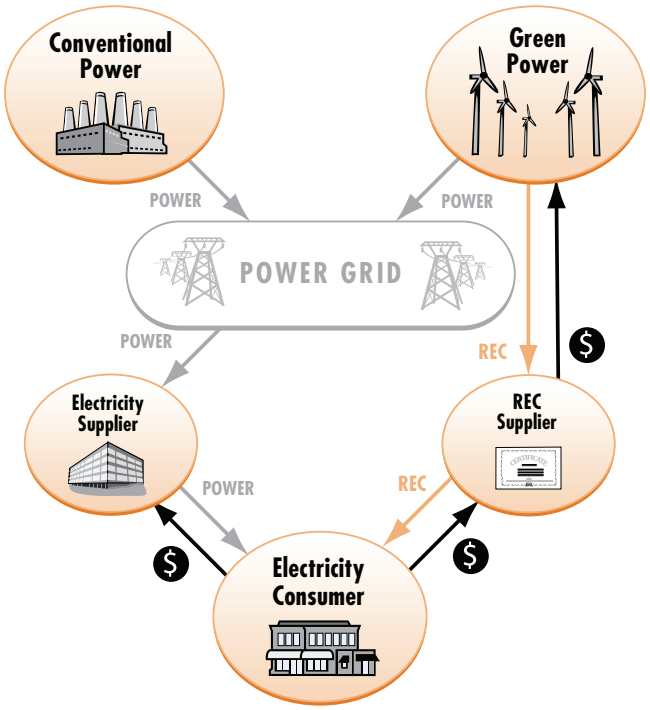
RECs were created to provide a means for assigning the rights to the portion of grid-based electricity supplied by renewable generators. In an electricity system with multiple generators using different fuels (wind, natural gas, coal, nuclear), it is not possible to distinguish or track electrons from a particular generator or guide them to a specific consumer. Thus, it is impossible to determine which customers actually use which electrons.

RECs represent the environmental (e.g., greenhouse gas reductions) and other non-power benefits of the generation of renewable energy. One REC is equivalent to one megawatt-hour (MWh) of electricity from a renewable generator.

Each REC catalogs important information about the source of its generation, which typically includes the location and technology type of the generator, date of generation (also referred to as its "vintage"), environmental emissions (if any), date the generator was built, and a unique tracking number. Various REC tracking systems have been established regionally across the U.S. to issue and record the exchange of RECs.[22]

RECs are an important accounting tool that has helped commoditize the market for green energy and has created a tradable and verifiable instrument for enabling the voluntary market as well as demonstrating compliance with state Renewable Portfolio Standard requirements. Only the owner of the REC can rightly claim the green benefits associated with its electricity generation, and the electricity, if separated from its REC, can no longer be considered renewable.

Figure 2.
Transaction Pathway for Voluntary REC Purchases[23]



22. For more information on RECs, see: http://www.epa.gov/greenpower/gpmarket/rec.htm. For more information on REC tracking systems, see: http://www.etnna.org/learn.html

23. *Guide to Purchasing Green Power.* March 2010. U.S. Environmental Protection Agency. Available: http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf

Text Box A: Validating RECs – Green-e

Green-e is an independent, third-party organization that certifies that green power production is generated from eligible sources. To do this, Green-e establishes a national, periodically-updated standard that defines eligibility criteria for REC transactions and the types of generation resources that qualify. For example, these criteria include the following requirements:[24]

- RECs must be sourced from the same region as the customer being served
- RECs must have been generated in the same calendar year, the first three months of the following calendar year, or the last six months of the prior calendar year from when they are sold
- RECs must have been generated from 'new renewables,' defined as generation facilities that have come online in the last 15 years
- RECs must not be simultaneously counted toward any local, state or federal mandate, such as state Renewable Portfolio Standards

Green-e also establishes standards for verification, which third-party auditors apply annually to ensure that the electricity associated with the REC was actually delivered to the grid, that the REC was generated from an eligible renewable generator, and that the REC sold by the provider was unique and not sold to more than one customer or double-counted. Use of the Green-e logo has become fairly ubiquitous with voluntary green power purchases, and it is intended to be a tool that communicates to customers that the product is following best practice standards.[25]

Green-e®

REC-based green electricity

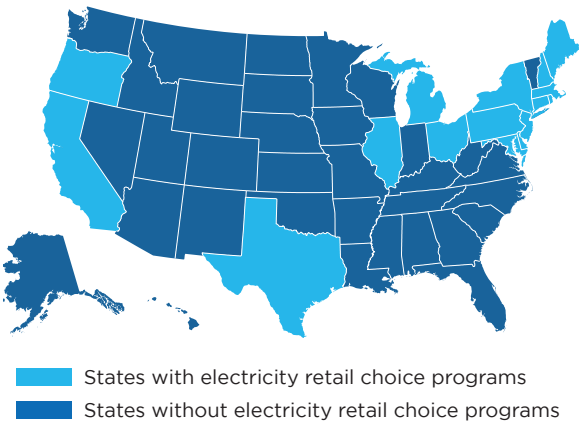
Competitive markets

One third of the states are open for retail competition enabling approximately half the customers in the U.S. to purchase electricity from an entity other than their utility.[26] See Figure 3.[27]

Customers in these states can purchase green energy by switching to a green power plan that is offered by a competitive electricity supplier. Public utility commissions (PUCs) typically provide lists or other information on authorized retail electricity suppliers. Links to these PUC lists are provided in Appendix A.

Retail suppliers commonly do not own generation resources. Instead, most of these suppliers operate purely as retail marketers, buying and

Figure 3.
States with Competitive Electricity Markets



24. *Green-e Energy National Standard and Governing Documents:* http://www.green-e.org/getcert_re_stan.shtml
25. For more information about Green-e, see their website: http://www.green-e.org/
26. *Annual Baseline Assessment of Choice in Canada and the United States.* December 2012. Distributed Energy Financial Group, LLC. Available: http://www.competecoalition.com/files/ABACCUS-2012.pdf. In these states (also sometimes referred to as "deregulated" states), utility companies only manage the local transmission, distribution and metering of electricity to end-users.
27. *Today in Energy: State electric retail choice programs are popular with commercial and industrial customers.* May 14, 2012. Energy Information Administration. Available: http://www.eia.gov/todayinenergy/detail.cfm?id=6250

selling electricity to end-users. To do this, they purchase electricity on a commodity basis either from wholesale marketers/traders or from the Independent System Operator (ISO), take title to electricity supply, and arrange delivery to their customers. Wholesale marketers/traders, in turn, buy supply directly from generators; they also trade in ISO markets.

Almost all "green pricing" plans rely on the purchase of wholesale conventional power that is paired with RECs (typically purchased from a broker) to match the amount of green electricity delivered to end-use customers. As such, these products are priced at a premium because of the additional cost of buying the necessary RECs.

Green pricing plans usually are offered on a month-to-month basis, or for 1-2 year contracts. Terms longer than 3 years are rare. Plans are also usually available with varying levels of green content and can be fuel specific (such as 50% renewable, 25% solar, 100% wind, etc.).

Some suppliers offer Green-e certified products (see Text Box A), while others do not. Products that are not Green-e certified may be less expensive because they avoid the additional stringency and expense of their requirements, such as supplying their RECs from older or otherwise unqualified renewable generation facilities.

Text Box B: Community Choice Aggregation

Among the states with competitive electricity markets, California, Illinois, Massachusetts, New Jersey, Ohio, and Rhode Island also have laws that allow Community Choice Aggregation (CCA). Under community aggregation, municipalities can decide to procure electricity to meet the collective demand of their residents.

Once formed, CCA programs become the residents' default electricity supply option. Residents can choose to opt-out if they prefer an alternative supplier, but CCAs can be attractive because they allow communities to use their combined buying power to deliver lower electricity rates.

Some municipalities have used aggregation to also pursue green energy goals. For example, Evanston, Illinois has a community aggregation program that supplies residents with 100% green power. Like most green pricing plans, their green power supply is derived entirely from pairing conventional wholesale power with wind REC purchases.

However, by utilizing their aggregated purchasing power, they currently receive this plan for a very competitive fixed rate of $0.05192 per kilowatt-hour.[28]

Chicago recently became the largest city to utilize community choice aggregation. The city negotiated an agreement with an alternative supplier to provide its residents with lower electricity rates starting in February 2013. This agreement did not specifically pursue renewable power, though it included a similar provision to entirely supply their electricity from non-coal sources.[29]

Another noteworthy aggregation program is Marin Clean Energy, which serves Marin County, California residents with a default 50% green power option. Marin Clean Energy buys its green power from a mix of bundled renewable energy and unbundled REC purchases, and they have started using their buying power to sign contracts to develop new renewable projects that, as they come online, will be used to displace the need for some of the unbundled RECs.[30,31]

28. *City of Evanston: Community Choice Electricity Aggregation.* Available: http://www.cityofevanston.org/sustainability/community-choice-aggregation/

29. *City of Chicago: Municipal Aggregation.* Available: http://www.cityofchicago.org/city/en/progs/electricity_aggregation.html

30. *MCE Integrated Resource Plan Annual Update.* September 1, 2012. Marin Energy Authority. Available: https://marincleanenergy.info/PDF/integrated-resource-plan.pdf

31. For more information on CCA and how it can be used to support clean energy, see: http://www.leanenergyus.org/

Utility programs

In traditionally regulated states, the incumbent utility alone manages both the supply and distribution of electricity. Customers cannot switch to a different supplier, but many of these utilities offer voluntary green pricing programs. For a premium monthly charge, these utilities will source the customer's generation from renewable resources.

Most utility green power programs are also REC-based. However, there is more variation between green pricing programs. See Figure 4 for a summary of some major plans.

Unbundled RECs – 3rd party marketers

Customers in both regulated and competitive markets can also purchase RECs separately from any electricity supply contract. This is frequently referred to as an "unbundled" transaction, because the RECs are sold separately from their underlying electricity. However, pairing RECs with grid electricity purchases is functionally equivalent to purchasing a green pricing plan from a local utility or competitive supplier and allows the buyer to make the same claims about reducing their carbon footprint.

Purchasing unbundled RECs can be a convenient alternative for a variety of reasons. These include:

- Claiming use of green power even if renewable generation is not actually available from a particular power supplier;
- Allowing a buyer to continue its relationship with its current electricity supplier;
- Providing an option for customers who lease space and do not have control over their utility service;
- Delivering higher quality RECs than available green pricing programs (again see Text Box A) and;
- Offering a lower price premium than buying "bundled" green power products.

RECs are often purchased from third-party marketers, who serve as intermediaries between consumers and renewable generators. The most common REC marketers include: 3Degrees, Bonneville Environmental Foundation, Community Energy, Constellation Energy Resources, Green Mountain Energy, NextEra Energy Resources, Renewable Choice Energy, and Sterling Planet.

