



# Status and Trends in the U.S. Voluntary Green Power Market (2012 Data)

J. Heeter and T. Nicholas  
*National Renewable Energy Laboratory*

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

This report is available at no cost from the National Renewable Energy  
Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

**Technical Report**  
NREL/TP-6A20-60210  
October 2013

Contract No. DE-AC36-08GO28308

# Status and Trends in the U.S. Voluntary Green Power Market (2012 Data)

J. Heeter and T. Nicholas  
*National Renewable Energy Laboratory*

Prepared under Task Nos. SA12.0324 and SM13.1580

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

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

## NOTICE

This report was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

Available electronically at <http://www.osti.gov/bridge>

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy  
Office of Scientific and Technical Information  
P.O. Box 62  
Oak Ridge, TN 37831-0062  
phone: 865.576.8401  
fax: 865.576.5728  
email: <mailto:reports@adonis.osti.gov>

Available for sale to the public, in paper, from:

U.S. Department of Commerce  
National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
phone: 800.553.6847  
fax: 703.605.6900  
email: [orders@ntis.fedworld.gov](mailto:orders@ntis.fedworld.gov)  
online ordering: <http://www.ntis.gov/help/ordermethods.aspx>

*Cover Photos: (left to right) photo by Pat Corkery, NREL 16416, photo from SunEdison, NREL 17423, photo by Pat Corkery, NREL 16560, photo by Dennis Schroeder, NREL 17613, photo by Dean Armstrong, NREL 17436, photo by Pat Corkery, NREL 17721.*



Printed on paper containing at least 50% wastepaper, including 10% post consumer waste.

## Acknowledgments

This work was funded by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy. The authors thank the Strategic Programs and Solar Offices for their support of this work. For their thoughtful review of the document, the authors thank Stephen Capanna, U.S. Department of Energy; Ed Holt, Ed Holt and Associates; Ian McGowan, 3Degrees; Steve Mudd, Xcel Energy; and Lori Bird, Nate Blair, Elizabeth Doris, and Marguerite Kelly of the National Renewable Energy Laboratory (NREL), as well as Mike Meshek of NREL for his editorial support. Finally, the authors thank the many green power marketers and utility contacts who provided the information summarized in this report.

Additional information on green power market trends and activities can be found on the Department of Energy’s Green Power Network website at [greenpower.energy.gov](http://greenpower.energy.gov).

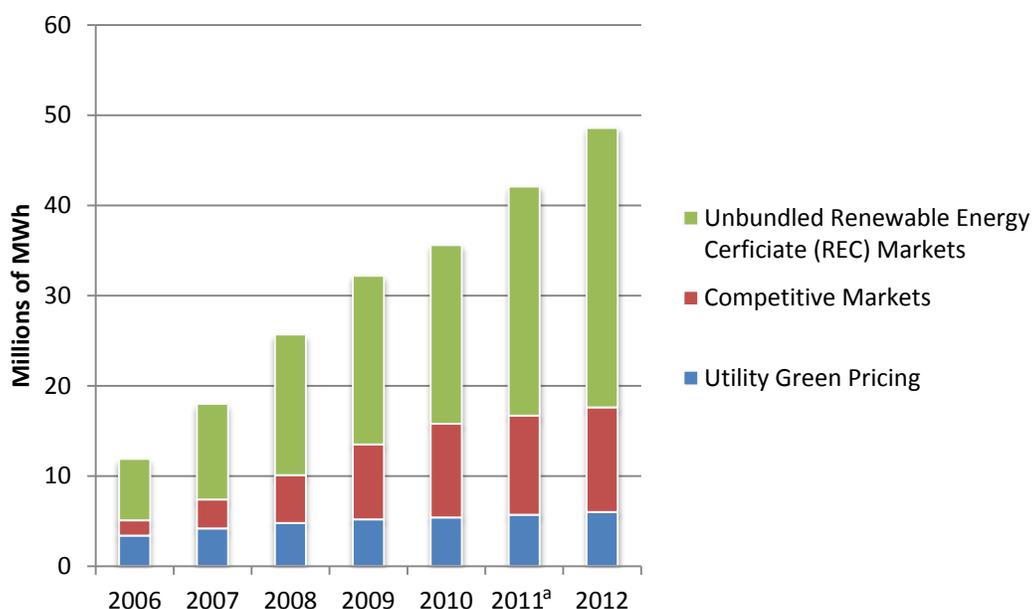
## List of Acronyms

|          |  |
|----------|--|
| EIA      | Energy Information Administration                      |
| EPA      | Environmental Protection Agency                        |
| ERCOT    | Electric Reliability Council of Texas                  |
| kW       | kilowatt   |
| kWh      | kilowatt-hour  |
| M-RETS   | Midwest Renewable Energy Tracking System               |
| MW       | megawatt   |
| MWh      | megawatt-hour  |
| NC-RETS  | North Carolina Renewable Energy Tracking System        |
| NREL     | National Renewable Energy Laboratory                   |
| PJM-GATS | PJM-Generation Attribute Tracking System               |
| PUC      | public utility commission                              |
| REC      | renewable energy certificate                           |
| RPS      | renewable portfolio standard                           |
| SREC     | solar renewable energy certificate                     |
| WREGIS   | Western Renewable Energy Generation Information System |

## Executive Summary

Voluntary green power markets are those in which consumers and institutions voluntarily purchase renewable energy to match their electricity needs. Voluntary action provides a revenue stream for renewable energy projects and raises consumer awareness of the benefits of renewable energy. These markets continued to exhibit growth and stimulate renewable energy development in 2012. Based on our review of the voluntary market, we identified the following market trends:

- In 2012, total retail sales of renewable energy in voluntary purchase markets exceeded 48 million megawatt-hours (MWh) and represented approximately 1.3% of total U.S. electricity sales. These figures represent a capacity equivalent of approximately 17,000 MW. From 2010 to 2012, total green power market sales increased by 36%, a compound annual growth rate of 17% (Figure ES-1).



**Figure ES-1. Estimated annual voluntary sales by market sector, 2006–2012**

<sup>a</sup> Voluntary sales for 2011 are estimated as the mid-point of 2010 and 2012 sales.

- Wind energy continues to provide the most renewable energy to voluntary markets, at 80.1% of total green power sales, followed by landfill gas and biomass (12.8%), hydropower (6.2%), solar (0.6%), and geothermal (0.3%). The percentage of solar used in the voluntary market increased from 0.2% to 0.6% and represents about 2% of sales in utility green pricing programs.
- Utility green pricing sales exhibited estimated growth of 5% in 2012, similar to growth in 2010 and 2009.
- In 2012, 10 new community solar projects were introduced, and as of July 2013, an additional 6 programs had begun. The capacity of existing community solar projects totals more than 14 MW, with an additional 13 MW of projects under development.
- Competitive markets saw slower growth than in previous years, increasing at a compound annual growth rate of 6% from 2010 to 2012. Some of the downturn may be due to

declining voluntary sales in Texas. In 2012, the renewable portfolio standard requirement in Texas increased. Renewable energy certificate (REC) prices in Texas also increased, indicating a potential shortage of supply for the voluntary market.

- REC markets were the fastest growing and largest market segment, increasing at a compound annual growth rate of 25% from 2010 to 2012. The REC market appears to have rebounded from 2010 when it only grew 6% compared to 2009.
- Nearly 1.9 million customers purchased green power in 2012. The number of customers purchasing unbundled RECs nearly doubled, driven primarily by residential customers.
- Wholesale RECs used in voluntary markets declined from around \$5/MWh in 2009 to less than \$1/MWh in 2010 through mid-2013. In July 2013, nationally sourced voluntary RECs increased to more than \$1/MWh, as the market in Texas began to tighten.
- Overall, the voluntary green power market continues to grow, exceeding 48 million MWh in 2012, with nearly 1.9 million customers participating.

# Table of Contents

|   |            |
|---|------------|
| <b>Acknowledgments</b> .....  | <b>iii</b> |
| <b>List of Acronyms</b> .....   | <b>iv</b>  |
| <b>Executive Summary</b> .....  | <b>v</b>   |
| <b>1 Introduction</b> .....   | <b>1</b>   |
| <b>2 Voluntary Green Power Market</b> .....   | <b>6</b>   |
| 2.1 Voluntary Market Sales .....  | 6          |
| 2.1.1 Utility Green Pricing Sales .....   | 10         |
| 2.1.2 REC and Competitive Market Sales .....  | 11         |
| 2.1.3 Residential and Nonresidential Customer Sales .....                           | 12         |
| 2.1.4 Capacity Equivalent of Green Power Sales .....                                | 13         |
| 2.2 Voluntary Market Customer Participation .....                                   | 14         |
| 2.2.1 Utility Green Pricing Participation .....                                     | 16         |
| 2.2.2 Competitive Market Participation .....  | 16         |
| 2.2.3 Unbundled Voluntary REC Market Participation .....                            | 17         |
| 2.3 Voluntary Market Products and Premiums .....                                    | 17         |
| 2.3.1 Utility Green Pricing Products and Premiums .....                             | 17         |
| 2.3.2 Unbundled REC and Competitive Market Products and Pricing .....               | 19         |
| 2.4 Green Pricing Marketing and Administrative Expenses .....                       | 21         |
| <b>3 REC Tracking Systems</b> .....   | <b>25</b>  |
| <b>4 REC Pricing in Voluntary and Compliance Markets</b> .....                      | <b>30</b>  |
| <b>5 Community and Crowdfunded Solar</b> .....                                      | <b>35</b>  |
| 5.1 Intersection of Community Solar, Net Metering, and Green Pricing Programs ..... | 37         |
| 5.2 Crowdfunding Solar .....  | 39         |
| <b>6 Interest of Large Consumers in New Voluntary Options</b> .....                 | <b>40</b>  |
| <b>7 Lessons from Large Green Pricing Programs</b> .....                            | <b>43</b>  |
| 7.1 Product History .....   | 43         |
| 7.2 Pricing .....   | 44         |
| 7.3 Customers .....   | 45         |
| <b>8 Conclusions and Observations</b> .....   | <b>47</b>  |
| <b>References</b> .....   | <b>48</b>  |
| <b>Appendix A. Leading Purchasers in the EPA Green Power Partnership</b> .....      | <b>50</b>  |
| <b>Appendix B. Estimated U.S. Green Pricing Customers and Sales by State</b> .....  | <b>52</b>  |
| <b>Appendix C. Top 10 Utility Green Pricing Programs</b> .....                      | <b>56</b>  |

## List of Figures

|  |    |
|--|----|
| Figure ES-1. Estimated annual voluntary sales by market sector, 2006–2012 .....                              | v  |
| Figure 1. Comparison of compliance and voluntary markets for new renewable energy, 2005–2012 .....           | 4  |
| Figure 2. Estimated annual voluntary sales by market sector, 2006–2012 .....                                 | 8  |
| Figure 3. Utility green power and competitive market sales by purchaser’s state, 2011 .....                  | 9  |
| Figure 4. Estimated green power sales by renewable energy source, 2012 .....                                 | 10 |
| Figure 5. Residential and nonresidential voluntary sales, 2006–2012 .....                                    | 13 |
| Figure 6. Trends in utility green pricing premiums, 2002–2012 .....  | 19 |
| Figure 7. Total retail sales of Green-e Energy certified renewable energy, 1998–2012 .....                   | 20 |
| Figure 8. Estimated average marketing and administrative expenses .....                                      | 21 |
| Figure 9. Participation rate compared to marketing and administrative expenses .....                         | 22 |
| Figure 10. Participation rate compared to marketing and administrative expenses per customer .....           | 23 |
| Figure 11. Median marketing and administrative expenses as a percentage of green power premium revenue ..... | 24 |
| Figure 12. Renewable energy tracking systems in North America .....  | 26 |
| Figure 13. Green-e eligible retirements in tracking systems .....  | 28 |
| Figure 14. Compliance and voluntary retirements in ERCOT, 2007–2013 .....                                    | 29 |
| Figure 15. Voluntary REC prices, January 2008–July 2013 .....  | 30 |
| Figure 16. Compliance market (Tier 1) REC prices, January 2008–July 2013 .....                               | 32 |
| Figure 17. Compliance market SREC spot prices, August 2009–August 2013 .....                                 | 33 |
| Figure 18. Community solar program cumulative capacity (kW) .....  | 36 |
| Figure 19. Non-utility off-takers of wind .....  | 41 |
| Figure 20. Growth in the EPA Green Power Partnership, 2006–July 2013 .....                                   | 42 |

## List of Tables

|   |    |
|---|----|
| Table 1. Comparison of Voluntary Support Mechanisms .....   | 3  |
| Table 2. Estimated Annual Voluntary Sales (Millions of MWh) by Market Sector, 2006–2012 <sup>a</sup> .....  | 7  |
| Table 3. Location of Utility Green Power Supply, 2012 .....   | 11 |
| Table 4. Contract Length by Type of Procurement, 2012 .....   | 11 |
| Table 5. Estimated Cumulative Renewable Energy Capacity (MW) Supplying Green Power Markets, 2008–2012 ..... | 14 |
| Table 6. Estimated Cumulative Green Power Customers by Market Segment, 2006–2012 .....                      | 15 |
| Table 7. Export/Import Capability of REC Tracking Systems .....   | 27 |
| Table 8. Utilities Reporting to EIA with Most PV Net Metering Customers, 2011 .....                         | 38 |
| Table 9. Net Metering Customers at Utilities Reporting to EIA with Most Green Power Customers, 2011 .....   | 38 |
| Table A-1. Top 25 Purchasers in the EPA Green Power Partnership Program, July 3, 2013 .....                 | 50 |
| Table B-1. Estimated U.S. Green Pricing Customers and Programs by State, 2010 and 2011 .....                | 52 |
| Table B-2. Estimated U.S. Green Pricing Customers by Customer Class, 2002–2011 .....                        | 54 |
| Table B-3. EIA Estimated U.S. Green Pricing Sales (MWh) by State, 2011 .....                                | 55 |
| Table C-1. Green Pricing Program Renewable Energy Sales, December 2012 .....                                | 56 |
| Table C-2. Green Pricing Program Total Number of Customer Participants, December 2012 .....                 | 56 |
| Table C-3. Green Power Sales as a Percentage of Total Retail Electricity Sales (kWh), December 2012 .....   | 57 |
| Table C-4. Price Premium Charged for New, Residential Customer-Driven Renewable Power, December 2012 .....  | 57 |
| Table C-5. Customer Participation Rate, December 2012 .....   | 58 |

# 1 Introduction

“Voluntary” markets for renewable energy, or “green power” markets, are those in which consumers and institutions voluntarily purchase renewable energy to match their electricity needs. Entities can voluntarily purchase renewable energy through utility green power programs and green power marketing activities in competitive electricity markets, as well as in unbundled renewable energy certificate (REC) markets. RECs are present in all of these types of products, but in some cases the RECs are bundled at the wholesale level with electricity and provided to the consumer, while in others, entities may purchase RECs at retail separate from electricity. All of these approaches are covered in this report:

- **Utility green pricing (regulated utility markets)**—Utility green pricing programs began in the early 1990s when a few utilities offered options to their customers. These programs continue to be offered by utilities in traditionally regulated electricity markets. Today, more than 860 utilities offer green power programs to their customers. As a result, more than half of all U.S. electricity customers have an option to purchase some type of green power product directly from a retail electricity provider. In utility green pricing programs, RECs are obtained by the utility and offered to customers. Utilities differ in how they procure RECs for their green pricing programs but often enter into power purchase agreements for the energy and RECs. In other cases, they may procure unbundled RECs.
- **Competitive green power (competitive utility markets)**—In states with competitive (or restructured) retail electricity markets, electricity customers can often buy electricity generated from renewable sources by switching to an alternative electricity supplier that offers green power. In some of these states, default utility electricity suppliers offer green power options to their customers in conjunction with competitive green power marketers so that switching is not required. More than a dozen states that have opened their markets to retail competition have experienced some green power marketing activity.<sup>1</sup>
- **Voluntary unbundled REC market (separate from electricity)**—Whether or not customers have access to a green power product from their retail power provider, they can purchase green power through unbundled RECs. More than 25 companies offer unbundled RECs to retail customers via the Internet, and a number of other companies market RECs solely to commercial and wholesale customers.<sup>2</sup>

---

<sup>1</sup> States with competitive offerings include Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, and Texas. Washington, D.C. also has green power marketing activity.