Challenges for RECs and REC-based green pricing programs

The U.S. voluntary green power market totaled almost 50 million MWh in 2012 (an increase of 36% since 2010).[32] That total represents about 20% of all nonhydropower renewable electricity production in the U.S. for that year, which totaled about 219 million MWh.[33] Historically, REC-only products have represented the majority of all voluntary green power sales.[34]

While RECs may be a convenient way to buy green power, they also face some obstacles, primarily focusing on concerns about additionality and the loss of the hedging value of renewable electricity.

Weak impact on additionality

As noted earlier, additionality is a concept that refers to the extent to which green power purchases result in greater amounts of renewable electricity output to the grid than would have otherwise occurred. The belief that these purchases make a difference and contribute to a cleaner environment is fundamental to individual and corporate decisions to buy green power. While RECs provide a clear claim of ownership to renewable energy, the impact of RECs on the mix of grid power has been an ongoing question. As Google stated in a 2011 whitepaper:[35]

> *Additionality is a tricky concept. Perhaps it is easiest to give an example of what's not additional. Imagine a power company built a wind farm many years ago. They built it because they thought it was good business at the time, but the fact that it was a renewable resource was not important to their decision. They currently sell the power into*

32. Heeter, J. and T. Nicholas. *Status and Trends in the U.S. Voluntary Green Power Market* (2012 Data). October 2013. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy14osti/60210.pdf
33. *Electric Power Monthly.* July 2013. U.S. Energy Information Administration. Available: http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1_a
34. Heeter, J. and T. Nicholas. *Status and Trends...*
35. *Google's Green PPAs: What, How and Why,* p. 3. April 29, 2011. Google, Inc. Available: http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdfs/renewable-energy.pdf

Figure 4.
Comparison of Utility Green Pricing Programs

Utility	State	Program Name	Green-e Certified?	Source of Green Energy (wholesale RECs/ bundled PPAs/ utility owned resources)	Sold by Blocks or Percent of Customer Load?	Price Premium ($/MWh, 2012)	
Austin Energy	TX	GreenChoice	YES	PPA	Sold for 100% of customer's load	Varies by 'batch'	
Dominion Virginia Power	VA	Dominion Green Power	YES	RECs	Sold for 100% of customer's load. [Also offer block option]	$13	
DTE Electric	MI	GreenCurrents	YES	RECs	Sold for 100% of customer's load. [Also offer block option]	$20	
Duke Energy Carolinas/ Duke Energy Progress	NC	NC GreenPower	NO	RECs	100 kWh blocks	$40 for residential, $25 for large volume customers	
Pacific Power/ Rocky Mountain Power	CA, ID, OR, UT, WA, WY	Blue Sky	YES	RECs	100 kWh blocks. [Other options available in OR]	$19.50. [Large volume customers receive discount]	
Xcel PSCo	CO	Windsource CO	YES	majority PPA	100 kWh blocks	$21.59	
Xcel NSP	MN	Windsource MN	YES	majority PPA, balance with RECs as necessary	100 kWh blocks	$35.30, but the net premium fluctuates monthly by amount of credit received from fuel cost rider exemption	

*Estimate

Sources:

Austin	http://www.austinenergy.com/About%20Us/Newsroom/Reports/2012AnnualPerformanceReport.pdf ; http://www.austinenergy.com/energy%20efficiency/Programs/Green%20Choice/index.htm
VA	https://www.dom.com/dominion-virginia-power/customer-service/rates-and-tariffs/pdf/varidg.pdf ; http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=3
DTE	http://efile.mpsc.state.mi.us/efile/docs/14569/0213.pdf
NC	http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=43f2da79-ac8b-439e-8668-efeefbbc998f ; http://www.ncgreenpower.org/faq/
Pacific Power	http://www.pacificpower.net/env/bsre/faq.html ; https://www.google.com/url?q= http://www.psc.utah.gov/utilities/electric/00%2520thru%252010/00docs/00035T01/243096%25202012%2520Annual%2520Report%2520of%252 jRIA9TZGVfWz2Q
CO	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Windsource/Windsource_-_CO_-_Product_Content_Label_-_Residential ; https://www.dora.state.co.us/pls/efi/efi_p2_v2_demo.show_document?p_dms_document_id=110329&p_session_id=
MN	https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={A87EBC83-0E91-44E3-8903-F4CF http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Windsource/Windsource_-_MN_-_Product_Content_Label_-_Residential ; https: tle=200910-42756-01

	Total Sales (MWh, 2012)	Program Revenue ($, 2012)	Admin. & Marketing Costs as % of Revenues	Term of Commitment for Participants	Participants Exempt from Fuel Riders/ Pass-throughs?	Notes
	744,443			Varies by 'batch'	YES	Pricing for each 'batch' based on terms of specific long-term wind PPAs, plus other fees as necessary. In 2014, batch-based model will be replaced with a simple $10/MWh premium. This swaps a fixed-priced program for floating pricing -- customer's net premium may be lower, though they will no longer receive the fuel cost rider exemption
	250,364	$ 3,254,732*	50%	Month-to-month	NO	
	56,860	$1,275,619	21%	Month-to-month	NO	
		$ 1,003,389 [statewide, 2011]	25%	Month-to-month	NO	NC GreenPower is an independent, statewide, multi-utility program administered by independent non-profit Advanced Energy
	335,306	$4,490,901	26%	Month-to-month	NO	Pacific Power also applies a portion (33%) of Blue Sky revenues to help fund new community-based renewable energy projects
	201,239	$ 4,344,750*	5%	1-year minimum for residential, 3-year commitment for most commercial	NO	Price based on estimated cost of building incremental new wind generation to serve enrollees, with program revenues applied to Xcel's CO renewable development fund (RESA). Xcel is trying to significantly alter program for 2014
	172,017	$6,175,340	5%	1-year minimum for residential, 3-year commitment for commercial	YES	Price based on the cost of wind PPAs used for program, after including a credit for the capacity value of these resources

20the%2520Blue%2520Sky%2520Program.xlsx&sa=U&ei=Sb6fUczNMZHi4AOijYHQBQ&ved=0CAcQFjAA&client=internal-uds-cse&usg=AFQjCNGWlvF8VzITdFz-

A9AD3368}&documentTitle=20135-86600-01 ;
//www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={3A7A0B32-A07E-4854-ABD4-9140D21046A6}&documentTi

the grid, and they're happy with their investment. Moreover, this power company has no plans to build any more wind farms. One day, they learn that Google is looking to purchase renewable electricity. The power company figures it could sell Google the output of their wind farm; for their existing customers they would just make up the difference by buying some other source of energy, perhaps from the coal plant down the street.

In our view, this is not additional. We'd be handing money over for green electricity, but in the grand scheme of things, nothing would change. The carbon output of the whole system would be the same and no new renewable generation would get built.

A key question is: Do voluntary REC purchases actually incent developers to build new renewable generation facilities? A 2011 report by the National Renewable Energy Laboratory concluded that:[36]

> *(t)he importance of RECs . . . 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.*

Bottom line: There is no clear link between voluntary REC purchases and the development of new renewable generation capacity.

No long-term cost stability/hedging benefit

Besides the additionality concerns, RECs also fail to transmit to consumers the cost stability and hedging value of renewable energy. While the zero fuel cost is an innate benefit of renewable generation, REC purchasers do not see this value. If rising fossil fuel prices drive up grid-based electricity, the REC buyer's power bill will increase too, and they will continue to pay for RECs on top of that.

In this environment, a growing number of more sophisticated corporate buyers are seeking to reduce their reliance on short-term, REC-based green power.[37] A recent report summarized this trend as follows:[38]

> *Many companies with a history of predominantly purchasing RECs have transitioned instead to favoring PPAs and on-site direct investment, driven by longer-term commitments to emissions reductions and renewable energy. These companies are looking to capture the long-term value of renewable energy, like electricity price certainty, instead of year-on-year purchases of RECs. In some cases companies are able to get closer to cost parity (the price at which renewable energy is cost competitive with fossil fuel) with long-term PPAs or on-site direct investment. Companies also increasingly recognize that RECs do little to incentivize new investments in renewable energy. By investing directly or signing PPAs, companies are directly adding renewable capacity to the grid.*

On December 5, President Obama directed the country's biggest energy consumer, the federal government, to increase its renewable power consumption to at least 20% by 2020 with specific new guidance to prioritize first onsite generation, followed by bundled renewable products, before pursuing unbundled REC transactions.[39]

36. Holt, E., J. Sumner, & L. Bird. *The Role of Renewable Energy Certificates in Developing New Renewable Energy Projects,* p. 37. June 2011. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy11osti/51904.pdf

37. For example, the EPA Green Power Partnership provides a list of long-term green power buyers, which is rapidly expanding and highlights this growing desire to source green power differently. *Green Power Partnership: Long-term Contracts.* September 19, 2013. Environmental Protection Agency. Available: http://www.epa.gov/greenpower/toplists/longtermcontract.htm

38. *Power Forward: Why the World's Largest Companies Are Investing in Renewable Energy,* p. 4. March 1, 2013. David Gardiner & Associates, LLC. Available: http://www.dgardiner.com/power-forward-goes-global/

39. Presidential Memorandum -- *Federal Leadership on Energy Management.* December 5, 2013. Available: http://www.whitehouse.gov/the-press-office/2013/12/05/presidential-memorandum-federal-leadership-energy-management

New Options 3

Solar leases/PPAs

Where available, third-party financing of solar systems has quickly become the dominant trend for new installations. This development allows customers to avoid the large upfront capital costs of onsite solar PV. There are two basic models: (1) solar leases and; (2) solar PPAs.

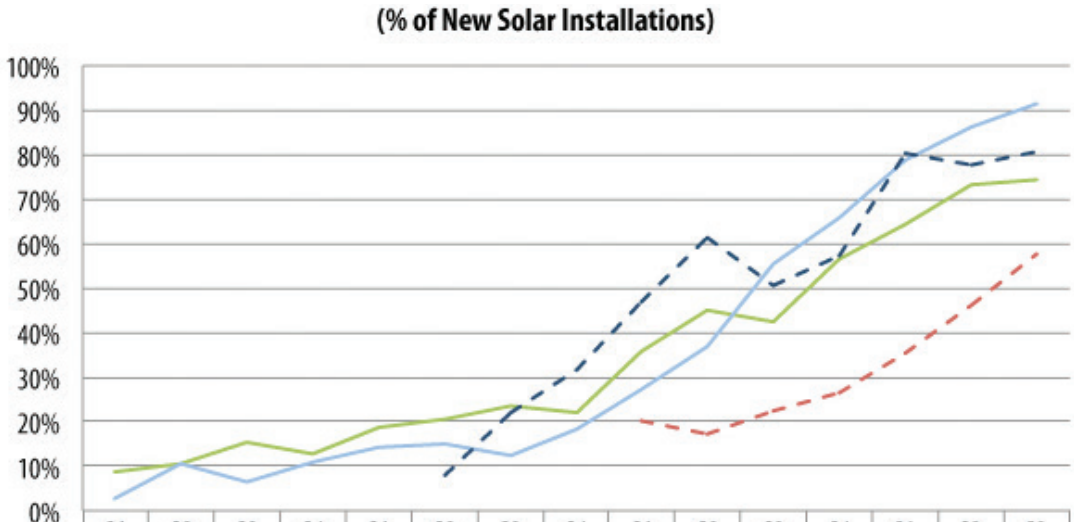
Figure 5 shows statistics of the dramatic rise in popularity for third-party ownership in four select states.[40]

Under solar lease programs, a solar leasing company will provide the capital to install a PV system on a customer's property and, in exchange, the customer agrees to pay a fixed monthly fee for the system's use.

A solar power purchase agreement is similar to a solar lease. A solar installer provides the PV system at its expense and recoups the investment via a contract under which the customer agrees to buy all the electricity generated by the PV system. The solar PPA typically locks in a price over a fixed period (usually up to 20 years).

Under either of these financing arrangements, the customer receives two monthly bills – one from the solar company and one from their local electric utility. However, because the output of the solar system reduces the amount

Figure 5.
Increasing Popularity of 3rd-Party Owned Solar Systems



	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012
California	8.7%	10.7%	15.2%	12.6%	18.8%	20.7%	23.5%	22.1%	35.7%	44.9%	42.6%	56.7%	64.4%	73.3%	74.4%
Arizona	2.6%	10.5%	6.3%	10.9%	14.3%	14.9%	12.5%	18.4%	27.4%	37.0%	55.3%	65.8%	78.8%	86.1%	91.3%
Colorado						7.8%	21.9%	31.7%	46.9%	61.2%	50.5%	57.1%	80.3%	77.7%	80.6%
Massachusetts									20.2%	17.2%	22.4%	26.5%	35.2%	46.1%	58%

Source: U.S. Solar Market Insight Report, Q3 2012

40. *Third-Party Solar Financing*. Green Power Network, U.S. Department of Energy. Available: http://apps3.eere.energy.gov/greenpower/onsite/solar_financing.shtml

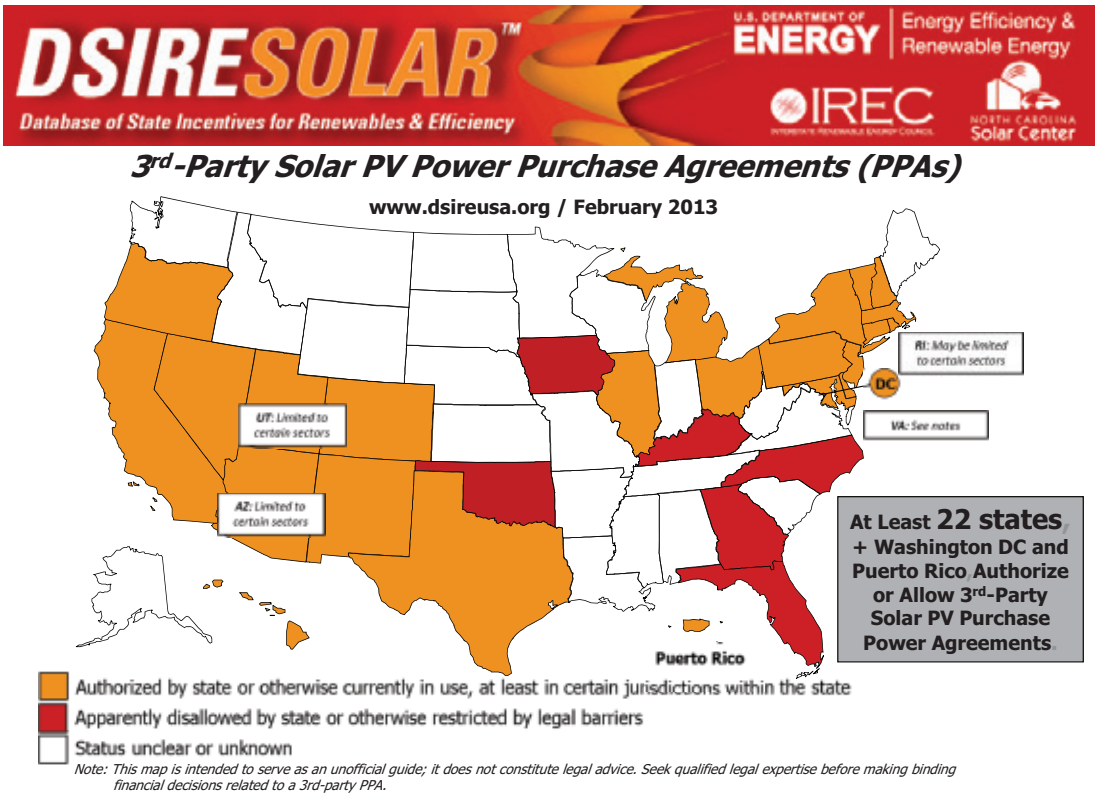
of electricity supplied by the utility, the sum of these two bills likely will be less than what the customer would otherwise pay their utility absent a PV installation.

Because a solar leasing/PPA company owns the system, it owns any accompanying tax credits or other incentives.[41] Though conditions may vary by program, the solar company will usually be responsible for any system maintenance or repairs that may be necessary over the life of the arrangements. At the end of the lease or PPA term, the customer usually will have the option to renew, purchase the system or have it removed.

In many states solar PPAs are unavailable because of state or utility commission regulations, as some view selling electricity to be the exclusive domain of regulated electric utilities. Figure 6 provides a map showing states where solar PPAs are permitted.[42]

Consumers may find solar PPAs to be preferential to leases. Since the solar lease option involves a fixed monthly payment, it may be riskier for the customer if their contractual arrangement does not include a strong performance guarantee. In some circumstances solar leases can also complicate or eliminate the ability to utilize available tax incentives.[43]

Figure 6.
Availability of Solar PPAs by State



41. The customer should understand who controls the RECs generated by the system; if the RECs are not retained or retired on behalf of the customer, they cannot rightfully claim the environmental benefits associated with their purchase.
42. *3rd-Party Solar PPA Policies.* February 2013. Database of State Incentives for Renewables and Efficiency. Available: http://www.dsireusa.org/documents/summarymaps/3rd_Party_PPA_map.pdf
43. *Solar PV Project Financing: Regulatory and Legislative Challenges for Third-Party PPA System Owners.* February 2010. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy10osti/46723.pdf

Some common solar lease/PPA providers include: Astrum Solar, Clean Power Finance, Constellation Energy Resources, NRG Solar, OneRoof Energy, Real Goods Solar, SoCore Energy, SolarCity, Sungevity, SunRun, and Vivient Solar.

Advantages

No upfront capital cost
The primary advantage of a solar lease/PPA is being able to install onsite PV while avoiding the large upfront capital requirements. Just like purchasing a new vehicle or other significant purchase, many would-be customers will find the investment unaffordable without access to financing.

Moreover, since the installer covers the capital costs, they also take possession and utilize the applicable incentives. This allows public sector and non-profit entities without tax liabilities to have competitive access to onsite generation.

Simplicity for customer
Under solar PPAs and some solar lease offerings the solar company is responsible for system maintenance and any necessary repairs. Many customers may find avoiding these obligations an additional advantage to these arrangements. [Customers with self-financed systems may have the option to set up a maintenance contract with their solar installer, though this could require an additional fee.]

Long-term cost stability and hedging value of resource
Similar to owners of self-financed systems, the customer receives the renewable resource's long term price predictability and hedging value.

Challenges

Resource and ownership limitations
As described earlier for traditionally financed onsite generation, applicability of solar leases/PPAs may be limited by a variety of physical constraints. This option will not be relevant for many residential or commercial customers who rent their space. For consumers who have adequate roof space or vacant property, the relative favorability of pricing will ultimately hinge on the combination of the site's resource potential and projections for how their local utility rates might increase over time.

Credit requirements
Like financing other purchases, availability can depend on the credit worthiness of the buyer. Interested customers with less than excellent credit histories may find it difficult to access third-party solar financing.

Cost of financing
Financing is not free. Just like buying a new vehicle or other large purchases, the entity providing financing is a business intending to earn a return over the life of its investment. Their profit margin is built into the customers' monthly bill. Over the life of the system, customers who can easily afford the upfront capital requirements may be better off self-financing.

Community shared projects

Another new option for accessing renewable energy is to participate in a shared community resource. These programs have typically included either wind or solar generation (also known as "solar gardens").

In community projects, participants commit to provide upfront or ongoing monthly payments in exchange for a defined share in a renewable energy system. A participant's share is usually determined on a capacity basis (e.g., a specific number of solar panels). Community shared projects are predominately administered by utilities, though they can also be structured in various ways under special purpose business entities or nonprofit organizations.

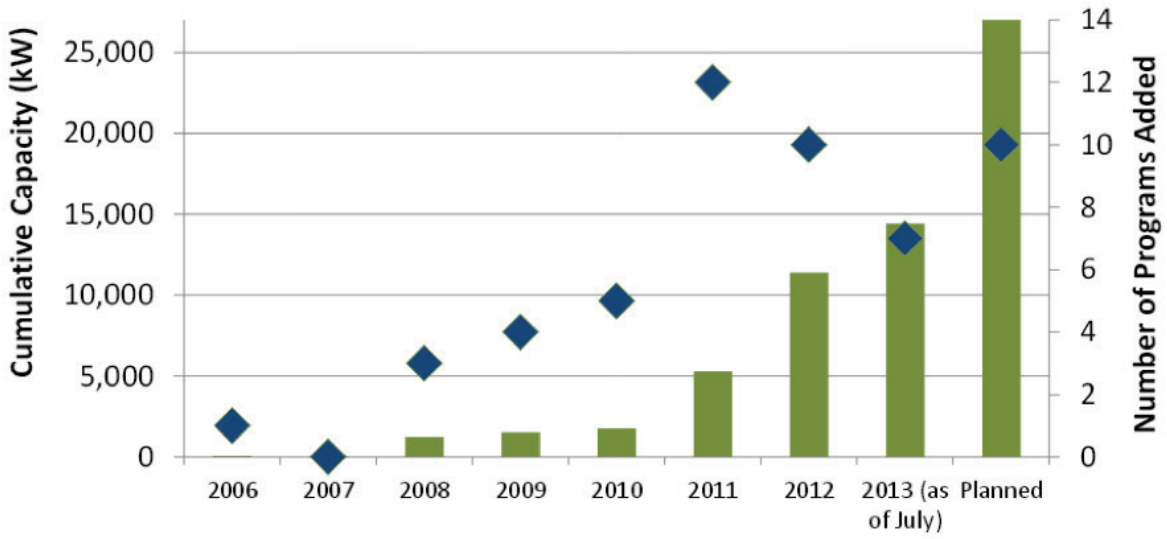
Participants in shared projects generally receive credit on their monthly utility bill for their portion of the system's output. Hence, a shared off-site project offers a type of virtual net metering, providing for a similar bill offset. Receiving the benefit of the community resource via bill credit, rather than direct monetary payments, avoids potential tax and securities implications. As with solar PPAs, RECs may be included or retained by the utility.