<sup>2</sup> For a current list of companies offering voluntary REC products, see the Department of Energy’s Green Power Network website: <http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=2>.

In addition to these voluntary market segments, numerous additional means of procurement are emerging. In some cases, new models are providing a hedge against future electricity prices or other benefits, but they do not provide the environmental benefit to the customer (i.e., the REC is transferred to another party). Emerging models include:

- **Community solar.** Community solar programs allow utility customers to purchase a portion of a larger solar project. Customers then receive the benefits of the energy that is produced by their share. Structures differ, but a common model is for the RECs to be transferred to the utility to meet compliance with a renewable portfolio standard (RPS). More than 40 community solar projects totaling approximately 14 MW exist in the United States.
- **Large direct project investment and “crowdfunding.”** Large organizations, such as Google, have made direct investments in renewable projects. Google’s investments have supported more than 1,000 MW of wind and solar in the United States. On a smaller scale, crowdfunding, which allows individuals to contribute to project financing, has supported solar development. Mosaic, a crowdfunding platform for solar, has invested in around 4 MW of solar. Project investments, whether large or small, typically do not convey the RECs to the investors. Investors also do not receive the power produced by the project.
- **Direct power purchase agreements and large commercial customer green power rates.** A number of corporations, universities, and others have negotiated power purchase agreements for renewable energy. Importantly, not all states allow for power purchase agreements. In addition, a few utilities have proposed new tariffs that would allow large utility customers to purchase renewable energy from a specific facility in the utility service territory, instead of negotiating a power purchase agreement directly.
- **On-site solar/solar leasing.** On-site solar systems, which in some states are primarily owned by third parties, allow customers to provide a location for a solar system and potentially see savings on electricity expenditures. In most cases outside of California, the RECs from on-site solar systems are used by the electric utility to meet RPS compliance.

Table 1 outlines these emerging models and highlights the relative market sizes compared to utility green power, competitive suppliers, and unbundled RECs. While the emerging methods have seen large growth in recent years, the capacity they support as of 2012 was much less than is supported by utility green pricing, competitive suppliers, and unbundled REC market. In some cases, markets do overlap, making it difficult to compare true market sizes.

**Table 1. Comparison of Voluntary Support Mechanisms**

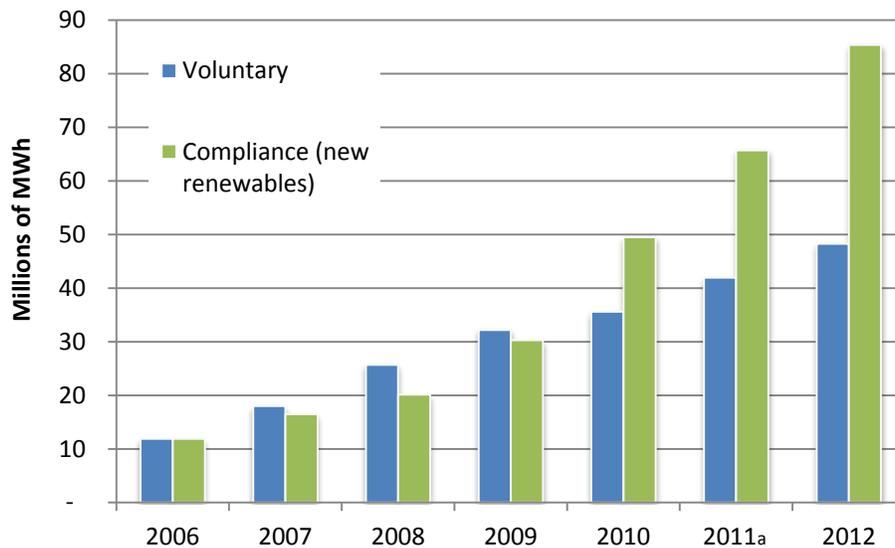
| <b>Support Mechanism</b>  | <b>REC Ownership</b>                             | <b>Value Proposition</b>  | <b>Market Size (2012)</b>  |
|---|--|---|--|
| Utility green power or competitive supplier                               | With customer                                    | Match electricity use with renewables; corporate sustainability goals                       | 2,400 MW   |
| Unbundled RECs  | With customer                                    | Match electricity use with renewables; corporate sustainability goals                       | 14,900 MW  |
| On-site photovoltaics (PV)  | Outside of California, typically goes to utility | Support renewables development by providing a host site; potentially lower electricity bill | 1,416 MW residential, 2,897 MW nonresidential <sup>a</sup>   |
| Community solar   | Varies, currently nearly always to utility       | Support local solar development; potentially lower electricity bill                         | 14 MW  |
| Power purchase agreements/<br>large commercial customer green power rates | Varies   | Corporate sustainability goals; support new renewables; potential financial returns         | Unknown; likely to be captured in estimate of utility green power, competitive supplier, or unbundled REC segment. |
| Direct project investment   | Typically with project developer                 | Support new renewables; potential financial return  | 1,115 MW (Google) <sup>b</sup>   |
| Crowdfunding (small-scale direct project investment)                      | Varies   | Support new solar development; potential financial return                                   | 4 MW (Mosaic) <sup>c</sup>   |

<sup>a</sup> SEIA and GTM (2013)

<sup>b</sup> As of October 2013. Google (2013)

<sup>c</sup> As of October 2013. Mosaic (2013)

Through 2009, the voluntary market exceeded or nearly equaled the compliance market for new renewables (Figure 1). However, the compliance market increased dramatically in 2010 because many states set significant targets for 2010.<sup>3</sup> By 2015, compliance demand for new renewable energy due to existing state RPS policies is expected to be about 140 million megawatt-hour (MWh) (Barbose 2013).



**Figure 1. Comparison of compliance and voluntary markets for new renewable energy, 2005–2012**

<sup>a</sup> Voluntary sales for 2011 are estimated as the mid-point of 2010 and 2012 sales.

Estimates of compliance market demand assume that RPS targets are fully met.

Source: Barbose (2013)

The data on voluntary market trends presented in this report were formerly reported in *Market Brief: Status of the Voluntary Renewable Energy Certificate Market (2011 Data)* (Heeter et al. 2012) and *Status and Trends in U.S. Compliance and Voluntary Renewable Energy Certificate Markets (2010 Data)* (Heeter and Bird 2011).<sup>4</sup> Voluntary market data are based on figures provided to the National Renewable Energy Laboratory (NREL) by utilities and independent renewable energy marketers. NREL also supplements this data with information from the Energy Information Administration (EIA), REC certifiers, REC tracking systems, and press releases describing large voluntary green power

<sup>3</sup> Although RPS policies generally allow pre-existing renewable energy generation sources (i.e., those installed *before* the adoption of the RPS) to meet their targets, the estimates presented here reflect only the amount of new renewable energy generation that these policies are expected to stimulate. These figures are compared to the voluntary market estimates because voluntary markets primarily support generation from new renewable energy projects (i.e., those installed *after* voluntary green power markets were established). Estimates of compliance market demand assume that RPS targets are fully met.

<sup>4</sup> Voluntary market data from previous years are captured in earlier versions of this report, including Heeter et al. (2012), Heeter and Bird (2011), Bird and Sumner (2010), Bird et al. (2009), and Bird et al. (2008).

purchases. Because data cannot be obtained from all market participants, the estimates presented here likely underestimate the market size. Because obtaining data on competitive markets is particularly challenging due to market sensitivity and rapid changes in offerings, estimates of the competitive market are more uncertain.

This report documents REC activities and trends in the United States, presenting data and analysis on voluntary market sales and customer participation, products and premiums, green pricing marketing, and administrative expenses. The report also details REC tracking systems, REC pricing in voluntary and compliance markets, community and crowd-funded solar, large consumer interest in voluntary options, and lessons from successful green pricing programs.

## 2 Voluntary Green Power Market

Voluntary consumer purchases of renewable energy represent a market support mechanism for renewable energy development. In the early 1990s, a small number of U.S. utilities began offering “green power” options to their customers. Since then, these products have become more prevalent, offered by traditional utilities and renewable energy marketers operating in states that have introduced competition into their retail electricity markets or offering RECs online. Today, more than half of all U.S. electricity customers have an option to purchase some type of green power product directly from a retail electricity provider, while all consumers have the option to purchase RECs.

### 2.1 Voluntary Market Sales

Overall, retail sales of renewable energy in voluntary green power markets exceeded 48 million MWh and represented approximately 1.3% of total U.S. electricity sales in 2012.<sup>5</sup> Based on the sales data we present in this report, we estimate the market value of green power sales (the above-market cost of the green power) in 2012 to be between \$208 million and \$366 million.<sup>6</sup>

Green power sales (in megawatt-hours) increased by 37% between 2010 and 2012, with a compound annual growth rate of 26% since 2006 (see Table 2 and Figure 2). A market estimate for 2011 was not made, thus, data here are presented as changes between 2010 and 2012 or as compound annual growth rates between 2010 and 2012. The unbundled REC markets represent 64% of all green power sales.<sup>7</sup> The unbundled REC market rebounded strongly in 2012 from 2010, after growing only 6% from 2009 to 2010. The competitive market sector growth has slowed, likely due to slow growth in Texas as a result of increased RPS retirements in that state. Annual growth rates in the utility green pricing sector continued to decline in 2012.

---

<sup>5</sup> U.S. electricity sales totaled 3,750 million MWh in 2011 (EIA 2013). The remaining renewable energy generation is rate-based by utilities or used to meet RPS policies.

<sup>6</sup> Estimates of the above-market value of green power sales are determined by multiplying green power sales in megawatt-hours in three subsectors (utility green pricing programs, residential competitive markets, and nonresidential competitive and REC market) by a low and high estimate of prices in each of the sectors.

<sup>7</sup> The REC sales figures reflect sales to end-use customers separate from electricity. RECs bundled with electricity and sold to end-use customers through utility green pricing programs or in competitive electricity markets are counted in other categories.

**Table 2. Estimated Annual Voluntary Sales (Millions of MWh) by Market Sector, 2006–2012<sup>a</sup>**

| <b>Market Sector</b>                     | <b>2006</b>            | <b>2007</b> | <b>2008</b>             | <b>2009</b>             | <b>2010</b> | <b>2012</b>            |
|--|------------------------|-------------|-------------------------|-------------------------|-------------|------------------------|
| <b>Utility Green Pricing</b>             | <b>3.4</b>             | <b>4.2</b>  | <b>4.8</b>              | <b>5.2</b>              | <b>5.4</b>  | <b>6.0</b>             |
| % Change from previous year              | 39%                    | 23%         | 15%                     | 7%                      | 5%          | 5% <sup>f</sup>        |
| % Nonresidential                         | 38%                    | 38%         | 45%                     | 45%                     | 46%         | 48%                    |
| <b>Competitive Markets</b>               | <b>1.7<sup>b</sup></b> | <b>3.2</b>  | <b>5.3<sup>c</sup></b>  | <b>8.3<sup>c</sup></b>  | <b>10.4</b> | <b>11.6</b>            |
| % Change from previous year              | -20% <sup>d</sup>      | 88%         | 64% <sup>c</sup>        | 56% <sup>c</sup>        | 25%         | 6% <sup>f</sup>        |
| % Nonresidential                         | 41%                    | 44%         | 32%                     | 40%                     | 35%         | 38%                    |
| <b>Unbundled REC Markets<sup>e</sup></b> | <b>6.8</b>             | <b>10.6</b> | <b>15.6</b>             | <b>18.7</b>             | <b>19.8</b> | <b>31.0</b>            |
| % Change from previous year              | 75%                    | 55%         | 49%                     | 20%                     | 6%          | 25% <sup>f</sup>       |
| % Nonresidential                         | 99%                    | 98%         | 99%                     | 99%                     | 99.8%       | 98%                    |
| <b>Retail Total</b>                      | <b>11.9</b>            | <b>18.0</b> | <b>25.7<sup>c</sup></b> | <b>32.2<sup>c</sup></b> | <b>35.6</b> | <b>48.6</b>            |
| % Change from previous year              | <b>40%</b>             | <b>51%</b>  | <b>43%<sup>c</sup></b>  | <b>25%<sup>c</sup></b>  | <b>11%</b>  | <b>17%<sup>f</sup></b> |
| % Nonresidential                         | <b>73%</b>             | <b>75%</b>  | <b>75%</b>              | <b>76%</b>              | <b>73%</b>  | <b>78%</b>             |

<sup>a</sup> Includes sales of new and existing renewable energy; totals and growth rates may not compute due to rounding.

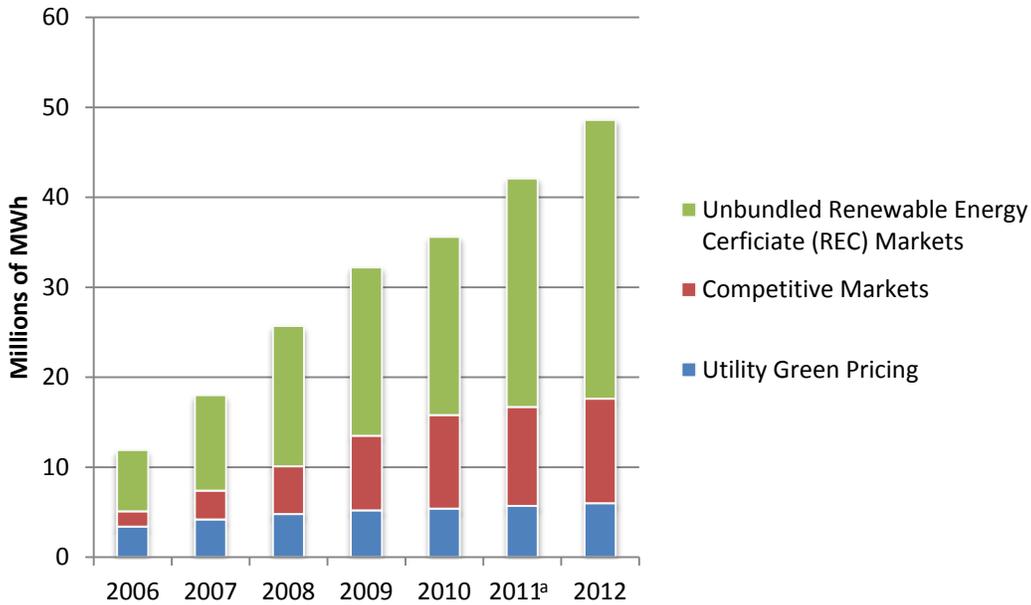
<sup>b</sup> Sales figures for 2006 may be underestimated because of data gaps.

<sup>c</sup> Competitive market sales for 2008 and 2009 were revised upward in this report to reflect data on green power markets in Texas published by the Texas public utility commission (PUC) in 2010 and 2011. For historical reports, see <https://www.texasrenewables.com/reports.asp> (Accessed October 14, 2013).

<sup>d</sup> 2006 number is likely underestimated because of data gaps.

<sup>e</sup> Includes only RECs sold to end-use customers separate from electricity (unbundled)

<sup>f</sup> Compound annual growth rate for 2010–2012; Changes from 2010 to 2012 were 11% for utility green pricing, 12% for competitive markets, 56% for unbundled REC markets, and 37% total.



**Figure 2. Estimated annual voluntary sales by market sector, 2006–2012**

<sup>a</sup> Voluntary sales for 2011 are estimated as the mid-point of 2010 and 2012 sales.

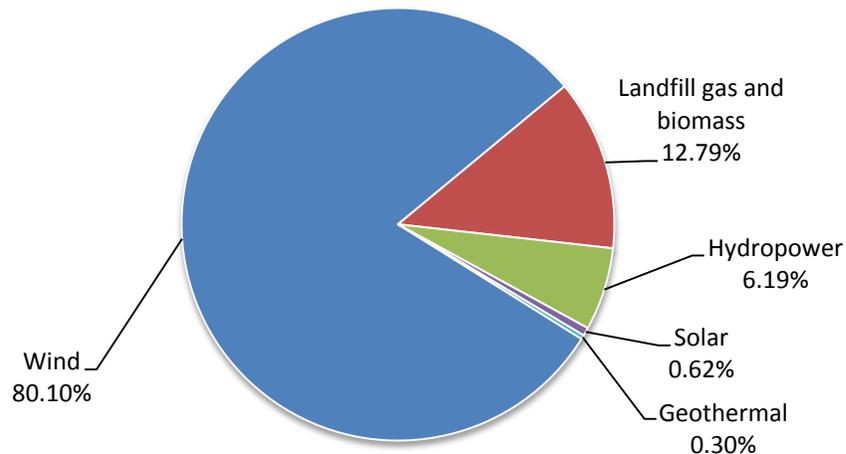
Utility green power and competitive market sales are predominant in certain states.<sup>8</sup> State data on utility and competitive market sales for 2011 are publically available from the EIA (Figure 3). EIA collects data directly from utilities and marketers as part of its Form 861; however, it should be noted that because not all competitive retailers report to EIA, these data underestimate sales, particularly in states with competitive retail markets.<sup>9</sup> The top states in terms of total sales include Texas, Oregon, New York, California, and Washington.

<sup>8</sup> Data on the geographic location of purchasers of unbundled RECs is not available from EIA.

<sup>9</sup> According to EIA, Form EIA-861 is completed by “electric utilities, wholesale power marketers (registered with the Federal Energy Regulatory Commission), energy service providers (registered with the States), and electric power producers. Responses are collected at the business level (not at the holding company level).” (EIA 2011a).



In terms of resources used, wind energy represented 80.1% of the total green power sales reported here, followed by biomass energy sources, including landfill gas (12.8%), hydropower (primarily low impact or small hydropower, 6.2%), solar (0.6%), and geothermal (0.3%) (Figure 4). Solar surpassed geothermal in 2012 and provided about 2% of the supply for utility green pricing programs.



**Figure 4. Estimated green power sales by renewable energy source, 2012**

### 2.1.1 Utility Green Pricing Sales

Utility green pricing sales continue to exhibit some growth, but growth has slowed in recent years. Collectively, utilities in regulated electricity markets sold about 6.0 million MWh of green power to customers in 2010 (Table 2). Green pricing program sales to all customer classes grew by a compound annual growth rate of 5% between 2010 and 2012, exhibiting growth that was similar to what was seen between 2009 and 2010 and which was markedly slower than growth from previous years, when rates ranged from 15% to 39% (Table 2). While some programs continue to grow robustly, the slower growth in this sector may be a result of many factors, such as the decline in new utility program development, decline in the economy, decreased emphasis on marketing programs, switching by nonresidential participants from utility green pricing to unbundled REC purchasing, or increased focus by nonresidential participants on on-site projects.

In utility green pricing programs, the average residential purchase in 2012—approximately 5,800 kilowatt-hours per year (kWh/year)—surpassed the high seen in 2008 of approximately 5,500 kWh/year, increasing about 7% from 2010. The average nonresidential purchase increased nearly 60% from 2010, rising to about 227,000 kWh/year in 2012.

In 2012, green pricing sales represented a small proportion of a utility company’s overall energy sales. On average, renewable energy sold through green pricing programs in 2012 represented 1.2% of total utility electricity sales of the utilities offering green pricing

programs (on a megawatt-hour basis). Top performing programs saw rates ranging from 2.8% to 23.9%. Due to a large nonresidential purchase, one small utility reported that 23.9% of its total retail electricity sales were green power sales (see Appendix C).

In 2012, utility green power supply typically came from within a utility’s region (81%) (Table 3).<sup>10</sup> About half of utility procurement (56%) came from unbundled RECs, in contracts of fewer than five years (Table 4). The second largest supply came from RECs bundled with electricity (40%), of which the vast majority was contracted for 11 or more years (92%). Smaller portions of utility green power supply came from systems owned by the utility (3%) or was purchased from utility customers (e.g., from on-site solar systems) (1%).

**Table 3. Location of Utility Green Power Supply, 2012**

| Within Service Territory | Within State | Within Region |
|--------------------------|--------------|---------------|
| 24%                      | 53%          | 81%           |

**Table 4. Contract Length by Type of Procurement, 2012**

| Contract Length              | Unbundled RECs | RECs Bundled with Electricity | Owned by Utility | RECs Produced by Utility Consumers |
|------------------------------|----------------|-------------------------------|------------------|------------------------------------|
| ≤1 year                      | 39.30%         | 0%                            | 0%               | 0%                                 |
| 2–5 years                    | 43.20%         | 0%                            | 0%               | 41%                                |
| 6–10 years                   | 0.20%          | 8%                            | 1%               | 45%                                |
| 11+ Years                    | 0.30%          | 92%                           | 99%              | 15%                                |
| Percent of total procurement | 56%            | 40%                           | 3%               | 1%                                 |

### 2.1.2 REC and Competitive Market Sales

In REC markets and competitive green power markets (i.e., in states with retail competition), an estimated 42.6 million MWh of renewable energy was sold to retail customers in 2012 (Table 2). Overall, 2012 was again a mixed year for both REC marketers and competitive marketers; some saw large gains in sales, while others saw sales remain flat or even down compared to 2010.

In competitive electricity markets, an estimated 11.6 million MWh were sold as a bundled green power product in competitive electricity markets—a 12% increase from 2010. Due to the challenges of obtaining data from competitive marketers and the lack of current data on the Texas market, which has seen a dramatic increase in the number of

<sup>10</sup> Utilities were asked to self-define region. Typically the region was considered to be the regional transmission organization or independent system operator boundary, or in the Western U.S., the Western Electricity Coordinating Council.

companies offering renewable energy products in recent years, the sales figures for the competitive market are underestimated.

In previous years, voluntary retirements in the Electric Reliability Council of Texas (ERCOT) surpassed compliance retirements, and they were increasing year to year. However, in 2012, voluntary retirements in ERCOT declined from 15.3 million MWh to 9.5 million MWh.<sup>11</sup>

Retail REC sales (unbundled RECs) increased by 56%, reaching 31 million MWh in 2012. This represents a substantially greater growth than in 2010, which saw only 6% annual growth, compared to a compound annual growth rate for 2010–2012 of 25% (Table 2). The Environmental Protection Agency’s Green Power Partnership, which tracks how participants purchase renewable energy, saw those purchases increase by 17% between 2011 and 2012. Unbundled REC purchases account for 76% of all purchases made by partners in the Green Power Partnership.

### **2.1.3 Residential and Nonresidential Customer Sales**

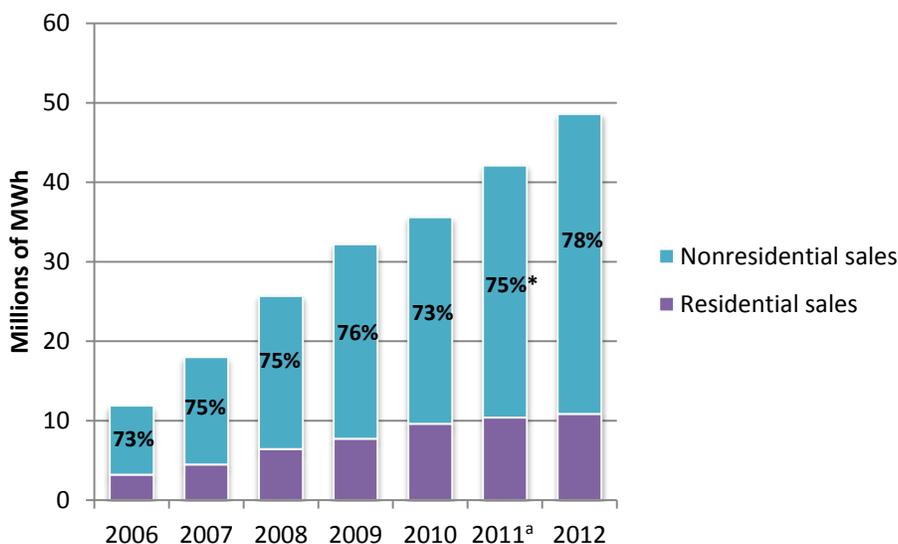
Sales to nonresidential customers continued to outpace those to residential customers, with 78% of all sales by volume to the nonresidential sector in 2012, slightly greater than in previous years (Table 2). Figure 5 delineates green power sales by customer segment. Residential customers played a larger role in green pricing programs and competitive markets than in REC markets in 2012. Residential customers accounted for 52% of green pricing sales and 62% of competitive market sales but only 2% of unbundled REC sales (Table 2).

Nearly all unbundled REC sales on a megawatt-hour basis were to business and institutional customers. Generally, nonresidential customers find REC-only products attractive because of their flexibility and the greater potential for cost savings they offer because they can be sourced from renewable energy projects in more favorable resource locations; also, transaction costs may be lower because the marketer and purchaser don’t have to negotiate electricity supply. For commercial and institutional customers that operate facilities in multiple locations across the country, RECs may also provide a more efficient green power sourcing solution than working with utilities in each individual utility territory.<sup>12</sup> On the other hand, residential customers may not be aware that RECs are available or may not understand what they convey.

---

<sup>11</sup> A retirement occurs when a REC is used for voluntary purposes and will no longer be traded or claimed. This issue is discussed further in Section 2.3.

<sup>12</sup> For example, the EPA Green Power Partnership reports that the majority of its Top 25 partners purchase RECs. For more information, see [www.epa.gov/greenpower](http://www.epa.gov/greenpower).



**Figure 5. Residential and nonresidential voluntary sales, 2006–2012**

<sup>a</sup> Voluntary sales in 2011 are estimated as the mid-point of 2010 and 2012 sales.

### 2.1.4 Capacity Equivalent of Green Power Sales

At the end of 2012, megawatt-hour sales of renewable energy in voluntary markets represented a generating capacity equivalent of approximately 17,300 MW, with nearly all of that capacity coming from new renewable energy sources (see Table 5).<sup>13,14</sup> Since 2007, when total renewable capacity supplying the green power market was 5,100 MW, the amount of renewable energy capacity serving green power markets increased more than three-fold.

<sup>13</sup> Capacity estimates are calculated based on reported green power kilowatt-hour sales, assuming capacity factors for each renewable resource type. For wind, a capacity factor of 26% was assumed, 85% for landfill gas, 83% for biomass, 65% for geothermal, 42% for hydroelectric, and 14% for solar electric. These figures are based on industry data and the average capacity factors of operating plants.

<sup>14</sup> “New” renewable energy capacity is defined here as capacity that was sourced from renewable energy systems that were built or repowered after January 1, 1997.

**Table 5. Estimated Cumulative Renewable Energy Capacity (MW) Supplying Green Power Markets, 2008–2012**

| Market                                 | 2009           |              | 2010           |              | 2012           |               |
|--|----------------|--------------|----------------|--------------|----------------|---------------|
|  | Total Capacity | New Capacity | Total Capacity | New Capacity | Total Capacity | New Capacity  |
| Utility Green Pricing                  | 1,700          | 1,600        | 1,700          | 1,600        | 2,400          | 2,200         |
| Competitive Markets and Unbundled RECs | 7,700          | 6,400        | 9,400          | 6,800        | 14,900         | 14,900        |
| <b>Total</b>                           | <b>9,400</b>   | <b>8,000</b> | <b>11,200</b>  | <b>9,400</b> | <b>17,300</b>  | <b>17,200</b> |

“New” renewable energy capacity is a subset of total renewable energy capacity supplying green power markets. Totals may not sum due to rounding.

## 2.2 Voluntary Market Customer Participation

In 2012, nearly 1.9 million electricity customers nationwide purchased green power products through regulated utility companies, from green power marketers in a competitive-market setting, or in the form of RECs (Table 6).<sup>15</sup> This represents nearly flat growth from 2010, though growth varied by sector. Participation in utility green pricing programs and competitive markets was essentially flat, while REC market participation nearly doubled. Utility green pricing programs remained nearly flat over all, but saw a 13% decline in nonresidential participation.

<sup>15</sup> It is important to note that there is greater uncertainty in our customer estimates for competitive and REC markets because of data limitations. For more detailed estimates by state for 2009 and 2010, see data from EIA 2011 in Appendix B. Generally, our estimates are consistent with the EIA estimates when adjusted for customers in Ohio who participated in community aggregations in 2005 and earlier. We excluded these customers from our estimates because they purchase products with very low renewable energy content (1%–2%).

**Table 6. Estimated Cumulative Green Power Customers by Market Segment, 2006–2012**

|                              | <b>2006</b>      | <b>2007</b>        | <b>2008</b>      | <b>2009</b>        | <b>2010</b>        | <b>2012</b>        |
|------------------------------|------------------|--------------------|------------------|--------------------|--------------------|--------------------|
| <b>Utility Green Pricing</b> | <b>490,000</b>   | <b>550,000</b>     | <b>550,000</b>   | <b>550,000</b>     | <b>570,000</b>     | <b>570,000</b>     |
| Residential                  | 470,800          | 526,700            | 519,700          | 526,300            | 544,700            | 549,600            |
| Nonresidential               | 15,500           | 20,200             | 26,100           | 26,000             | 22,900             | 17,200             |
| % Residential Growth         | 23%              | 12%                | -1%              | 1%                 | 4%                 | 0.4% <sup>a</sup>  |
| % Nonresidential Growth      | 37%              | 30%                | 29%              | -1%                | -12%               | -13% <sup>a</sup>  |
| <b>Competitive Market</b>    | <b>~ 210,000</b> | <b>300,000</b>     | <b>390,000</b>   | <b>830,000</b>     | <b>~ 1,200,000</b> | <b>~ 1,200,000</b> |
| <b>Voluntary REC Market</b>  | <b>~ 10,000</b>  | <b>&gt; 10,000</b> | <b>30,000</b>    | <b>&lt; 20,000</b> | <b>&gt; 60,000</b> | <b>~110,000</b>    |
| <b>Retail Total</b>          | <b>~ 710,000</b> | <b>~ 860,000</b>   | <b>~ 970,000</b> | <b>~ 1,400,000</b> | <b>~ 1,830,000</b> | <b>~1,870,000</b>  |
| % Change                     | ~ 22%            | ~ 21%              | ~ 13%            | ~ 44%              | ~ 25%              | ~2%                |

In some cases, estimates have been revised from those reported in previous NREL reports as updated data have become available. Totals may not add due to rounding.