Requirements to participate in these programs can also vary by criteria like project capacity limits, geographical proximity, and types of ratepayer classes allowed. The Interstate Renewable Energy Council (IREC) has recently released a set of stakeholder developed model rules for community shared projects, and, as more states begin to adopt policies encouraging community programs, more standardization may occur.[44]

As illustrated in Figure 7, participation in community solar programs has jumped since 2010, although they still represent a fraction of a percent of the nation's installed solar capacity.

To view existing community shared renewable programs, IREC provides a good summary:[46] http://www.irecusa.org/wp-content/uploads/Shared-Solar-Program-Comparison-Chart.pdf

Figure 7.
Capacity and Number of Community Solar Programs[45]



44. *Model Rules for Shared Renewable Energy Programs.* June 2013. Interstate Renewable Energy Council. Available: http://www.irecusa.org/wp-content/uploads/2013/06/IREC-Model-Rules-for-Shared-Renewable-Energy-Programs-2013.pdf

45. Heeter, J. *Voluntary Renewable Energy Markets 101.* September 23, 2013. National Renewable Energy Laboratory. Available:http://renewableenergymarkets.com/docs/presentations/2013/REM%20101%20Voluntary%20Market%20-%20Heeter.pdf
See also: Heeter, J. and J. McLaren. *Innovations in Voluntary Renewable Energy Procurement: Methods for Expanding Access and Lowering Cost for Communities, Governments, and Businesses.* September 2012. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy12osti/54991.pdf

46. For a more detailed comparison of community shared solar, see: *A Guide to Community Solar: Utility, Private, and Non-Profit Project Development.* September 2012. U.S. Department of Energy. Available: http://www.nrel.gov/docs/fy12osti/54570.pdf
For more information on community shared wind, see: Windustry: http://www.windustry.org/community-wind and OwnEnergy, Inc.: http://www.ownenergy.net/

Advantages

Expanded access to onsite renewables
Community shared programs expand access to a broader group of potential customers, such as renters, who otherwise would be unable to take advantage of the benefits (additionality, hedging value) of onsite systems.

Reduced project costs
Customers may find community shared programs to be cheaper than onsite generation. Building one medium or large scale facility instead of many small distributed systems may result in improved efficiencies, such as volume discounts for solar hardware and reduced project transaction costs, that can be passed on to participants.

Easy signup
Developing a community project may take years and significant effort for organizers, but, for the customer, signup can be done in a single conversation, allowing them to bypass the effort associated with an onsite installation.

Incentive program equity
Taxpayers and ratepayers as groups ultimately fund the various incentive programs that are available for installing onsite solar systems. Since only a subset of the population is able to utilize onsite generation, allowing more contributors to participate provides a greater degree of taxpayer/ratepayer equity.

Challenges

Not universally available
Shared renewable programs are gaining momentum, but this option is currently unavailable to most Americans. Programs exist in about a dozen states, though they are mostly offered from public utilities (co-ops or city- or county-owned). The vast majority of the investor-owned utilities, which serve 68% of American customers,[47] do not currently offer community shared programs. Moreover, expanding these programs to states with retail choice will be even more challenging, particularly in states where bill reconciliation would have to be handled by the retail supplier instead of the utility.[48]

While shared programs can also be arranged under special purpose business entities or nonprofit organizations, these can present a host of complexities for the organizers. Potential tax, securities and other legal implications need to be carefully navigated,[49] and overcoming all the hurdles can increase costs and result in multi-year project development timelines.

Exclusion of large volume buyers
Community shared programs are generally not intended for larger commercial and industrial buyers. System size caps are common for these programs. For example, the Interstate Renewable Energy Council has advocated for a maximum system capacity of two megawatts.[50] Smaller systems can be easier to site in proximity to communities, but these requirements purposely exclude larger volume buyers.

47. U.S. Electric Utility Industry Statistics. *2013-14 Annual Directory & Statistical Report.* American Public Power Association. Available: http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf

48. *Model Rules for Shared Renewable Energy Programs.*

49. For example, arranging a community-shared project under a special purpose business entity requires the organizer to manage the formation and operation of a new business. The type of business entity utilized could impact both the project's ability to use available tax incentives and the tax treatment of any income the project might generate for its participants. Entities that attempt to raise capital by offering ownership shares or other return on investment would fall under federal and state regulations for issuing securities. These types of projects would likely want to seek an exemption from the Securities Exchange Commission's registration requirements, though qualifying for an exemption would effectively limit the number of middle-income individuals who could invest in any project. For a more thorough discussion of these issues, see: *A Guide to Community...*

50. *Model Rules for Shared Renewable Energy Programs.*

Text Box C: California's New 600 MW Community Solar Program

California's Green Tariff Shared Renewables bill, also known as S.B. 43, easily became the nation's largest community-shared renewable energy program when it was signed into law by Governor Jerry Brown on September 28, 2013. This law will allow participating customers to support the development of up to a statewide maximum of 600 MW of new renewables. The law is only applicable for customers served by the state's three largest utilities, Pacific Gas and Electric, San Diego Gas & Electric, and Southern California Edison, and these utilities are charged with administering their own programs.

Customers will be allowed to enroll for as much as 100% of their electricity demand. Participants in the program will pay a new rate for their electricity that reflects the full cost of their share of a larger community-shared facility, though their bills will also receive a credit for the fair value of their portion of the facility's output. For participants, this will effectively function like signing a solar PPA, except the solar panels will not be placed on their property and everything will be handled through just one monthly utility bill instead of two separate transactions.

RECs generated by these facilities must be retired by the utilities on behalf of the participants and cannot be counted towards the utilities' state RPS requirements. Individual projects under the program are limited to a maximum size of 20 MW, though one-sixth of the cumulative program cap is earmarked for projects no larger than 1 MW. Customers are also not allowed to subscribe to more than 2 MW of nameplate generating capacity (though governmental and educational entities may exceed the two-megawatt cap).[51]

PPAs for off-site renewables

A Power Purchase Agreement is a contract signed between an electricity generator and an electricity buyer, which specifies terms for power sales from a particular power plant. Under these agreements, the seller owns, operates, and maintains the facility, and the buyer agrees to purchase the plant's output at a negotiated price for the life of the deal. PPAs can be signed either with an existing facility that is not already under contract (also referred to as operating on a "merchant" basis) or with a new generation facility, in which case the seller will also have responsibility for project development. PPAs are long-term arrangements often for 15-25 years.

In the utility industry, PPAs have played an important role for financing power plants. Traditionally, PPA buyers are utilities that find it more economical or less risky to meet their electricity supply needs via contracting with an independent generator rather than building and operating new generation facilities internally.

However, a growing number of companies and other organizations with a history of purchasing REC-based green power are starting to favor PPAs with renewable generators. As the cost of developing renewables has been dropping, these large electricity buyers are finding PPAs to be an increasingly competitive option. The American Wind Energy Association highlighted this development in a recent report, writing:[52]

> *Price appeal is, at least in part, behind another trend: an increase in non-traditional entities buying wind power. In addition to the 74 utilities purchasing or owning new wind energy in 2012, purchasers last year included at least 18 industrial buyers, 11 schools and universities, and eight towns and cities. Wind power users include manufacturing plants, data centers, farms, medical centers and other entities.*

Under these arrangements, the customer agrees to buy both the power and RECs as a bundled product from the renewable generator. However, terms and applicability for PPA deals may be dependent on where the customer is located.

51. *SB-43 Electricity: Green Tariff Shared Renewables Program.* 2013. California Legislative Information. Available: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB43

52. *AWEA U.S. Wind Industry Annual Market Report* 2012, p. 9-10. April 2013. American Wind Energy Association. Available: http://www.awea.org/Resources/Content.aspx?ItemNumber=5346

Notable corporations that have signed long-term PPAs with offsite renewable generators include Google, Microsoft, Sprint, and Wal-Mart. PPAs are also gaining traction as an option for institutions like universities. For example, Ohio State signed a PPA in 2012 for 50 MW of wind power capacity from a wind farm owned and operated by renewables developer Iberdrola. Terms of their 20-year deal include a fixed price of $46.50 per MWh with a 2% annual escalator as well as ownership rights for the associated RECs.[53]

Advantages

Clear additionality
One of the big advantages to PPAs is clear additionality. Having long-term PPAs provides the developer with the revenue predictability needed to access project financing and/or can lower the cost of financing. Without these agreements, either from a utility or end-use customer, renewable energy facilities rarely get built. PPAs also may offer an off-taker the opportunity for project branding and naming rights.

Long-term cost stability and hedging value of resources
Like other long-term arrangements for bundled green energy, the customer receives the full hedging and cost stability benefit of the resource. This provides the potential for energy cost savings over the life of the PPA. These deals also provide a hedge against future increases in REC prices for customers who otherwise would purchase RECs on a short-term basis (as few REC purchases are secured on long-term contracts).

Large quantity procurements
Customer sites have limited space available for onsite generation, and may not be located at ideal generation sites anyway. PPAs allow customers to procure much larger quantities of renewable energy and take advantage of sites with the best resource potential.

Challenges

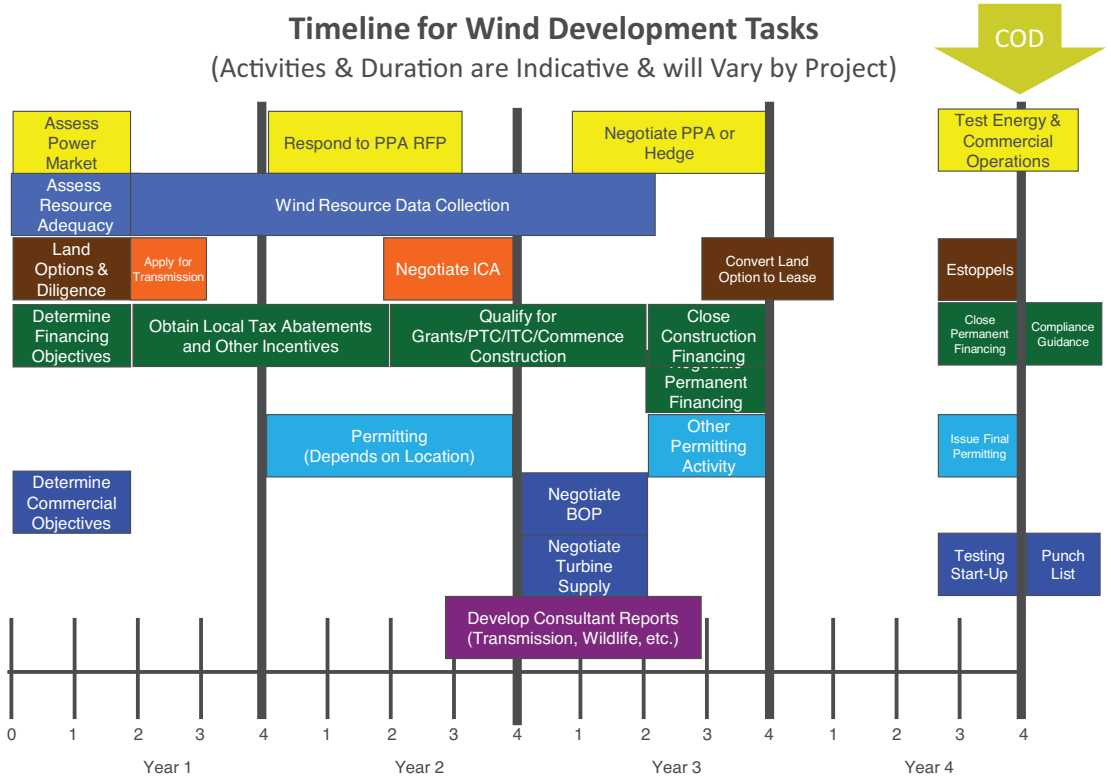
Access for smaller customers
For developers of utility grade renewable energy projects, power purchase agreements are critical for accessing project financing. Before providing financing, the lender will need to be assured of the creditworthiness of the PPA off-taker, and generally, lenders want to see a purchaser with at least an investment grade credit rating.[54] While Fortune 500 companies like Google and Wal-Mart can easily meet the necessary credit requirements, many other large electricity buyers may find PPAs to be unavailable or overly burdensome. There is also no good precedent for two or more smaller end-users to directly sign a PPA with a developer.