<sup>a</sup> Compound annual growth rate for 2010–2012

### **2.2.1 Utility Green Pricing Participation**

The number of green pricing customers was nearly flat between 2010 and 2012 (Table 6), with residential customers increasing slightly (0.4%) and nonresidential customers declining by 13%.<sup>16</sup> As in the past, a small number of green pricing programs account for the majority of customers, with just 10 utilities accounting for 76% of all participants (see Appendix C).<sup>17</sup> From 2010 to 2012, residential participation increased by less than 1%, while nonresidential participation declined by nearly 25%. Nonresidential growth has been slowing in recent years, and absolute numbers of nonresidential participants has continued to decline since 2008.

At the end of 2012, the average participation rate in utility green pricing programs among eligible utility customers was 2.8% with a median of 1.5%. These industry-wide rates have shown little change in recent years. Participation rates in top-performing programs have remained relatively unchanged since 2007, though they have improved compared to the ranges in early years: Top-performing participation rates ranging from 6.5% to 18.2% in 2012, compared to a range of 3.9% to 11.1% in 2003.

For 2012, utilities reported that an average of 8.5% and a median of 7.2% of customers dropped out of green pricing programs. These figures represent an increase from 2010 when utilities reported an average of 7.0% and a median of 4.7%, but the figures are consistent with 2009 when utilities reported an average of 7.8% and a median of 6.3%.

### **2.2.2 Competitive Market Participation**

In the competitive green power market, participation was essentially flat between 2010 and 2012. In 2012, approximately 1.2 million customers (primarily residential customers) participated. Because obtaining data about the competitive market is particularly challenging, these figures likely underestimate the number of participants in competitive market programs.

The Texas market saw dramatic growth in customer numbers in 2009 and 2010, but since then, growth has dropped off. The largest gains in 2009 and 2010 were due to one marketer. According to the most recent published EIA data (for 2011), the number of green power customers in Texas increased to 465,000 in 2011 from 412,000 in 2010 and 316,000 in 2009 (see Appendix B).<sup>18</sup>

---

<sup>16</sup> NREL attempted to contact all utility green pricing programs and received data directly from approximately 40% of programs in 2012, including all major programs. Supplemental data from EIA were used for the remaining programs, which are smaller and do not have a large impact on overall participant numbers. When possible, other sources and previously reported data were used to estimate data for gaps.

<sup>17</sup> NREL issues five different Top 10 lists based on total sales of renewable energy to program participants, total number of customer participants, customer participation rates, green power sales as a fraction of total utility sales, and the premium charged to support new renewable energy development. These lists can be found in Appendix C or at <http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=3>.

<sup>18</sup> The EIA figures include customers in both utility green pricing programs and competitive market programs, but they do not include all competitive retailers; therefore, these estimates underestimate the total number of customers but serve to show at a minimum the level of growth in Texas.

While the number of green power purchasers has expanded during the past few years in markets with retail competition, participation has been less consistent over time, as some markets have grown and then contracted. In the last few years, growth in competitive markets has been concentrated in Texas and a few programs in the Northeast. Data from EIA show that Massachusetts, Oregon and Maryland gained more than 3,000 customers in 2011 than they did in 2010 (see Appendix B).

Data from EIA also show that participation in states varies greatly. According to 2011 EIA data, more than 4% of customers in Texas are green power customers.<sup>19</sup> Several other competitive market states (Connecticut, New York, and Vermont) have seen participation greater than 1%. Over time, participation has generally been more volatile in competitive markets than in traditionally regulated markets.

### **2.2.3 Unbundled Voluntary REC Market Participation**

The number of REC-only buyers nearly doubled between 2010 and 2012, after seeing large growth in 2010. In 2012, nearly 110,000 customers were purchasing unbundled RECs, an increase from more than 60,000 customers in 2010. In 2012, approximately 80% of the unbundled customers were residential customers. The large increase in residential unbundled REC customers in 2010 and 2012 could be a result of REC marketers more specifically targeting the residential sector. Often residential customers may not be aware of the option to purchase RECs via the Internet. The Natural Marketing Institute found that in 2010 only 14% of the general population was aware they could buy renewable power from their electric or another company, even though all consumers have the option to buy RECs (NMI 2011).

While most REC buyers are residential customers, the majority of REC sales on a megawatt-hour basis are made to nonresidential customers due to the much larger purchase sizes. As a result of large nonresidential REC purchases, REC sales represent 64% of total green power megawatt-hour sales (Table 2) and have grown dramatically in recent years (see Appendix A for a list of top green power purchasers).

## **2.3 Voluntary Market Products and Premiums**

### **2.3.1 Utility Green Pricing Products and Premiums**

Typically, green pricing programs are structured so that customers can either purchase green power for a certain percentage of their electricity use (often called “percent-of-use products”) or in discrete amounts or blocks at a fixed price (“block products”), such as a 100-kWh block. Most utilities offer block products but may also allow customers to buy green power for their entire monthly electricity use. Utilities that offer percent-of-use products generally allow residential customers to elect to purchase 25%, 50%, or 100% of their electricity use as renewable energy, while a few offer fractions as small as 10%. Under these types of programs, larger purchasers, such as businesses, can often purchase green power for some fraction of their electricity use as well.

---

<sup>19</sup> EIA data also include participant in utility green pricing programs.

More recently, the concept of community solar has emerged. In community solar programs, customers purchase a share of a community solar system. In return, they obtain a proportionate share of the system output, which is credited to them on their utility bills. These programs are offered by utilities or third parties operating in conjunction with utilities. Community solar programs differ in terms of the upfront cost and return payment received by participants. One program, the Holy Cross Energy solar project, sells upfront shares for \$3.15 per watt (W) and credits participants at a rate of \$0.11/kWh for producing their shares.<sup>20</sup> Community solar programs are addressed in depth in Section 5.

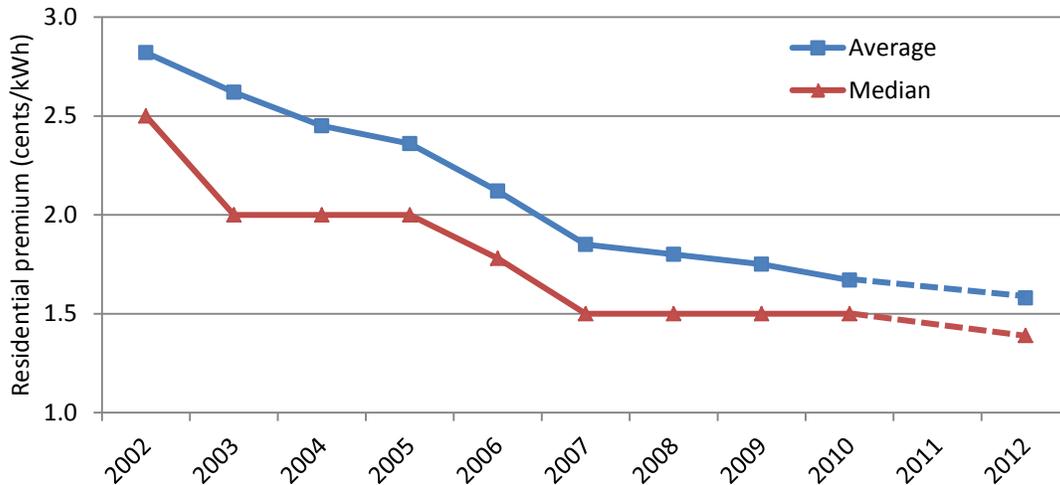
In 2012, the price of green power for residential customers in utility programs ranged from 0.87¢/kWh below standard electricity rates to 4.61¢/kWh above standard electricity rates, with an average premium of 1.58¢/kWh and a median premium of 1.40¢/kWh. These premiums have been adjusted to account for any fuel-cost exemptions granted to green power program participants.<sup>21</sup> In 2012, the 10 utility programs with the lowest premiums for energy derived from new renewable sources had premiums ranging from 0.87¢/kWh (a savings) to 0.86¢/kWh. On average, residential consumers spent about \$6.97 per month above standard electricity rates for green power through utility programs, which is slightly higher than expenditures in previous years of around \$6.30 (2010) and \$5.40 (2009).

Since 2002, the average price premium has dropped at a compound annual rate of 6% (see Figure 6). Some of this reduction can be attributed to lower market costs for renewable energy supplies or increased competitiveness with conventional generation sources. The competitiveness of wind and other renewables with conventional generation, as well as regional demand from state renewable energy standards, will affect premiums in coming years.

---

<sup>20</sup> For more information, see “Holy Cross Energy Launches 80 kW Community Solar Program” at [http://apps3.eere.energy.gov/greenpower/news/news\\_template.shtml?id=1564](http://apps3.eere.energy.gov/greenpower/news/news_template.shtml?id=1564) (accessed October 3, 2011).

<sup>21</sup> For example, a small number of utilities exempt green pricing customers from monthly or periodic fuel charges imposed to pay higher-than-expected fossil fuel costs. For a detailed discussion of this topic, see Bird et al. (2008).



**Figure 6. Trends in utility green pricing premiums, 2002–2012**

### 2.3.2 Unbundled REC and Competitive Market Products and Pricing

Green power products offered in electricity markets with retail competition tend to differ from those offered by utilities in regulated markets, as they are more likely to be sourced from RECs because suppliers may be less able to enter into long-term contracts with generators. In addition, price premiums may fluctuate more frequently.

Initially, green power marketers in competitive markets were often forced to offer existing renewable energy sources because of a lack of new renewable energy supplies, but most marketers now offer primarily new renewable energy. This movement toward increased reliance on new sources has also been encouraged by green power product certification programs, which set standards for product quality and have required increasing amounts of new renewable energy. Both Green-e Energy<sup>22</sup> and the EPA Green Power Partnership<sup>23</sup> currently operate on a 15-year rolling window for defining a “new” facility, meaning that projects must have come online within 15 years prior to the sale of the green power in order to be classified as new.

The price premium charged for competitive-market products depends on several factors, including the price of default service and the cost of renewable energy generation available in the regional market. In recent years, some marketers (e.g., in Texas) have charged prices close to or even below the prevailing cost for system power; others have offered fixed-price products, providing customers with protection against increasing prices for a specified period of time—usually one year.

Competitively marketed green power products generally carry a price premium between 1¢/kWh and 2.5¢/kWh for residential and small commercial customers, although

<sup>22</sup> Administered by the Center for Resource Solutions, the Green-e Energy program certifies retail and wholesale green power products that meet its environmental standards, product content, and marketing standards. For details on the Green-e Energy National Standard, see the Green-e website at [green-e.org](http://green-e.org).

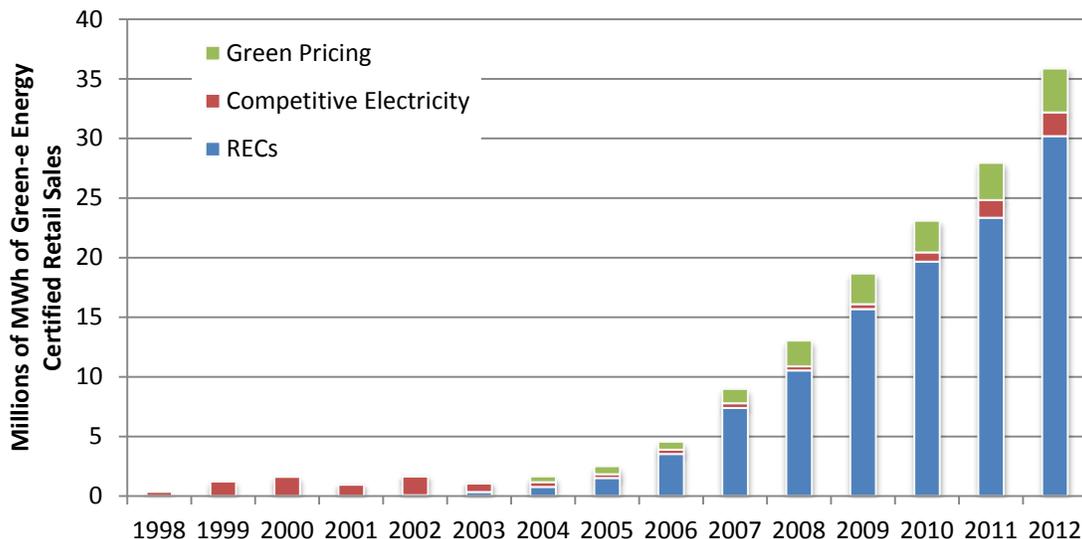
<sup>23</sup> See the EPA’s Green Power website at [epa.gov/greenpower](http://epa.gov/greenpower).

offerings have ranged from small discounts to a premium of about 10¢/kWh in recent years. For utility/marketer programs offered in states with retail competition, the average price premium for green power was about 2.3¢/kWh in 2012. In addition, price premiums can change frequently with changes in market conditions. Higher-priced products often contain a larger fraction of new renewable energy content or resources that are more desirable to consumers, such as new wind and solar.

Retail prices charged for REC products typically range from about 0.5¢/kWh to 2.5¢/kWh for residential and small commercial customers. In most cases, large commercial customers are able to negotiate lower prices. Nearly all REC products are sourced from “new” renewable energy generation projects as a result of product certification requirements.

Because RECs are generally not subject to the same regulatory scrutiny as electricity and mandatory renewable requirements, REC buyers often seek certification out of concerns about double counting and to ensure a level of oversight and auditing. Buyers may also be interested in using the Green-e Energy label in communication materials.

Figure 7 shows Green-e Energy certified retail transactions from 1998 to 2012. Green-e Energy certified 35.9 million MWh of retail transactions in 2012 (Terada 2013). This represents an increase of 29% from 2011.