Protracted process
Customers interested in signing PPAs must be willing to endure a longer process for procuring their green energy. Building a new, offsite wind or solar farm, even if stepping into a "shovel ready" project (where the developer has already secured leases, permits, transmission interconnection agreements, etc.), can still take a minimum of 12-18 months to complete construction and start generating electricity. For an example of the timeline for securing a PPA and developing a new wind farm, see Figure 8.

53. Dial, A. *Wind Power Purchasing.* April 9, 2013. Available: http://www.epa.gov/greenpower/documents/20130408_AparnaDial.pdf

54. Einowski, E. *Project Finance for Wind Power Projects.* Chapter Nine, The Law Of Wind. 2010. Stoel Rives LLP. Available: http://www.stoel.com/webfiles/LawOfWind.pdf

Figure 8.
Hypothetical Wind Project Development Timeline[55]



Deal complexity

Customer PPAs can be structured in different ways depending on location and other factors, but regardless the customer will be exposed to the complexities of the electricity sector and PPA negotiations.

When a company contracts directly with a generator and takes title to the electricity produced, they become responsible for wholesale power purchases, sales and delivery. This adds complexity and, if managed in-house, wholesale electricity transactions are federally regulated, requiring approval from the Federal Energy Regulatory Commission as a licensed wholesale power marketer.

Google, which has signed contracts for over 570 MW of wind power in recent years,[56] acknowledged this challenge in a recent whitepaper:[57]

> *The downsides are that these PPAs require us to actively manage purchases and sales of power on the wholesale energy markets, which can be a complex process. This puts Google in the business of managing power scheduling and contracting, when we'd rather spend our resources building products for our users.*

55. Krebs, S. *Fundamentals of Power Purchase Agreements.* September 23, 2013. OwnEnergy, Inc. Available: http://www.renewableenergy-markets.com/docs/presentations/2013/REMPPAFundamentalsaspresentedfull092313.pdf
56. *Purchasing clean energy.* Google Inc. Accessed September 18, 2013. Available: http://www.google.com/green/energy/use/#purchasing
57. *Expanding Renewable Energy Options for Companies Through Utility-Offered "Renewable Energy Tariffs",* p. 2. April 19, 2013. Google Inc. Available: http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf

To avoid this complexity, the PPA customer can pay to outsource the management of wholesale power transactions and delivery. For instance, Ohio State contracted separately with their local utility to provide transmission and delivery services for their wind PPA with Iberdrola.[58] This option though is only available for customers in states with competitive electricity markets.

Another way to simplify the PPA process for the customer is if the local utility is willing and able to be the direct counterparty. For example, the University of Oklahoma worked with their local utility, Oklahoma Gas and Electric Company (OG&E), to supply all of the university's electricity (bundled with the RECs) from a new wind farm. The university signed a 25-year PPA with OG&E in 2008, and OG&E subsequently constructed a wind farm that was completed in 2010.[59]

However, this option is only available in traditionally regulated markets and where the local utility is willing to collaborate. Even then, there is no standardized, straightforward or expedient process for a customer to execute such an arrangement.

Another alternative that could simplify green PPAs is for the customer to avoid being involved in the wholesale electricity transactions. Some developers are now offering what is being referred to as a "virtual PPA," "structured PPA" or "synthetic PPA,"[60] which, in the financial world, would be more accurately called a contract for differences for renewable energy.

Under these agreements, there is actually no physical exchange of electricity between the parties. Instead, the parties will enter a deal structured around a benchmark electricity price, the customer will receive the project's RECs, and the developer will simply sell the project's power on a merchant basis. If wholesale power prices drop below the benchmark [commonly referred to as a "strike price"], the customer will pay the difference to the developer. Similarly, if power prices rise above the benchmark, the developer will pay the difference to the customer. The customer will have to continue to pay its local utility or supplier for its electricity, but this structure is a hedge for both entities.[61]

However, customers may find synthetic PPAs to be trading one type of complexity for another. Bundled energy products might be preferable to these synthetic arrangements, which are in effect financial derivative transactions. Fluctuations in wholesale energy prices may not always correlate with the customer's retail prices, and this can also create accounting issues.

Renewable energy tariffs

Given the limitations associated with PPAs and on-site installations, some major green electricity buyers have begun to press traditionally regulated utilities for a new class of renewable energy tariff. According to Google:[62]

> *[C]ompanies cannot request and procure renewables directly from the local utility in a transparent and straightforward manner, where they know how much renewable power they are getting (and from where). With few exceptions, utilities and the state commissions that regulate them do not provide a way for large users to request renewable power. In short, even though companies want renewable power and are willing to pay for it, the product is not being offered.*

To address this shortfall, Google proposes that utilities be required to provide "renewable energy tariffs." Utilities traditionally provide electric power under a number of different rate schedules, or 'tariffs,' for various classes of customers. For example, rates for larger industrial customers vary from those paid by residential customers. Google's proposal is a call for utilities to offer customers the choice to buy renewable energy through a new tariff category and pay the associated costs so that other ratepayers are not impacted.

58. Dial, A. *Wind Power Purchasing.*

59. Ellis, B. *Wind Power Purchase Agreement Between Oklahoma Gas and Electric Company and The University of Oklahoma.* April 9, 2013. Available: http://www.epa.gov/greenpower/documents/20130408_UniversityOfOklahoma.pdf

60. For example, see Apex Clean Energy: http://www.epa.gov/greenpower/documents/events/Apex_EPAGPPPresentation_2013-07-18_WithoutNotes.pdf; Geronimo Energy: http://www.geronimoenergy.com/pdf/Virtual_PPA_Brochure.pdf; or OneEnergy Renewables: http://oneenergyrenewables.com/purpose-built

61. For more information, see: *Synthetic Power Contracts (Special Update).* April 12, 2013. Chadbourne & Parke LLP. Available: http://www.chadbourne.com/files/Publication/1676ccf7-d77b-4d38-9528-9614f6993c6f/Presentation/PublicationAttachment/5e329132-bf14-4768-bb91-9f79bb123fc7/SyntheticPPAs_Apr13.pdf

62. *Expanding Renewable Energy...*, p. 2.

Google also wants these tariffs to provide an integrated service that includes a renewable power component and, if needed, "a supplemental 'shaping' service from (likely non-renewable) generation" to fill in the gaps and ensure reliability. In addition, the tariff would give customers the option to designate the renewable energy source they wish to buy and, perhaps most importantly, the right to source bundled power from a renewable facility that is owned or contracted by the customer or the utility under a PPA.

In response to customer requests, Dominion Virginia Power proposed its first renewable energy tariff in December 2012. Dominion is planning to at least offer the tariff as a pilot program that would be open on a voluntary basis to larger non-residential customers. The program would hold a three-year enrollment period subject to a cap of 240,000 MWh and 100 customers. Individual customers would be limited to purchases between 1,000-24,000 MWh annually. The Dominion program is currently awaiting approval from the Virginia state commission, and, pending approval, the tariff could be launched as soon as early 2014.[63]

Under the program, customers can choose to increase the amount of renewable energy they receive. They would purchase a defined quantity of renewable energy under the terms of the new rate schedule, and the balance of their power would continue to be supplied under the terms of their current tariff. Dominion would help connect participating customers with renewable generators and assist in negotiating contract terms between the three parties. Dominion would also retire or transfer to the customer the RECs associated with their purchase. The customer would be responsible for all costs associated with its renewable power purchase, including an administrative fee to cover anticipated costs for Dominion to implement and manage the tariff.

In November 2013, following extensive discussions with Google and other data center owners, Duke Energy proposed a similar, new renewable energy tariff.[64] Duke's proposed program would function very much like the Dominion pilot. The proposed Duke pilot would run for three years, though total participation would have a higher cap at 1,000,000 MWh annually. However, Duke would offer the tariff on a more limited basis, as the pilot would be open only to offsetting new demand from large, non-residential customers who have added at least 1 MW of load to Duke's system since July 2012.[65] Duke's proposal is now before the North Carolina Utilities Commission.

The draft renewable energy tariffs from Dominion and Duke are included respectively as Appendices 2 and 3.

In addition, NV Energy in Nevada has a new renewable energy tariff option available for non-residential customers, though each customer contract under the tariff will first require approval from their state utility commission.[66] Other utilities, including two in Michigan, are also rumored to be interested and researching the concept.[67]

63. *Application of Virginia Electric and Power Company for Approval to Establish a Renewable Generation Pilot Program.* December 20, 2012. Virginia Electric and Power Company. Virginia State Corporation Commission, Case Number: PUE-2012-00142.

64. Downey, J. *Duke Energy's new industrial rate idea could expand NC renewables.* April 19, 2013. Charlotte Business Journal. Available: http://www.bizjournals.com/charlotte/blog/power_city/2013/04/duke-energys-new-industrial-rate-idea.html?page=all

65. *Duke Energy Carolinas' Petition for Approval of Rider GS (Green Source Rider) Pilot.* November 15, 2013. Duke Energy Carolinas. North Carolina Utilities Commission, Docket Number: E-7 Sub 1043.

66. The NV Energy tariff also includes a specific provision that would prevent customers from realizing potential cost savings over the life of a customer's renewables contract. See: *Schedule No. NGR, NV GreenEnergy Rider.* September 13, 2013. Sierra Pacific Power Company. Available: https://www.nvenergy.com/company/rates/nnv/electric/schedules/images/NV_GreenEnergy_Rider.pdf

67. Davidson, R. *Case study - Dominion Virginia Power prepares to launch green tariff.* July 1, 2013. Windpower Monthly. Available: http://www.windpowermonthly.com/article/1187596/case-study---dominion-virginia-power-prepares-launch-green-tariff

Advantages

PPA benefits while leveraging utility's expertise

Renewable energy tariffs are attractive to green power customers because they provide all the benefits of PPAs [clear additionality; long-term cost stability and hedging value of resource; and potential for large quantity procurement]. At the same time, however, customers are also able to retain and leverage the advantages of the utility's expertise and management. As explained by Dominion Virginia Power in regards to their proposed tariff:[68]

> *Put simply, based on input from customers, [Dominion] will act as an agent to the participating customer in negotiating [their renewable power service agreements], bringing [Dominion's] expertise in buying and selling electricity and daily participation in the renewable energy markets to the negotiation table with the preferred provider. As the customer's agent in that process, [Dominion] will ensure that the terms of the [agreements] will incorporate those individualized factors required by the participating customer, such as the renewable technology, delivery point, generation profile, any unique customer requirements, liquidated damages, and credit provisions. And while under the Pilot [Dominion] will be negotiating on behalf of, and for the benefit of, the participant (and not itself)...*
>
> *Further, to ensure that the customer is able to gauge whether they are receiving the best price and fairest terms through this involved and transparent negotiation process, [Dominion] will provide the voluntary participant with information regarding what is currently happening in the industry and marketplace, and how it can find additional information about renewable energy.*

Challenges

Not currently available

While proposals are pending in Virginia and North Carolina, and others are rumored to be exploring the concept, access to renewable energy tariffs is not currently available for customers anywhere in the U.S.

Possibility for state-to-state variations in program administration

Even if renewable energy tariffs gain momentum, programs will need to be adopted on a state-by-state basis. This could produce differences between program requirements, costs and quality.

Concept only applicable for traditionally regulated states

Tariffs are used by traditionally regulated utilities to ensure that the rates charged for electricity service are transparent and state commission approved. In states with retail competition, retail marketers supply electricity to end-users on a competitive basis. Their rates are not overseen by state commissions, and, therefore, the same mechanism does not exist to compel renewable energy tariff offerings outside the traditionally regulated states.

68. *Post-Hearing Brief of Virginia Electric and Power Company,* p. 17-18. June 18, 2013. Virginia Electric and Power Company. Virginia State Corporation Commission, Case Number: PUE-2012-00142.

4 Innovative Vehicles for Public Capital

Beyond procurement decisions, consumers may soon have expanded options to support renewable electricity through their investment portfolios. To date, investors interested in supporting renewable energy have been largely limited to taking equity stakes in publicly traded corporations that operate in this space.

Providing greater access to renewable energy for public capital investment could also greatly expand availability, and lower the costs, of capital for the industry. For example, Figure 9 provides a comparison of the costs of capital from private tax equity sources with those normally required from a variety of public capital vehicles. New and larger sources of capital will be critically important if the industry is to continue its expansion. This is especially true given the high uncertainty that surrounds the future of the tax credits that have historically attracted tax equity investment.

Ultimately, lowering the cost of capital for new renewable energy projects would translate to lower generation costs and improved economic competitiveness against traditional generation resources. Analysis by the National Renewable Energy Laboratory estimates that "increasing the use of public capital can lower a project's [levelized cost of energy] associated with solar and wind deployment by roughly 8%–16% (and perhaps more), depending on the assumptions."[70]

Briefly described in the remainder of this section are three innovative public capital investment vehicles for renewable energy project development. These include solar asset-backed securities (solar ABSs), renewable MLPs/REITs, and crowdfunding. While each of these faces headwinds, they could each become important new options for individuals who want to support renewables.

Figure 9.
Cost of Capital, Market Size, and Investors – Tax Equity Versus Public Market (U.S. Only)[69]

	Cost of Capital (Indicative)	Market Size–Securities Outstanding (billions of dollars)
Tax Equity		
Utility-scale, unlevered	7%–10%	N/A (approximately 20 firms, mostly financial)
Levered	12%–18%	
Public Capital Vehicles		
Mortgage-backed securities	3%–7%	$13,200
ABS (non-mortgages)	3%–7%	$2,150
Debt products	3%–7%	$31,200
MLPs	5%–9%	$338
REITs	7%–12%	$579

69. Mendelsohn, M. and D. Feldman. *Financing U.S. Renewable Energy Projects Through Public Capital Vehicles: Qualitative and Quantitative Benefits.* April 2013. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy13osti/58315.pdf

70. Ibid., p. vi.

Solar Asset-Backed Securities

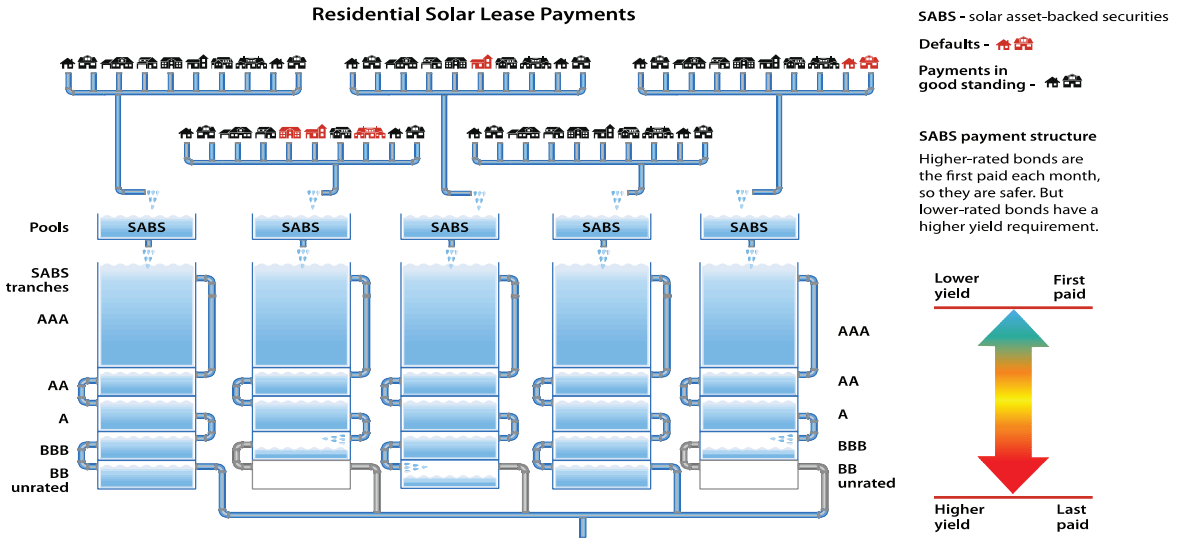
As described earlier in this paper, by 2015, several hundred thousand distributed solar projects are likely to be completed for residential and commercial customers under long-term lease or power purchase arrangements. A large and growing customer base of this size may be suited for securitization.

Investopedia describes securitization as the process of creating "a financial instrument by combining other financial assets and then marketing different tiers of the repackaged instruments to investors. The process can encompass any type of financial asset and promotes liquidity in the marketplace."[71]

Since renewable energy projects typically sell their power output through long-term PPAs, they offer stable cash flow characteristics that could be attractive to investors. Securitization would allow debt from a number of similar renewable assets to be pooled, so that ownership shares of these revenue streams could be easily priced and traded on open markets.

The lease/PPA payments solar developers receive could potentially be securitized as a new ABS product, similar to the secondary markets for mortgages, automobile loans, student loans, and credit card debt. Like other ABS products, solar ABS pools could then be further divided into tranches based upon the credit worthiness of the underlying customer classes. This allows investors to invest in tranches that match their desired risk and reward profiles. Figure 10 demonstrates how solar lease payments could be aggregated into various tranches of solar ABS offerings.

Figure 10.
Illustration of Hypothetical Solar ABSs[72]



71. Accessed September, 2013. Available: http://www.investopedia.com/terms/s/securitization.asp
72. Mendelsohn, M. and D. Feldman. *Financing U.S. Renewable...*

Securitization can offer investors a range of benefits, including a dividend yield, risk minimization (achieved by diversification of the underlying assets), strong market liquidity, product consistency, and price transparency. Asset-backed securities typically appeal to institutional investors that are seeking better yields than government bonds as well as portfolio diversification, though interested retail investors can also easily invest in these securities through certain index funds.

Despite mortgaged-backed securities' infamous role in the 2008-2009 financial crisis, many stakeholders are predicting that solar ABSs will play a similarly important role in delivering the sector's future capital needs. According to analysis from the National Renewable Energy Laboratory, an estimated $3.4 billion was invested in third-party owned residential solar systems at the end of 2012, generating about $93 million in annual lease/PPA payments.[73] This asset pool that is potentially applicable for securitization should experience tremendous growth given the increasing market dominance of third-party owned solar installations.

While solar would be a new asset class, securitization of operating assets is not a new practice to either the ratings agencies or ABS investors. The ratings agencies have even been monitoring developments and offering guidance for overcoming obstacles to solar securitization.[74]

The U.S. witnessed its first solar ABS in November, 2013 as SolarCity announced an offering of about $54 million.[75] This offering is expected to carry a yield of around 4.8%, and it has received a preliminary rating of BBB+ (a low investment grade rating) from Standard & Poor's.[76] While small by wider securitization standards, this breakthrough will be keenly watched by industry stakeholders.

However, several hurdles still remain before solar securitizations will become more commonplace. Among the impediments are needs for greater scale, geographic diversity, performance data availability, and contractual design standardization.[77] To help overcome these barriers, the U.S. Department of Energy's National Renewable Energy Laboratory created the Solar Access to Public Capital (SAPC) working group that is working on document standardization and collection and public availability of PV system performance data. The SAPC working group includes a broad collection of solar fleet operators, banks, and ratings agencies.[78]

Solar securitization holds exciting potential to provide the distributed solar industry with greater availability and lower cost capital. As solar ABSs become a more readily available product, interested investors will have a new opportunity to support the distributed PV market while also earning a return.

Renewable Master Limited Partnerships/Real Estate Investment Trusts

Though technically not securitization vehicles, MLPs and REITs are alternative investment structures that similarly promote liquidity, accessibility, and low cost of capital. They are proven for attracting capital formation in other sectors and could be relevant for renewables.

The Master Limited Partnership is a business structure that is taxed like a partnership but has ownership stakes that are traded like corporate stock. MLPs are allowed to avoid corporate income taxation (what is commonly referred to as 'double taxation') by passing their income to its owners who then pay taxes only at the individual level.