**Figure 7. Total retail sales of Green-e Energy certified renewable energy, 1998–2012**

Source: Terada 2013

The Green-e Energy program also certifies wholesale renewable energy transactions, which totaled 15.7 million MWh in 2012. It is important to note that 6.5 million MWh sold in certified wholesale transactions were resold in Green-e Energy certified retail transactions. The remaining 9.1 million MWh were sold in non-Green-e Energy certified transactions, most likely to utilities and electric service providers, power marketers, or

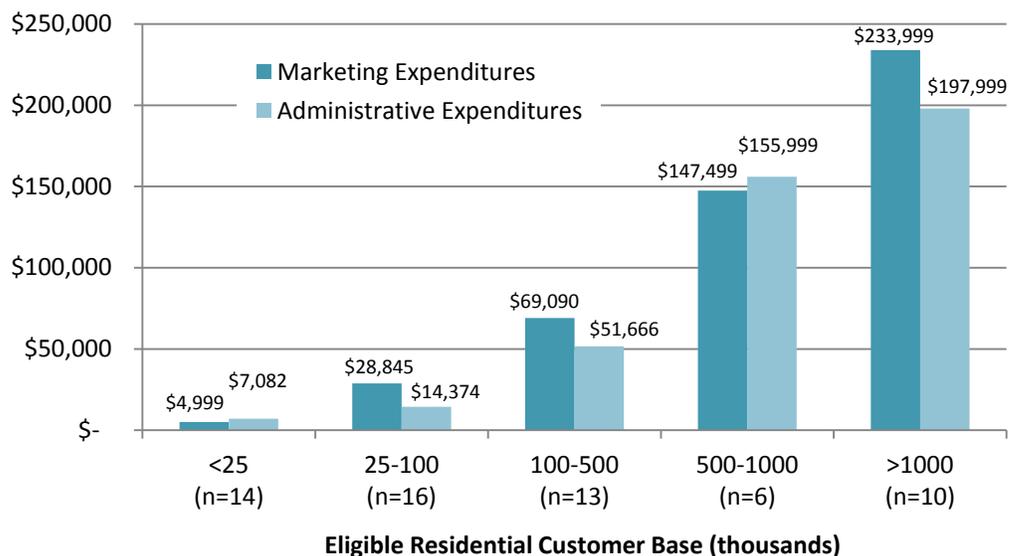
retail customers. In total, Green-e Energy certified 42.4 million MWh of unique transactions in 2012.

## 2.4 Green Pricing Marketing and Administrative Expenses

Retail product pricing typically reflects the costs involved in attracting and servicing retail customers to some degree, though data on marketing and administrative expenses are challenging to obtain. This section highlights marketing and administrative expenses for utility green pricing programs and examines their relationship to utility size, participation rate, and green power premium revenue. While these figures help illustrate trends in marketing and administrative expenses, each utility program will face unique circumstances when deciding how much to spend on marketing and administration. For a more detailed look at marketing and administrative expenses, see Friedman and Miller (2009).

Utilities in some cases are working with third parties to market their programs. In 2012, 33% of programs that reported to NREL indicated that they were working with a third party.

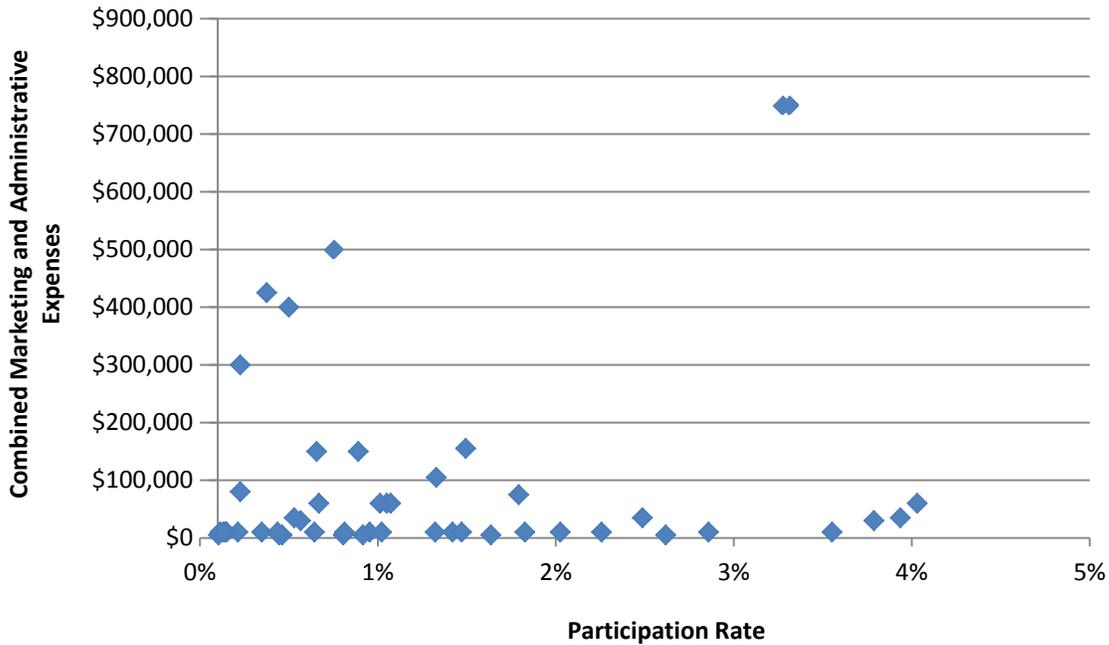
Marketing and administrative expenses increase with the size of the utility (measured as the number of eligible green power customers in their service territory) (Figure 8).



**Figure 8. Estimated average marketing and administrative expenses**

While Figure 8 shows that larger utilities spend more on marketing and administration, these increased expenses do not necessarily correlate to increased green power program participation. Large utilities may spend more on marketing in dollar terms because they have a larger territory to reach out to. Also, in some cases, for example, a new program operating in a large service territory may spend heavily on marketing and administration and see large increases in customer participation, but may not see large increases in the participation rate for a number of years. Figure 9 shows that a majority of surveyed utilities (59%) spent less than a combined \$50,000 on marketing and administration; yet,

the participation rate among these utilities varies from .03% to more than 5% (some data points suppressed to preserve confidentiality). The disconnection between participation and expenses is further highlighted by examining companies with less than 1% participation (52% of all companies surveyed); these companies had expenses ranging from \$4,999 to more than \$500,000,<sup>24</sup> yet had no significant difference in participation rate.



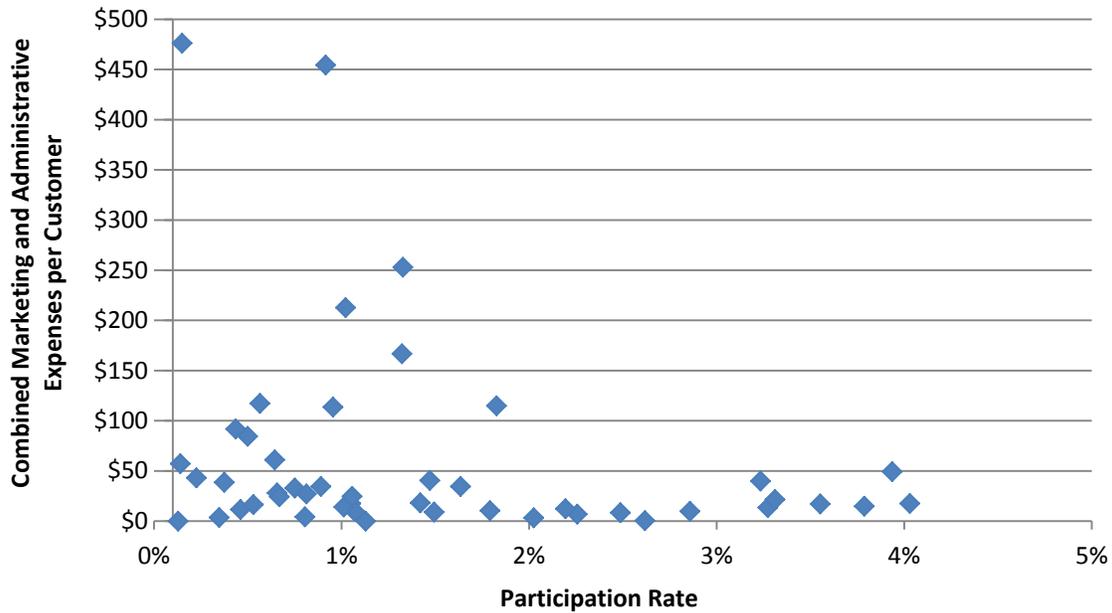
**Figure 9. Participation rate compared to marketing and administrative expenses**

Programs indicating \$500,000+ in their response for either marketing or administrative expenses are captured here as \$500,000.

Some data points were suppressed to preserve confidentiality.

Figure 10 shows the participation rate based on marketing and administrative expenses per green power customer. This allows participation rates to be compared with less weight placed on company size. As shown in Figure 7, total marketing and administrative expenses increase as the total customer base increases; however, Figure 10 shows that no trend has been established linking increased expenses per customer to increased participation rate.

<sup>24</sup> NREL’s questionnaire asked participants how much was spent on marketing expenses, and then separately, how much was spent on administrative expenses. Answer options for both questions were \$0; \$1-\$9,999; \$10,000-\$49,999; \$50,000-\$99,999; \$100,000-\$199,999; \$200,000-\$299,999; \$300,000-\$399,999; \$400,000-\$499,999; and \$500,000+. Because of the \$500,000+ option, it is not certain exactly what some participants spent, only that it is was greater than \$500,000.



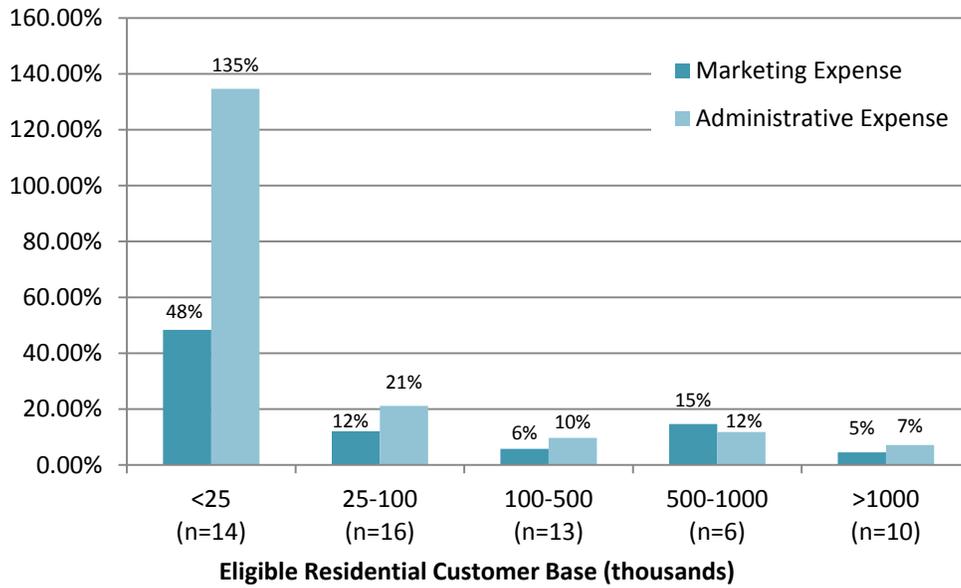
**Figure 10. Participation rate compared to marketing and administrative expenses per customer**

This figure excludes seven outlier data points. Those outliers show expenses per customer ranging between \$833 and \$2,500; all with participation rates of 1% or less.

Programs indicating \$500,000+ in their response for either marketing or administrative expenses are captured here as \$500,000.

Some data points were suppressed to preserve confidentiality.

Figure 11 shows marketing and administrative expenses as a percentage of green power premium revenues. Although it is among the most common metrics, expressing expenditures as a percentage of revenues is somewhat problematic, because it is easy to overlook the fact that a lower expenditure percentage may be as much a function of a relatively high premium and high program revenues (the denominator in the equation) as the marketing expenditure itself (the numerator in the equation) (Friedman and Miller 2009).



**Figure 11. Median marketing and administrative expenses as a percentage of green power premium revenue**

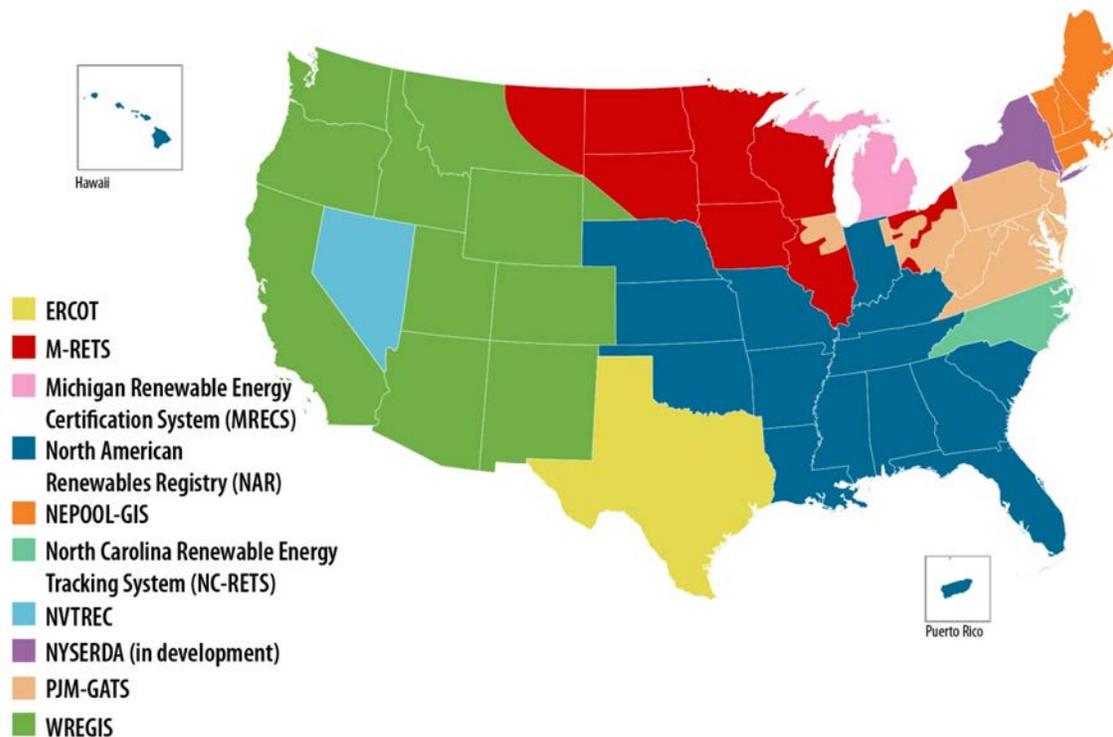
Percentages calculated based on green power premium, not total electricity rate.

### 3 REC Tracking Systems

States and others have created REC tracking systems to verify compliance with RPS targets. These electronic tracking systems ensure that RECs are only “retired” (used to meet compliance) once by assigning a unique serial number to each megawatt-hour of renewable energy generation, which constitutes a REC. The systems also track the attributes of RECs, such as the type of renewable energy facility (e.g., wind or biomass), the project location, and the generation date.

In compliance markets, tracking systems are used by obligated utilities and by public utility commissions (PUCs) that oversee compliance. Utilities use the systems to manage all or portions of their REC portfolios, transfer RECs to others, and ultimately to demonstrate compliance with the RPS by transferring RECs into retirement accounts. RECs deposited into retirement accounts can no longer be traded. PUCs use retirement accounts to verify the number of RECs a utility is using to comply with RPS requirements. Tracking systems are also used in voluntary markets, though their use is not as predominant as in compliance markets. The Green-e Energy certification program, a leading certifier and auditor of RECs in the voluntary market, allows green power suppliers to use tracking systems to simplify some parts of the Green-e audit process. In 2012, more than half of Green-e Energy sales used a REC tracking system (Terada 2013).

In the United States, there are currently nine different tracking systems. REC tracking systems in some cases follow the same boundaries as local regional transmission organizations or independent system operators (Figure 12).



**Figure 12. Renewable energy tracking systems in North America**

The North American Renewables Registry (NAR)<sup>25</sup> covers states and provinces not covered by an APX, Inc. tracking system.  
 Source: Updated from ETNNA 2011

The ability of tracking systems to transfer RECs in and out of their system (exporting or importing of RECs) has increased over the past few years (see Table 7). Transfer capability is important because some states allow RECs from other states to be used to meet state RPS targets. For example, in North Carolina, 25% of compliance can be met with out-of-state RECs (i.e., anywhere in the United States). REC import/export capability may also be important for the voluntary market. This additional functionality has been improved through bi-lateral agreements between tracking systems and in part due to the fact that one service provider, APX, Inc., developed most of the regional REC tracking systems.

<sup>25</sup> For more information, see the “Registries” Web page at <http://narecs.com/resources/registries.htm> (accessed September 18, 2013).

**Table 7. Export/Import Capability of REC Tracking Systems**

| <b>Exporting From</b> | <b>Exporting To</b>  |
|-----------------------|----------------------|
| NAR                   | NC-RETS <sup>a</sup> |
| NC-RETS               | NAR                  |
| NAR                   | MIRECS               |
| MIRECS                | NAR                  |
| M-RETS <sup>b</sup>   | NAR                  |
| M-RETS                | NC-RETS              |
| M-RETS                | MIRECS               |
| PJM-GATS <sup>c</sup> | MIRECS               |
| WREGIS <sup>d</sup>   | NAR                  |
| WREGIS                | NC-RETS              |
| ERCOT                 | NC-RETS              |

Source: NAR 2013

<sup>a</sup> North Carolina Renewable Energy Tracking System

<sup>b</sup> Midwest Renewable Energy Tracking System

<sup>c</sup> PJM-Generation Attribute Tracking System

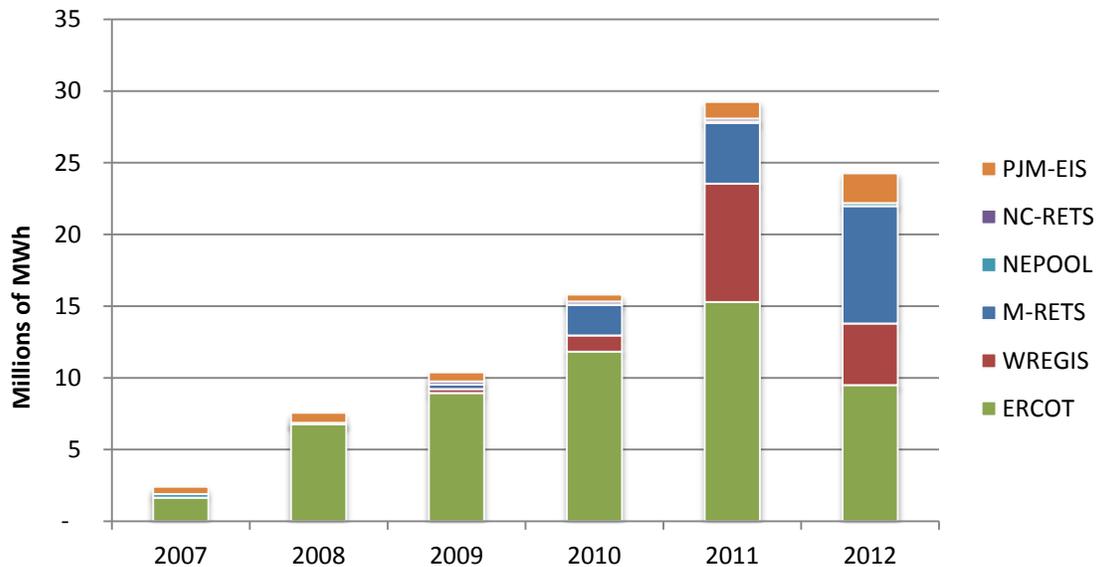
<sup>d</sup> Western Renewable Energy Generation Information System

Tracking systems can be important providers of public market information. They can provide information on the number of RECs retired in a given year. The Texas PUC has encouraged public access to REC market data by requiring ERCOT to report annually the aggregate quantity of RECs retired for voluntary and compliance purposes. In the current reporting year, confidentiality is ensured to account holders, which may be retiring compliance or voluntary RECs, but after one year, confidentiality is expired, and ERCOT documents how many RECs were retired by each account holder.<sup>26</sup>

PJM-EIS has developed a public report on voluntary retirements, and other tracking systems are publishing the retirements of Green-e Energy eligible (not necessarily retired) RECs.<sup>27</sup> It should be noted that data presented here only represent that a Green-e Energy eligible REC was retired; Green-e Energy eligible RECs may also be eligible to be retired to meet RPS compliance and ultimately retired for that purpose. Data from these sources show that retirements declined in 2012, primarily due to decreases in ERCOT and WREGIS (Figure 13).

<sup>26</sup> ERCOT's Annual Report on the Texas Renewable Energy Credit Trading Program can be found at [www.texasrenewables.com/reports.asp](http://www.texasrenewables.com/reports.asp).

<sup>27</sup> PJM-GATS public reports can be found at [pjm-eis.com/reports-and-news/public-reports.aspx](http://pjm-eis.com/reports-and-news/public-reports.aspx). In addition to voluntary retirements, PJM-EIS provides publicly available data on the RECs retired to meet RPS compliance in PJM states.

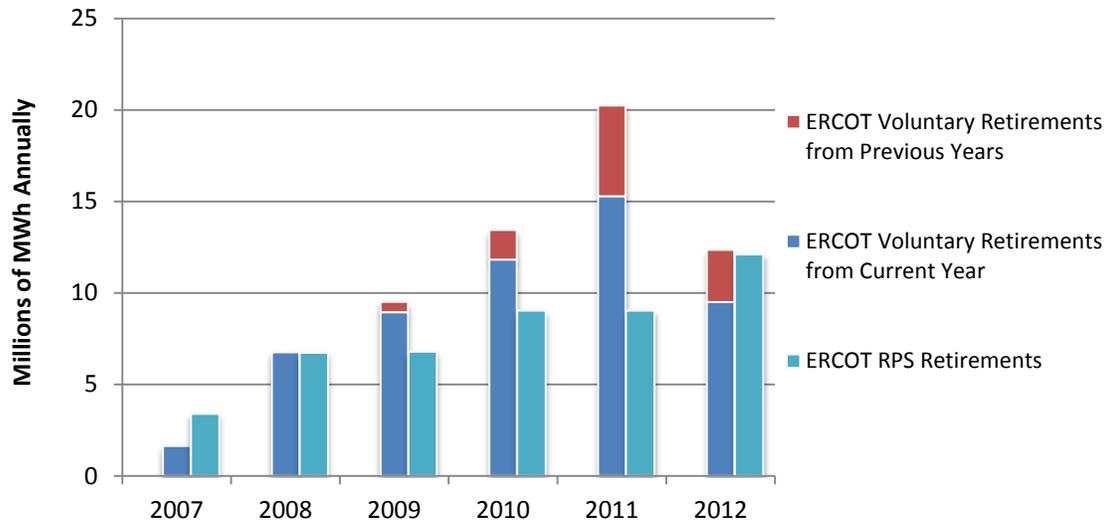


**Figure 13. Green-e eligible retirements in tracking systems**

In WREGIS, the increase in voluntary eligible retirements in 2011 and a subsequent decline in 2012 may have been due to utilities in Washington State increasing their compliance retirements; if generators were no longer going to be selling into the voluntary market, they may not have continued their Green-e registration, making the RECs generated from their projects no longer Green-e eligible (Coon 2013).

According to ERCOT, the decline in voluntary retirements in 2012 in ERCOT was due to increased compliance retirements.<sup>28</sup> The compliance retirement increased from 4,264 MW to 5,256 MW. The MW requirements are then translated to MWh targets through the use of a capacity conversion factor (32.2% in 2012). Thus, compliance REC retirements increased from about 9 million MWh to about 12 million MWh (Figure 14). Voluntary retirements fell from more than 15 million MWh to less than 10 million MWh, not including retirements from previous years.

<sup>28</sup> For more information, see “Renewable Energy Generation in Texas Continues to Grow, up 7 Percent from 2011” at [http://www.ercot.com/news/press\\_releases/show/26445](http://www.ercot.com/news/press_releases/show/26445) (accessed October 11, 2013).



**Figure 14. Compliance and voluntary retirements in ERCOT, 2007–2013**

## 4 REC Pricing in Voluntary and Compliance Markets

Pricing for voluntary RECs differs from compliance REC pricing and from pricing offered by utility green pricing programs. Unlike compliance RECs, which generally must be sourced from within some geographic region to be eligible for RPS compliance, voluntary RECs can be sourced either regionally or nationally.

This overview of wholesale REC prices presented in this section is based on indicative data available from brokers and third-party data providers. With a few exceptions, there is little price transparency in REC markets. Most transactions are conducted as bilateral contracts between parties, and prices are not reported. In addition, prices can vary widely by region. Therefore, data presented here are only indicative and should be used with caution.

In general, REC values depend on several factors, including the technology, the vintage (year in which it was generated), the volume purchased, program eligibility (e.g. Green-e Energy), the region in which the generator is located, and the market supply/demand balance. Natural gas prices can also affect the cost competitiveness of renewable energy generation, which is reflected in REC prices.

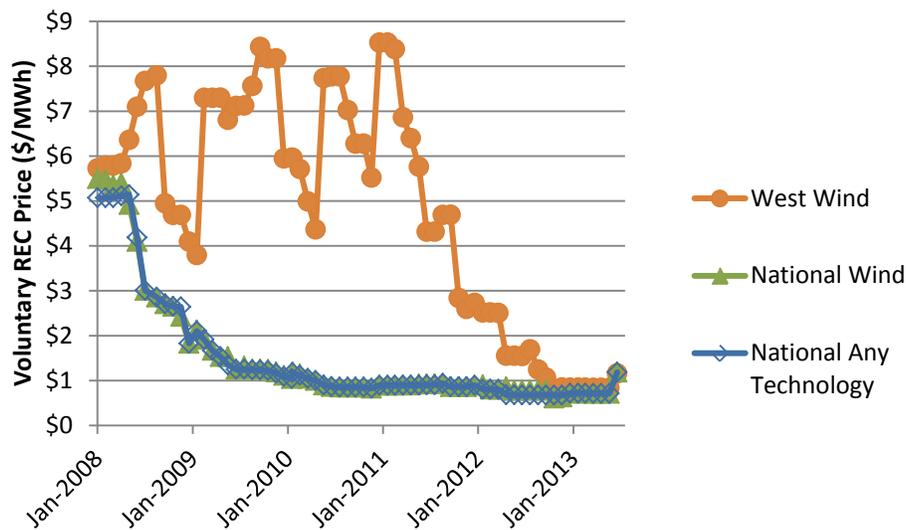


Figure 15. Voluntary REC prices, January 2008–July 2013

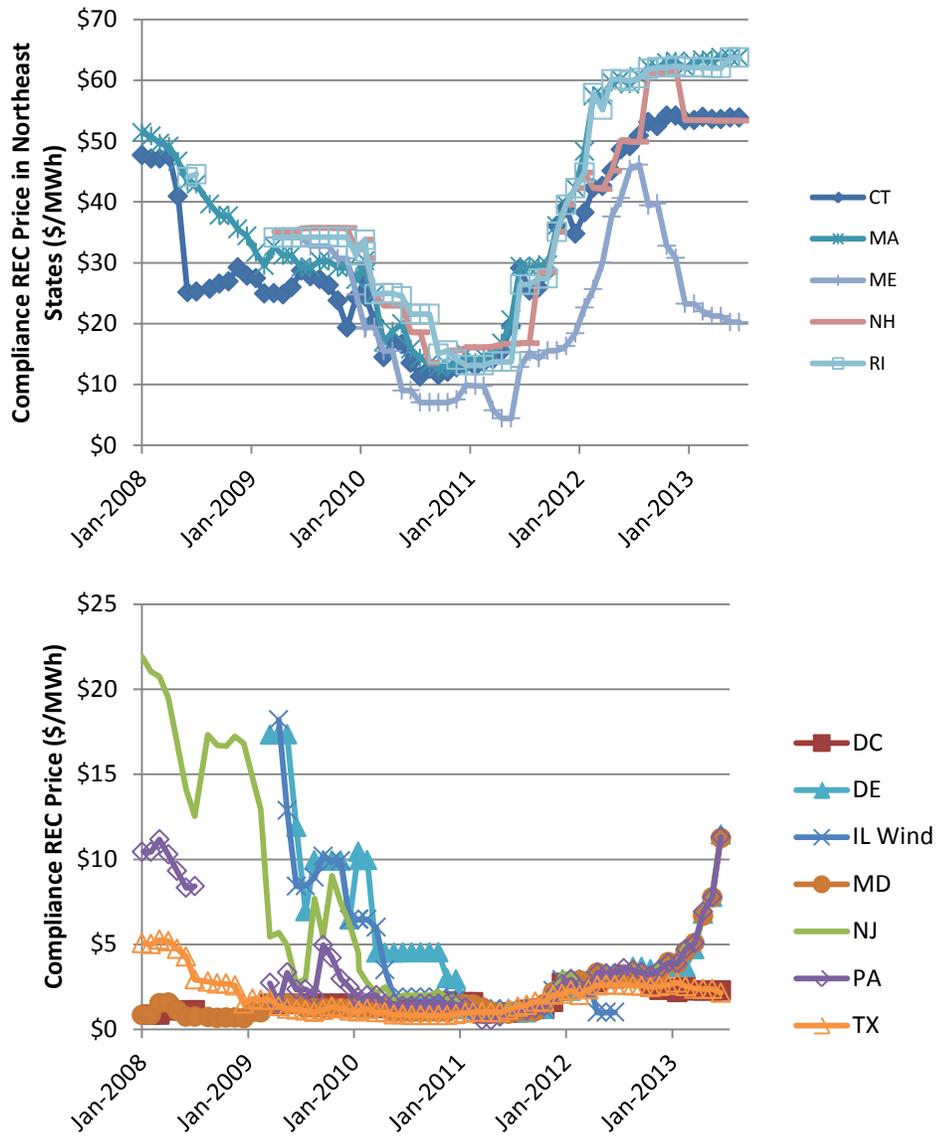
Source: Marex Spectron 2013

As shown in Figure 15, wholesale RECs used in voluntary markets have traded at less than \$2/MWh since 2009. In July 2013, voluntary nationally sourced RECs increased above the \$1/MWh level for first time since mid-2010. Nationally sourced voluntary wind REC prices have been comparable to nationally sourced voluntary RECs for any technology, while wind from the western United States has earned higher prices, particularly in the 2009–2012 timeframe.

### *REC Pricing in Compliance Markets*

In the second half of 2011, REC prices began to increase in the Northeast, and through early 2013 stabilized at near alternative compliance payment (ACP) levels in Connecticut, Massachusetts, New Hampshire, and Rhode Island, while declining to around \$20/MWh in Maine (Figure 16). ACP levels in the region are generally between \$55/MWh and \$65/MWh, meaning that if REC prices were to increase above that level, compliance entities would likely pay the ACP instead of buying RECs.

In other regions, RECs traded at less than \$5/MWh in 2012, though some markets began to increase in 2013. REC trades in the mid-Atlantic were closing above \$10/MWh in July 2013 in Delaware, Maryland, New Jersey, and Pennsylvania. In Texas, REC prices have doubled from early 2011 through July 2013, but remain at around \$2/MWh (Figure 16).