73. Ibid.

74. For example, see: Giudici, A., J. Kim, & B. Yagoda. *Will Securitization Help Fuel The U.S. Solar Power Industry?* January 23, 2012. Standard and Poor's. Available: http://www.standardandpoors.com/ratings/articles/en/eu/?articleType=PDF&assetID=1245327716473

75. *SolarCity Announces Proposed Securitization.* November 4, 2013. SolarCity Corporation. Available: http://investors.solarcity.com/releasedetail.cfm?ReleaseID=803917

76. Cardwell, D. *Bonds Backed by Solar Power Payments Get Nod.* November 15, 2013. The New York Times. Available: http://www.nytimes.com/2013/11/15/business/energy-environment/bonds-backed-by-solar-power-payments-get-nod.html?ref=business&_r=1&
For more information, see also: http://www.standardandpoors.com/spf/upload/Ratings_US/SolarCity_LMC_11_11_13.pdf

77. Borod, R. *The Devil in the Details of Solar Securitization.* April 15, 2013. WorldTrade Executive: Practical International Corporate Finance Strategies. Available: http://www.dlapiper.com/files/upload/DLAPiper_CF_04152013.pdf

78. As one component of the SAPC's ongoing efforts, standardized lease and PPA contracts are now available – see: https://financere.nrel.gov/finance/solar_securitization_public_capital_finance
Data collection, under contract from NREL, is being handled by the SunSpec Alliance's Open Solar Performance and Reliability Clearinghouse: http://www.sunspec.org/osparc/

The tax advantaged MLP structure therefore can be attractive to investors as the single layer of taxation can support greater returns. In addition, since MLP units are traded publicly like stocks, they provide a highly liquid mechanism for investment in qualifying assets. As a result, businesses that structure as MLPs may be able to attract more capital at lower cost.

To organize as an MLP, at least 90% of a business's income must come from qualifying sources. This includes dividends, interest, rents, capital gains, and natural resource activities such as exploration, development, mining or production, processing, refining, transportation, storage, and marketing of any natural resource.[79] Midstream oil and gas operations currently represent over 70% of all market capital in MLPs. The qualifying sources definition was expanded in 2008 to include the transportation and storage of certain renewable and alternative fuels like ethanol and biodiesel, but the MLP structure remains unavailable to renewable energy resources like wind and solar.[80]

The liquidity and relatively low cost of capital available through MLPs would be an excellent match for the needs currently facing the renewable energy industry. Moreover, renewable assets would be well suited for MLPs, since they generally have long lives and can provide predictable cash flows.

For these reasons, there has been considerable interest in expanding MLP status to renewable electricity sources. Legislation was originally introduced in June 2012 (and reintroduced in May 2013), though the effort currently remains stalled in Congress.[81]

Real Estate Investment Trusts are similar to MLPs and are another potential investment vehicle for renewable generation assets. REITs normally provide capital (equity or debt) for income producing commercial real estate, such as office buildings, apartment complexes, or shopping malls.

Like MLPs, the REIT structure is attractive because it allows for the avoidance of corporate tax as long as at least 90% of its taxable income is distributed to its investors. Though REITs can be privately held, many are publicly listed and also traded like stock. This creates a highly liquid means of investing in real estate and provides access for small investors to participate in these markets.

Unlike MLPs, renewables are not explicitly excluded from participating in REITs. The applicability of this structure instead hinges on whether the Internal Revenue Service interprets wind and solar assets to be valid REIT property.[82]

At the very least, REITs have some options available to incorporate onsite renewables, and, to this extent, REITs like Prologis and Kimco are already taking advantage of hosting solar panels on their facilities.[83] However, whether REITs can specifically own a pool of renewable assets, the primary goal of renewables advocates, is far less clear. Several organizations have requested further IRS clarification, and one recent ruling suggests the IRS is not likely to agree that wind or solar farms are REIT-qualifying property.[84]

A final challenge facing both MLPs and REITs is that they would not be effective vehicles for utilizing federal tax incentives. Therefore, even if they are allowed to participate in direct ownership of utility scale projects, MLPs and REITs would probably be best suited as a source of take-out financing for tax equity investment after the tax benefits have been fully utilized.[85]

79. *MLP Primer – Fourth Edition.* November 19, 2010. Wells Fargo Securities. Available: http://naptp.org/documentlinks/Investor_Relations/WF_MLP_Primer_IV.pdf

80. Sherlock, M., and M. Keightley. *Master Limited Partnerships: A Policy Option for the Renewable Energy Industry.* June 28, 2011. Congressional Research Service. Available: http://ieeeusa.org/policy/eyeonwashington/2011/documents/masterlmtdpartnerships.pdf

81. Coons, C. *The Master Limited Partnerships Parity Act.* Available: http://www.coons.senate.gov/issues/master-limited-partnerships-parity-act

82. More specifically, the IRS will need to clarify whether/in which circumstances renewable generation assets qualify as real versus personal property. For more information, see: Feldman, D., M. Mendelsohn, and J. Coughlin. *The Technical Qualifications for Treating Photovoltaic Assets as Real Property by Real Estate Investment Trusts (REITs).* June 2012. National Renewable Energy Laboratory. Available: http://www.nrel.gov/docs/fy12osti/55396.pdf

83. Wiedmeyer, J. *These solar REIT pioneers are mining the sun for "good income."* August 18, 2013. National Renewable Energy Laboratory. Available: https://financere.nrel.gov/finance/content/these-solar-reit-pioneers-are-mining-sun-good-income

84. Kogan, K. *Is the IRS Considering Solar REITs?* June 12, 2013. Chadbourne & Parke. Available: http://www.renewableenergyworld.com/rea/news/article/2013/06/is-the-irs-considering-solar-reits...

85. Mendelsohn, M. and D. Feldman. Financing U.S. Renewable...

Crowdfunding

Crowdfunding is a means of raising capital for new projects or businesses from a wide pool of contributors. Crowdfunding is facilitated through an internet-based platform that allows other people or organizations to launch endeavors that are seeking start-up funding. Though platforms typically have their own niches and criteria, crowdfunded initiatives can range from one-off projects to new businesses (both for-profits and not-for-profits), and contributions can be structured as donations, lending with no financial returns, or investments in exchange for equity, profit or revenue sharing.

The largest crowdfunding platform is Kickstarter, which focuses specifically on funding creative and artistic projects. To date, more than 5 million contributors have provided over $720 million in funding for over 50,000 projects through Kickstarter.[86]

According to one report, crowdfunding platforms raised $2.7 billion and successfully funded more than 1 million campaigns globally in 2012. This total is forecasted to increase to $5.1 billion in 2013.[87]

However, securities-based crowdfunding opportunities, where contributors can earn a return on investment, have so far been unavailable to the general public. Historically companies offering to sell its securities would have to register with the Securities Exchange Commission (SEC) and follow extensive disclosure requirements, or find an exemption from the requirements, such as selling securities only to "accredited investors" (which include wealthy individuals, certain businesses and trusts, etc.).

The Jumpstart Our Business Startups Act (JOBS Act), passed by Congress and signed into law by President Obama in April 2012, provides a new exemption from these requirements. The revisions will allow entities to raise up to $1 million annually through securities-based crowdfunding. The SEC is still in the process of finalizing these rules, but start-ups should soon have an innovative new tool for raising capital at their disposal.

As crowdfunding has matured, significant interest has grown in how this model can be utilized to connect interested investors with clean energy projects. Crowdfunding could be a particularly logical source of debt financing for some small and medium-sized distributed renewable projects, which could attract capital from retail investors who are interested in the qualitative impact of their investments in addition to earning a return.[88]

The most visible player operating in this space has been Solar Mosaic, which focuses on crowdsourcing debt financing for distributed solar projects. Mosaic has utilized various exemptions that have allowed them to successfully crowdfund a number of projects, many promising yields between 4.5-5.5%, without having to wait on the SEC's pending rules. To comply with existing restrictions, Mosaic's investment opportunities are currently limited to participation from residents of California or accredited investors. Nevertheless, Mosaic has already raised over $3.8 million to develop about 5 MW worth of new solar projects.[89]

86. As of October 2013. See: http://www.kickstarter.com/help/stats?ref=help_nav

87. *2013CF: The Crowdfunding Industry Report.* 2013. Massolution. Available: http://research.crowdsourcing.org/2013cf-crowdfunding-industry-report

88. For more information, see: Bullard, N. *Extraordinary Popular Solution: Funding from Crowds?* June 15, 2012. Bloomberg New Energy Finance. Available: http://about.bnef.com/white-papers/extraordinary-popular-solution-funding-from-crowds/

89. As of October 2013. See: https://joinmosaic.com/browse-investments
Other novel initiatives to crowdfund clean energy projects include SunFunder, which utilizes a lending model and focuses exclusively on international projects located in developing nations; and RE-volv, which uses a charitable donation model as revolving-door seed-funding to finance solar installations for non-profits like schools or hospitals.

Appendices 5

Appendix A.

Lists of Licensed Electricity Suppliers in States with Competitive Markets

California:
https://ia.cpuc.ca.gov/esp_lists/esp_udc.htm

Connecticut:
http://www.dpuc.state.ct.us/electric.nsf/$FormByElectricApplicantsView?OpenForm&Start=1&Count=1000&ExpandView

Delaware:
http://depsc.delaware.gov/electric/elecsupplierinfo.pdf

District of Columbia:
http://www.dcpsc.org/customerchoice/whatis/electric/Approved_Commodity_electric_Suppliers.shtm

Illinois:
http://www.pluginillinois.org/res.aspx

Maine:
http://www.maine.gov/tools/whatsnew/attach.php?id=66311&an=1

Maryland:
http://webapp.psc.state.md.us/intranet/supplierinfo/searchsupplier_new.cfm

Massachusetts:
http://www.mass.gov/eea/energy-utilities-clean-tech/electric-power/electric-market-info/electric-competitive-suppliers/competitive-supplier-electric-brokers/

Michigan:
http://www.dleg.state.mi.us/mpsc/electric/restruct/esp/aeslist.htm

New Hampshire:
http://www.puc.nh.gov/Consumer/energysuppliers.htm

New Jersey:
http://www.nj.gov/bpu/pdf/energy/shopping_forms/connectivterritory.pdf
http://www.nj.gov/bpu/pdf/energy/shopping_forms/jcpltterritory.pdf
http://www.nj.gov/bpu/pdf/energy/shopping_forms/rocklandterritory.pdf
http://www.nj.gov/bpu/pdf/energy/shopping_forms/psegterritory.pdf

New York:
http://documents.dps.ny.gov/public/common/EscoSearch.aspx

Ohio:
http://www.puco.ohio.gov/apps/RegulatedCompanyList/index.cfm?IID=24

Oregon:
http://www.puc.state.or.us/Pages/electric_restruc/essinfo/eslist.aspx

Pennsylvania:
http://www.puc.state.pa.us/consumer_info/electricity/suppliers_list.aspx

Rhode Island:
http://www.ripuc.org/utilityinfo/electric/nonreg.html

Texas:
http://www.puc.texas.gov/industry/electric/directories/rep/alpha_rep.aspx
http://www.powertochoose.org/

Appendix B.

Dominion Virginia Power's Proposed Renewable Energy Tariff

Company Exhibit No. ___
Witness: KWS
Schedule 1
Page 1 of 3

120220080

Virginia Electric and Power Company

SCHEDULE RG
RENEWABLE ENERGY SUPPLY SERVICE
(EXPERIMENTAL)

I. APPLICABILITY

A. This Schedule is applicable, on an experimental, voluntary basis, to any Customer (a) electing to receive Electricity Supply Service and Electric Delivery Service from the Company, in accordance with Schedule GS-3 or Schedule GS-4 ("The Principal Tariff"), and (b) desiring to displace some portion of The Principal Tariff energy supply with the supply of Renewable energy (as defined below) purchased by the Company on behalf of the Customer in accordance with this Schedule. The planned supply of Renewable energy under this Schedule shall be between 1,000 and 24,000 MWh per year. This Schedule is not applicable where the Customer elects service in accordance with Section XXV - Net Metering of the Company's Terms and Conditions.