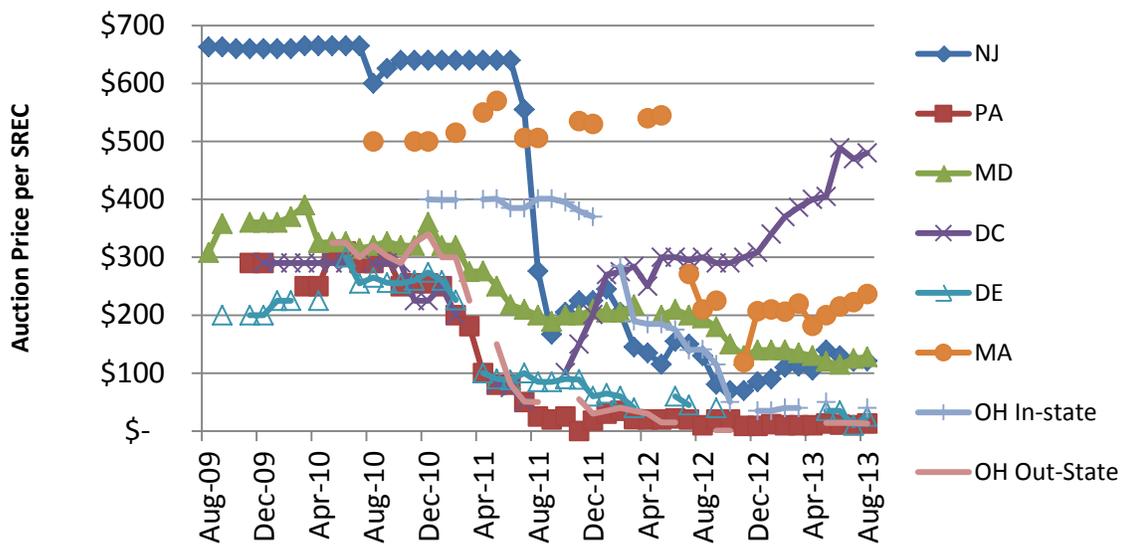
**Figure 16. Compliance market (Tier 1) REC prices, January 2008–July 2013**

Plotted values are the last trade (if available) or the mid-point of bid and offer prices for the current or nearest compliance year for various state compliance RECs.

Source: Marex Spectron 2013

Solar renewable energy certificates have higher values than RECs from other resource types in compliance markets. This is true for several reasons. First, 16 states and Washington, D.C., have specific provisions to encourage solar or customer-sited generation (DSIRE 2011), which creates a different supply and demand dynamic than for REC markets. Second, the alternative compliance payment level is often set higher for solar/distributed generation tiers than for standard RPS compliance because of the higher cost of solar relative to other renewables that may be used to meet the main RPS targets. For example, solar alternative compliance payments generally range from about \$350 to \$650/MWh compared to about \$55/MWh for the main RPS (Tier 1).

Spot pricing for solar renewable energy certificate (SRECs) is publicly available via platforms like SRECTrade and FlettExchange.<sup>29</sup> SRECTrade hosts a monthly auction, while Flett Exchange is an online exchange. Both platforms cover markets in PJM states, Massachusetts, and Ohio, and similar price trends can be seen in reported data from both companies. Figure 17 shows SREC prices for the current or nearest compliance year.



**Figure 17. Compliance market SREC spot prices, August 2009–August 2013**

Source: SRECTrade

For more information, see “SREC Market Prices” at [http://srectrade.com/srec\\_prices.php](http://srectrade.com/srec_prices.php) (accessed September 18, 2013)

In New Jersey, spot market prices for SRECs have been in the \$50–\$150 range in recent years, after declining dramatically from highs of more than \$600/MWh into mid-2011. In Pennsylvania, a similar, though not as dramatic, decline was seen in mid-2011. Spot prices for Pennsylvania SRECs dropped to less than \$50/MWh in mid-2011, from around \$300/MWh in mid-2010 (Figure 17), presumably due to oversupply in the market. By 2012, Pennsylvania SRECs were down to \$50, and have declined to less than \$15 in mid-2013.

<sup>29</sup> For more information, see [www.srectrade.com](http://www.srectrade.com) and [www.flettexchange.com](http://www.flettexchange.com).

In Washington, D.C., SREC spot prices have increased in recent years, due to policy modifications. In 2011, the Council of the District of Columbia closed the door to new out-of-district resources ( out-of-district systems approved before January 31, 2011 were grandfathered in) and increased the ultimate solar requirement from 0.4% to 2.5% by 2023. In 2012, SREC prices ranged from \$270 to \$310, increasing in 2013 to nearly \$490.

SREC pricing data are also available from PJM-GATS.<sup>30</sup> PJM-GATS reports solar weighted average prices for transactions in the PJM market that differ from spot prices reported by SRETrade and Flett Exchange because PJM-GATS pricing can include pricing from long- or mid-term contracts as well as spot prices. PJM-GATS reports prices on a monthly basis, based on when the SREC was issued, traded, or retired, not on when the generation occurred. For example, if a company contracted for SRECs that were generated in January 2013 at a given price but did not retire those SRECs until August of 2013, the January 2013 price would be reflected in PJM-GATS's August 2013 solar weighted average price report.

---

<sup>30</sup> For pricing data and other public reports, see <http://pjm-eis.com/reports-and-news/public-reports.aspx>.

## 5 Community and Crowdfunded Solar

Increasingly, utilities and third parties are developing community solar programs that allow customers to purchase a share of a renewable system developed in the local community. Under community solar programs, customers receive the benefits of the energy that is produced by their share. For example, the Holy Cross Energy solar project in El Jebel, Colorado, is an 80kW photovoltaic system supported by 18 community participants who purchase shares at an upfront cost of \$3.15/W (\$3,150/kW) and then receive a credit on their bill each month at a rate of \$0.11/kWh (see Footnote 20). Typically, community solar programs require an upfront investment in a “share” or “panel” of the project, which can cost hundreds of dollars. However, that is not always the case. Delta-Montrose Electric Association’s Community Solar Array program, also in Colorado, sells shares in \$10 increments.<sup>31</sup>

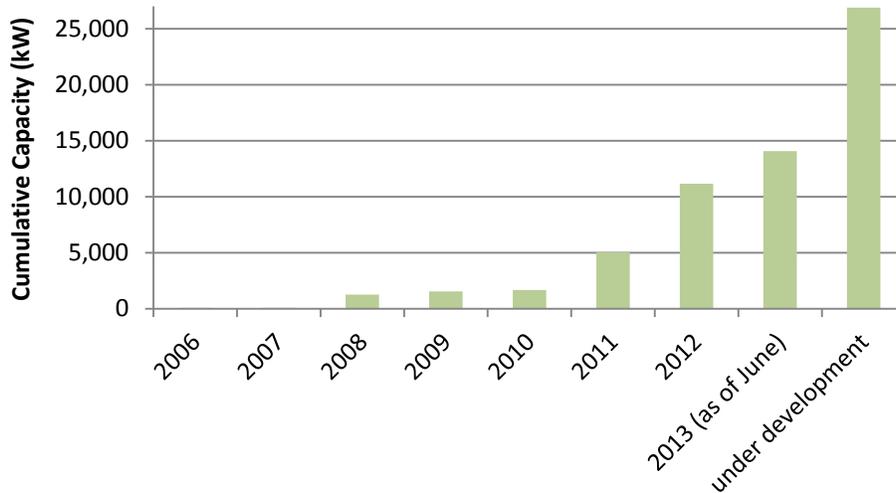
Unlike green pricing programs or unbundled REC purchases, the RECs produced by a community solar program are typically, though not always, retained by the host utility. The utility may use the RECs to comply with a renewable portfolio standard or to meet a voluntary renewable energy target. Without REC ownership, consumers cannot claim the environmental benefits of the solar project.

However, community solar programs provide choice to consumers, and they provide potential cost savings on electricity bills. Consumers participating in community solar programs may also pay less per watt compared to an on-site installation if they installed solar on their roofs, due to economies of scale. Community solar programs typically also allow consumers to keep their shares if they move within the utility’s service territory. For more on these issues, see Heeter and McLaren (2012).

Due to these advantages and other reasons, the community solar market is growing. In 2012, 10 programs were introduced, and as of July 2013, 6 programs had begun in 2013, with 9 projects under development. U.S. community solar programs had a combined capacity of more than 14,066 kW as of June 2013, and that capacity has been growing (Figure 18). In 2011, the Salt River Project (Arizona) began a 2,000-kW program for residential participants. Two additional large (greater than 1,000 kW) programs were developed in Arizona: Tucson Electric Power’s 1,600-kW program in 2011 and UniSource Energy Service’s 1,720-kW program in 2012. San Miguel Power Association, working with the Clean Energy Collective (Colorado) also developed a large system (1,000 kW) in 2012.

---

<sup>31</sup> For more information, see “Delta-Montrose Electric Association (Colo.) Launches Community Solar” at [http://apps3.eere.energy.gov/greenpower/news/news\\_template.shtml?id=1620](http://apps3.eere.energy.gov/greenpower/news/news_template.shtml?id=1620) (accessed October 3, 2011).



**Figure 18. Community solar program cumulative capacity (kW)**

In Colorado, legislation was passed in June 2010 requiring that investor-owned utilities develop plans to acquire RECs from community solar gardens. The bill required the PUC to set a minimum and a maximum purchase of electrical output for each utility. To comply, the state’s largest utility, Xcel Energy, offers an incentive under the Solar\*Rewards Community program. During 2012 Xcel Energy accepted 4.5 MW of customer owned community solar electricity; it will pay \$0.14 per kWh for small programs (10–50 kW), and \$0.11 per kWh for medium programs (50–500 kW), then scale down the payments over time after 3 MW of capacity has been installed. An additional 4.5 MW was made available to community solar developers on August 15, 2012, and Xcel closed the application process after 30 minutes, as three times the 2012 capacity allotment had been submitted; 10 solar garden applications were approved, ranging from 108 kW to 1,997 kW. In 2013, Xcel added 4.5 MW of projects under its Standard Offer Program (for systems between 10 kW and 500 kW), and began accepting bids for its Large RFP Program (for systems between 500.1 kW and 2 MW) on August 1, 2013. The Large RFP Program will accept up to 4.5 MW as well, for a total of 9 MW added to the Solar\*Rewards Community program this year.

Outside of Colorado, other states have also passed legislation, either requirements or incentives, to support community solar. In May 2009, the state of Washington passed SB 6170, which enables community solar participants to qualify for the state’s production incentive program (DSIRE 2012). Projects up to 75 kW are eligible. The production incentive can range between \$0.12/kWh and \$0.54/kWh, depending on whether the project qualifies for certain local content multipliers, and each participant in a community solar project is eligible to receive the incentive, which is capped at \$5,000 per year per participant (DSIRE 2012).

In Maine, net metering regulations allow for shared ownership of facilities up to 660 kW located in the service territory of an investor-owned transmission and distribution utility. (CMR 65-407-313) also allows group net metering.

In Vermont, the Public Service Commission approved group billing, which allows for net metering to be shared among multiple customers. Group billing can be applied to technologies other than solar, including wind, small hydro, and biomethane. (Vermont PSC 2009)

In 2013, Minnesota passed a law requiring Xcel Energy to set up and operate a community solar gardens program. Other investor-owned utilities in Minnesota are not required to, but may, offer community solar.

In California, a community solar bill (SB 43) was signed into law in September 2013. The bill creates a community solar pilot program for California's three investor-owned utilities (PG&E, SCE, and SDG&E), with a cap of 600 MW. PG&E expects that its current proposal for a green pricing program would be similar to that required by SB 43 (Hoyt 2013).

In Washington, D.C., the Community Renewables Energy Act of 2013 (Bill No. 20-0057) was approved by the City Council in October 2013. The Act enables community solar and other aggregated net metering arrangements. Projects can be up to 3 MW in size and must have at least two subscribers.

## **5.1 Intersection of On-Site Solar and Green Pricing Programs**

Utilities offering green pricing programs may also be providing customers with opportunities to install on-site solar or participate in a community solar garden. Given these potentially competing programs, how are utilities handling the potential overlap? This section provides lessons learned from top green power programs after a series of interviews (see Section 7 for details on the interview process and other lessons learned).

Green pricing managers anecdotally think there is overlap between customers who participate in green pricing and other offers, but data supporting this assumption are hard to find; data may not be readily available because programs are often run by different department within the utility, and some programs may be run by third parties. Xcel Energy has found that it is losing about 2,000 MWh annually from its Windsource program in Colorado due to net metering customers either leaving Windsource entirely or decreasing the size of their Windsource purchase (Mudd 2013).

A few utilities mentioned that their customers with on-site solar are signing up for the green pricing program to match the electricity not covered by their photovoltaic (PV) system.

One reason that utilities may not see a large impact of customers choosing on-site solar on their green pricing program is that for most leading utilities, the number of customers installing on-site solar is far fewer than the number of green pricing customers. In fact, the top three utilities in terms of PV net metering customers (listed in EIA) do not even have a green pricing program, though PG&E is seeking approval of a green pricing program (Tables 8 and 9). The number of PV net metering customers is used here as a proxy for the number of PV systems installed.

**Table 8. Utilities Reporting to EIA with Most PV Net Metering Customers, 2011**

| <b>Utility or Electric Supplier</b>       | <b>State</b> | <b>Total PV Net Metering Customers</b> |
|---|--------------|--|
| Pacific Gas & Electric                    | CA           | 59,597                                 |
| Southern California Edison                | CA           | 28,058                                 |
| San Diego Gas & Electric                  | CA           | 14,941                                 |
| Public Service Company of Colorado        | CO           | 9,633                                  |
| Jersey Central Power & Light              | NJ           | 5,779                                  |
| Hawaiian Electric Company                 | HI           | 5,556                                  |
| Long Island Power Authority               | NY           | 4,807                                  |
| Public Service Electric & Gas             | NJ           | 4,725                                  |
| Los Angeles Department of Water and Power | CA           | 4,672                                  |
| Arizona Public Service Co.                | AZ           | 3,814                                  |

Source: EIA 861

**Table 9. Net Metering Customers at Utilities Reporting to EIA with Most Green Power Customers, 2011**

| <b>Utility or Electric Supplier</b>   | <b>State</b> | <b>Total Green Power Customers</b> | <b>Total PV Net Metering Customers<sup>a</sup></b> |
|---------------------------------------|--------------|------------------------------------|--|
| Green Mountain Energy Company         | TX           | 296,101                            | n/a  |
| Portland General Electric Co          | OR           | 79,776                             | 2,112  |
| Just Energy                           | TX           | 54,232                             | n/a  |
| Sacramento Municipal Utility District | CA           | 51,509                             | 3,180  |
| First Choice Power                    | TX           | 42,555                             | n/a  |
| PacifiCorp                            | OR           | 39,446                             | 1,981  |
| Public Service Co. of Colorado        | CO           | 33,774                             | 9,633  |
| PacifiCorp                            | UT           | 32,550                             | 1,057  |
| Puget Sound Energy Inc.               | WA           | 32,459                             | 1,010  |
| Just Energy New York Corp.            | NY           | 31,640                             | n/a  |
| PECO Energy Co.                       | PA           | 24,629                             | 1,956  |
| Detroit Edison Co.                    | MI           | 22,689                             | 591  |
| Wisconsin Electric Power Co.          | WI           | 20,927                             | 239  |
| Northern States Power Co - Minnesota  | MN           | 20,347                             | 305  |

Source: EIA 861

<sup>a</sup> Net metering only applies to regulated distribution companies.