B. "Renewable energy" means electric energy (kWh) derived from sources as defined in Va. Code § 56-576. Such sources currently include sunlight, wind, falling water, biomass, sustainable or otherwise, (the definitions of which shall be liberally construed), energy from waste, landfill gas, municipal solid waste, wave motion, tides, and geothermal power. Renewable energy also does not include energy derived from coal, oil, natural gas, or nuclear power.

II. AVAILABILITY

This Schedule is available only during the period of time that all of the following criteria are met:

A. No more than 100 Customers have elected service under this Schedule, and

B. In aggregate, there are no more than 240,000 MWh of planned supply under this Schedule per year, and

C. The effective date of the Customer's contract under this Schedule is within three (3) years of the initial effective date of this Schedule.

(Continued)

Filed 12-20-12
Electric-Virginia

This Filing Effective For Usage On and After
90 Days Following the Date of the Commission's
Final Order in This Proceeding.

Virginia Electric and Power Company

SCHEDULE RG
RENEWABLE ENERGY SUPPLY SERVICE
(EXPERIMENTAL)

(Continued)

III. MODIFIED BILLING UNDER THE PRINCIPAL TARIFF

Billing under The Principal Tariff will reflect 100% of deliveries from the Company to the Customer except as follows:

A. For each 30-minute interval where the Customer's energy consumed exceeds the supply of Renewable energy purchased by the Company on behalf of the Customer, the Company will reduce the energy billed to the Customer under Paragraphs II.A.4., II.A.5. and II.B.6. of The Principal Tariff by the amount of Renewable energy supplied by the Company to the Customer under this Schedule. Further, the Company will reduce the On-peak or Off-peak (as applicable) Electricity Supply (ES) kWh billed to the Customer under Paragraph II.B.5. of The Principal Tariff by the On-peak or Off-peak energy supplied by the Company to the Customer under this Schedule.

B. For each 30-minute interval where the supply of Renewable energy purchased by the Company on behalf of the Customer exceeds the energy consumed by the Customer, the Company will reduce to zero the energy billed to the Customer under Paragraphs II.A.4., II.A.5. and II.B.6. of The Principal Tariff. Further, the Company will reduce to zero the On-peak or Off-peak (as applicable) ES kWh billed to the Customer under Paragraph II.B.5. of The Principal Tariff.

IV. MONTHLY RATE

A. Distribution Service Charges

1. Distribution kWh Charges

a. Distribution kWh Charge for All Customers

Where The Principal Tariff is Schedule GS-3	@	0.007¢ per kWh
Where The Principal Tariff is Schedule GS-4	@	0.006¢ per kWh

(Continued)

Filed 12-20-12
Electric-Virginia

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90 Days Following the Date of the Commission's
Final Order in This Proceeding.

Virginia Electric and Power Company

SCHEDULE RG
RENEWABLE ENERGY SUPPLY SERVICE
(EXPERIMENTAL)

(Continued)

IV. MONTHLY RATE (Continued)

b. Plus Distribution kWh Charge for Non-exempt or Non-opt-out Customers

Where The Principal Tariff is Schedule GS-3	@	0.016¢ per kWh
Where The Principal Tariff is Schedule GS-4	@	0.011¢ per kWh

2. Plus each Distribution kilowatt-hour used is subject to all applicable riders, included in the Exhibit of Applicable Riders.

B. Electricity Supply (ES) Service Charges

1. Administrative Charge of $500 per billing month.

2. Plus the Company's actual cost of purchasing the Renewable energy on behalf of the Customer (or an allocated share of such cost if multiple Customers are supplied from the same resource). The details regarding the actual cost will be specified in a written contract between the Company and the Customer. For any 30-minute interval where the Renewable energy purchased by the Company on behalf of the Customer exceeds the energy delivered to the Customer for that same 30-minute period, the Customer shall be obligated to pay for such excess. However, the Company will credit the Customer for such excess based on the Company's estimate of its avoided energy cost.

3. Plus each Electricity Supply kilowatt-hour used is subject to all applicable riders, included in the Exhibit of Applicable Riders, except fuel-related riders (*e.g.*, Fuel Charge Rider A).

V. TERM OF CONTRACT

The Company and Customer shall execute a contract ("Agreement") detailing requirements associated with the Company's supply of Renewable energy to be delivered under this Schedule. The term of contract under this Schedule shall coincide with the term of the Agreement. However, should the Customer's load change such that The Principal Tariff no longer applies to the Customer, service under this Schedule shall terminate upon final billing under The Principal Tariff, subject to the provisions of the Agreement.

Appendix C.

Duke Energy Carolinas' Proposed Renewable Energy Tariff

Duke Energy Carolinas, LLC

Electricity No. 4
North Carolina Original (Proposed) Leaf No. 104

RIDER GS
Green Source
Experimental

AVAILABILITY (North Carolina only)

This Rider is available on a limited and voluntary basis, at the Company's option, to nonresidential customers receiving concurrent service from the Company on Schedule OPT-G, OPT-H, OPT-I, who elect to displace all or a portion of the energy supplied for the customer's new load added to the Company's system after June 30, 2012, with procurement of renewable energy resources. The Customer's new load must be a minimum of 1000 kW. This Rider is not available to customers receiving service under Rider PS, PSC, SCG or NM. This Rider is available for enrollment for a three-year period following its initial approval, or until the aggregate program cap of approximately 1,000,000 annual megawatt hours is reached, whichever occurs first.

GENERAL PROVISIONS

To qualify for this Rider, the Customer must make an application to the Company requesting an annual amount of energy and Renewable Energy Certificates ("RECs") be produced or procured over a specific term. The application shall be accompanied by the payment of a nonrefundable application fee of $2000, which is intended to cover the Company's transaction fees related to the procurement of renewable energy pursuant to the Customer's application. The Company will make its best efforts to match the supply source, in terms of annual output and term of contract, with that requested by the Customer either by entering into a purchased power agreement(s) ("PPA") with a renewable energy supplier(s) or supplying the energy directly from one or more Duke Energy Carolina renewable energy assets that are dedicated to serving Rider GS customers. The Company shall allow the Customer to review the negotiated price terms and the terms and conditions of a PPA or the price offered from a dedicated Company asset prior to the Customer's election to participate in this Rider. Upon review of the price, and terms and conditions in the case of a PPA, the Customer may elect to move to proceed with or cancel its application; provided however, the terms and conditions of a PPA with a renewable energy supplier shall be set in Duke Energy Carolinas' sole discretion. In either case, the Customer shall be responsible for the entire cost incurred under the PPA or use of Company's asset. The renewable energy supplier is a renewable energy resource from which the Company procures energy and "RECs" as a result of the Customer's election under this rider.

In order to participate in this Rider, the Customer shall provide the Company a guarantee, surety bond, letter of credit or other form of security that is acceptable to the Company. Such security for payment of all obligations to the Company under this Rider shall be in an amount sufficient to cover the Company's full costs and other obligations of Company, including a termination or default of Customer's obligations under this Rider during its term.

In procuring the renewable energy, the Company will ensure that renewable energy resources utilized under this rider are or have been placed in service on or after January 1, 2007.

The Company shall not be liable to the Customer in the event that the renewable energy supplier fails to provide renewable energy to the Company and will make reasonable efforts to encourage the renewable energy supplier to resume production as soon as possible. However, in the event that the renewable energy supplier terminates the renewable energy contract with the Company, for any reason during the term of contract with the Customers, the Company, at the election of the Customer, shall make reasonable efforts to enter into a new purchased power agreement with another renewable energy supplier or to provide renewable energy from a Duke Energy Carolinas facility as soon as practicable with the cost of the renewable energy to the Customer revised accordingly.

This Rider is for retail service, in conjunction with the electric service agreement for the customer served at retail by the Company, in consideration of the Customer's retail purchase commitment under this Rider having induced a specified and agreed upon commitment by the Company to purchase or invest in a specified renewable energy resource.

The Company will retire the RECs associated with the energy procured for the participating customer upon receipt of payment from the Customer.

North Carolina Original (Proposed) Leaf No. 104
Effective
NCUC Docket No. E-7, Sub 1043

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RIDER GS
Green Source
Experimental

RATE

CHARGES

I. The rate for service supplied to the customer shall be the applicable time of use rate schedule including the Basic Facilities Charge, On-Peak Demand Charge, Economy Demand Charge, On-Peak Energy Charge, Off-Peak Energy Charge, and all applicable Riders, plus

II. Charges for the total cost of the renewable energy and RECs produced by the Company or procured under a PPA as a result of the Customer's election, during the previous billing period, determined on an hourly basis, plus

III. Rider GS Administrative Charge of $500.00 per month plus .02¢/kWh of renewable energy produced or procured as a result of the Customer's election during the previous billing period

CREDITS

I. Bill credits for renewable energy shall be based on a ¢/kWh rate equal to the avoided capacity and energy expense during the term in which the renewable energy supplier delivers renewable energy to the Company or the Company supplies renewable energy from a dedicated asset, applied to the actual renewable kWh procured or produced. The amount of the bill credits shall be determined at the sole discretion of the Company consistent with applicable North Carolina and federal law and regulation, including 18 C.F.R. § 292, using the Company's avoided cost model to determine the avoided capacity and energy fixed over the term the term in which the renewable energy supplier delivers to the Company. In the event that the credits for avoided capacity and energy, as calculated above, exceed the cost of the renewable energy and RECs produced or procured by the Company, on a ¢/kWh basis, such credits shall be limited to a ¢/kWh amount equal to the ¢/kWh cost of the renewable energy and RECs produced or procured by the Company. The Company shall allow the Customer to review the proposed bill credit prior to the Customer's election to participate in this Rider. Upon review of the proposed bill credit, the Customer may elect to proceed with or cancel its application to participate.

All terms and conditions of the rate schedule applicable to the individual Customer shall apply to the service supplied to the Customer except as modified by this Rider.

CONTRACT PERIOD

Each Customer shall enter into a contract for service under this Rider for a term and with terms and conditions consistent with the term and terms and conditions of the contract with the renewable energy supplier, or as agreed upon between Company and Customer in the case of renewable energy produced from a Duke Energy Carolinas facility, but, in either case the contract will not be for less than 3 years and not more than 15 years. If the Customer requests an amendment to or termination of the service agreement, or defaults on the service agreement before the expiration of the term of the agreement, the Customer shall pay to the Company an early termination charge equal to the full amount due under the termination and damages provisions set forth in the PPA(s). Such termination charge may be adjusted if and to the extent a successor customer requests service under this Rider and fully assumes the obligation for the purchase of renewable energy prior to the effective date of the contract amendment or termination; provided, however, Company will not utilize or change utilization of its assets and positions to minimize Customer's costs due to such early termination.

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