Some programs do not see overlap in customers because of the way they are structured. For example, Indianapolis Power & Light offers a feed-in tariff, but that program is dominated by large renewable energy developers. However, they recently offered an

electric tariff for electric vehicles and have had some inquiries about whether electric vehicle meters can be enrolled in the green pricing program.

## 5.2 Crowdfunding Solar

“Crowdfunding” is used to finance many types of projects, not just renewable energy. Kiva and Kickstarter, for example, are two platforms through which individuals can support a wide variety of crowd-funded projects. Crowdfunding renewable projects differs slightly from community solar in that crowdfunding participants provide upfront capital (as a loan) to support the development of the project rather than purchase shares of the project. Crowd-funded programs allow anyone, regardless of utility territory, to invest in the development of a renewable project.

Mosaic<sup>32</sup> is a crowdfunding program based in California, specifically for solar development. Crowdfunding programs give anyone (regardless of utility territory) the opportunity to invest in the development of a solar facility, which is typically hosted by a non-profit organization, though access may be restricted to certain states or accredited investors. To date, Mosaic has financed 15 solar facilities totaling more than 3 MW. The majority of projects (nine) are located in California; other projects are located in Arizona, New Jersey, and Colorado. The first five projects were funded by more than 400 people for a total of more than \$350,000 in zero-interest loans. Mosaic now offers projects with an annual return ranging from 4.5% to 5.4%.

The JOBS Act, signed in April 2012 by President Obama, grants crowd-funded projects raising up to \$1 million annually an exemption from the U.S. Securities and Exchange Commission’s securities regulation, allowing them to provide a return on investment, provided they file initial and periodic disclosures to the SEC. The SEC is now developing the regulations required to implement the JOBS Act.

---

<sup>32</sup> For more information, see [joinmosaic.com](http://joinmosaic.com).

## 6 Interest of Large Consumers in New Voluntary Options

The number of companies involved with green power is increasing, and the range of methods they use to procure renewables is expanding. Large consumers are interested in individual tariffs for renewable energy in their service territories, entering into power purchase agreements directly, or buying RECs.

Large customers are sometimes excluded from utility green pricing programs, but some large customers are interested in purchasing renewables from projects located in their service territory. An emerging voluntary purchase option is targeted at large commercial or industrial customers. Three utilities are in the initial stages of developing this type of tariff.

In April 2013, Google announced its support for an approach that would allow them to subscribe to a separate tariff for renewable energy. Google's proposed "renewable energy tariff" would be a voluntary tariff that would pass the cost of the renewable power directly to the consumers who want it.<sup>33</sup> This type of arrangement would allow Google to focus on its core business, instead of developing expertise in power purchase agreements or other contract mechanisms. Duke Energy is expected to file a similar plan in 2013.<sup>34</sup>

Sierra Pacific Power Company (SPPC) proposed a tariff designed to allow large customers to enter into a contract with them to procure renewable energy from a specific source.<sup>35</sup> The Commission ruled in Docket 12-11023 that the merits of any tariff should be addressed once a specific contract is presented to the Commission for approval. Apple is partnering with SPPC through the new tariff, working with SunPower for engineering and construction of an 18-MW to 20-MW solar farm near its data center in Reno, Nevada.<sup>36</sup>

Dominion Virginia Power has proposed a renewable generation pilot program ("RG Pilot Program" or Rate Schedule RG – Renewable Energy Supply Service).<sup>37</sup> The program would allow large customers to purchase renewable energy from renewable facilities located within PJM, at a negotiated term length. The proposed pilot is capped at 240,000,000 kWh or 100 customers. Participants would reduce their energy billing but

---

<sup>33</sup> For more information, see "Expanding Renewable Energy Options for Companies Through Utility-Offered 'Renewable Energy Tariffs' at [http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf) (accessed October 14, 2013).

<sup>34</sup> For more information, see "Expanding Options for Companies to Buy Renewable Energy" at <http://googleblog.blogspot.com/2013/04/expanding-options-for-companies-to-buy.html> (accessed October 14, 2013).

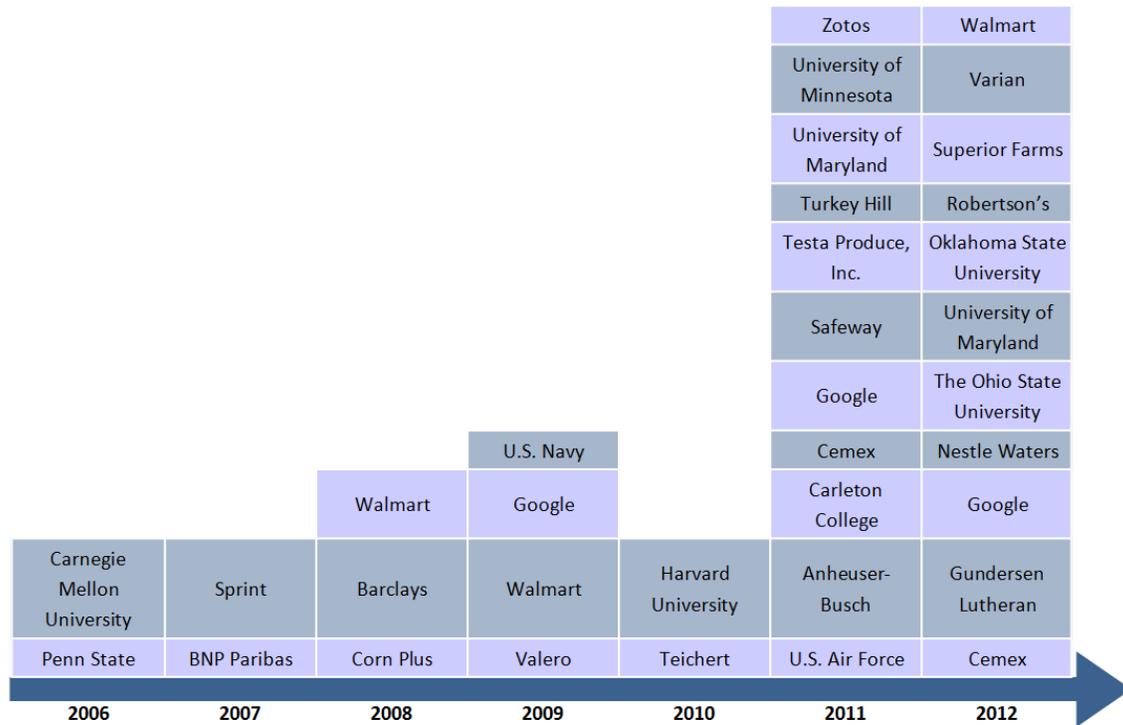
<sup>35</sup> Sierra Pacific Power Company also proposed a traditional green power tariff, which allows customers to purchase either 50% or 100% renewable energy. That tariff was approved.

<sup>36</sup> For more information, see "Apple is Planning a Solar Panel Farm for its Data Center in Reno" at <http://gigaom.com/2013/07/01/apple-is-planning-a-solar-panel-farm-for-its-data-center-in-reno/> (accessed September 26, 2013).

<sup>37</sup> Case No. PUE-2012-00142

continue to pay demand charges on 100% of their demand. Customers would not pay fuel rider costs on the renewable portion. The Virginia State Corporation Commission has not yet ruled on the matter.

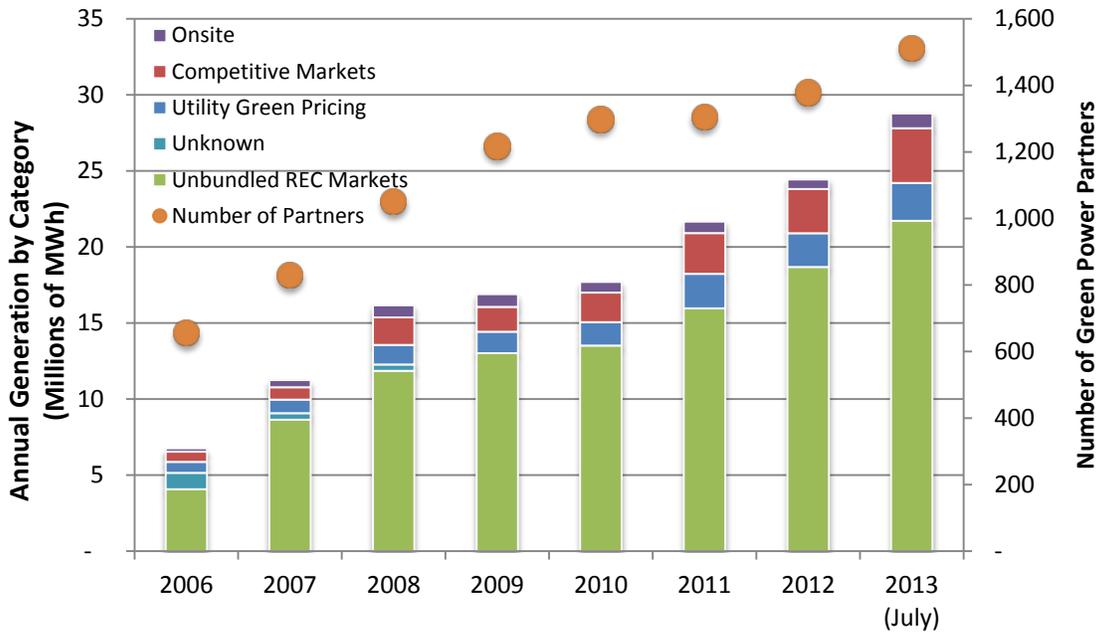
As large customer utility green tariffs are emerging as an option, the number of organizations obtaining renewables through power purchase agreements is increasing. Figure 19 shows non-utility off-takers of wind, ranging from corporations such as Walmart to universities such as Ohio State.



**Figure 19. Non-utility off-takers of wind**

Source: Di Capua (2013)

These and other purchasing options are recognized by the EPA’s Green Power Partnership. Although the Partnership is not new, it continues to recognize efforts of large purchasers, and has continued to grow over time. The number of organizations in Partnership has increased over time (Figure 20). As of July 2013, there were 1,512 Partners, an increase of 10% since the end of 2012. The level of green power sales supported by Partners increased 13% from 2011 to 2012, and it was up 18% in July 2013 compared to year-end 2012. Partners are primarily purchasing unbundled RECs (75%).



**Figure 20. Growth in the EPA Green Power Partnership, 2006–July 2013**

## 7 Lessons from Large Green Pricing Programs

In 2012, NREL reached out to 15 utilities with green pricing programs deemed leading programs both in terms of green power sales (according EIA data<sup>38</sup>) and in terms of data previously collected by NREL. We interviewed or gathered detailed responses by email from 11 of the 15 utilities. Utilities were asked about a variety of topics. This section summarizes their responses and additional information obtained from publically available resources. The experiences highlighted here are not intended to provide a representative sample of the utility green pricing market.

### 7.1 Product History

#### *Energy Mix*

Nearly all of the programs included in the interviews were providing green products that were mostly supplied by wind. This is consistent with national green pricing trends, where wind has historically provided 75%–85% of green pricing supply. One product has historically been approximately 40% landfill gas and continues to be so. Most programs reported having not significantly changed their energy mixes over time, though one program has moved to a higher percentage of wind; originally it consisted of approximately one-third wind and it is consists of more than 95% wind. A few programs have added more solar over time, primarily from local facilities, though the total percentage supplied by solar in those programs remains small (less than 5%). One utility has continued to add more dairy digester projects in recent years, citing the popularity of the program.

#### *Competition from REC Marketers*

Utility green pricing programs with prices higher than unbundled RECs may see challenges retaining large, nonresidential customers. The vast majority of utility green pricing programs interviewed noticed the appearance of unbundled RECs around 2009, though one program noted a shift in 2002–2003. Green pricing managers noted that some large nonresidential customers had dropped their program in favor of lower-priced products. One green pricing manager noted that his utility used to be invited to conversations with large companies about their renewable procurement, but that has since waned.

To retain or continue to attract large nonresidential green pricing customers, some utilities emphasize the local nature of their product and the marketing benefit of partnering with the utility (when the utility has a good reputation). One program manager indicated that if his product were only twice as much as unbundled RECs, he could possible make a compelling case to a large nonresidential customer, but when his products was 10 times more expensive, this was not possible. Another program indicated that it had revised procedures to allow for greater use of their product to get LEED (Leadership in Energy and Environmental Design) points, though only a few customers used the new procedure.

---

<sup>38</sup> EIA's Annual Electric Power Industry Report collects data on utility green pricing programs. See [www.eia.gov/electricity/data/eia861/](http://www.eia.gov/electricity/data/eia861/).

One utility program that offered a low price, comparable to unbundled RECs, indicated that it had not seen a shift in nonresidential participation.

## 7.2 Pricing

### *Pricing Methodology*

Top green pricing programs interviewed use different methodologies to set the price of their products. Some of this variation is due to how the product supply is procured. In nearly all cases, utilities were either prevented from earning a profit on their green product by their regulator or chose not to profit from the program for other reasons. One exception is a program that indicated it tries to be slightly revenue positive, in case revenue fluctuates from year to year. Another program indicated that if net revenues are positive, it will invest the revenue in more RECs and local solar projects. The primary methods for setting the price are:

- **REC cost.** The majority of programs interviewed determined the price by adding the cost of the renewable supply to any marketing and administrative expenses. In some cases, determining the renewable supply costs is relatively easy (e.g., if the cost is from purchasing unbundled RECs).
- **Incremental cost of renewable energy.** In markets where renewable energy is being procured in a bundled manner, the cost of the renewable supply can be determined by subtracting the average cost of procuring non-renewables to the average cost of procuring renewables. In its recent rate case, WE Energies set the price of its green pricing product by comparing the average cost of procuring renewables to the average cost of procuring non-renewables, and then added marketing and administrative expenses. The cost for renewables was determined to be \$0.10186/kWh, compared to the non-renewable cost of \$0.07971/kWh, leaving a renewable premium of \$0.02401. WE Energies added administrative costs of \$0.00185/kWh for the “mass market” program and \$0.0005/kWh for the “bulk market” program.<sup>39</sup> Madison Gas and Electric uses a similar approach.<sup>40</sup>
- **Based on proposals.** Some programs are not administered directly by utilities. In those cases, the green power price is typically established through a bidding process. For example, in Connecticut, energy suppliers bid on the opportunity to supply the CTCleanEnergyOptions program. Energy suppliers bid an “all-in” price that includes supply, administration, and marketing expenses.

---

<sup>39</sup> See Docket 5-UR-106, Exhibit-WEPCO/WG-Rogers-10, Schedule 6.

<sup>40</sup> For more information, see “Green Power Tomorrow—Frequently Asked Questions” at [http://www.mge.com/Images/PDF/CleanPower/GS1381\\_GPTFreqAskedQuestions.pdf](http://www.mge.com/Images/PDF/CleanPower/GS1381_GPTFreqAskedQuestions.pdf) (accessed October 14, 2013).

### *Administrative Expenses*

Programs may be criticized for spending what can be perceived as a large amount of the price on marketing and administration; however, most programs recognized that marketing expenses are essential to getting new customers to participate, although data is sensitive. Marketing and administrative expenses can also be challenging to compare across utility programs, as utilities may classify expenses differently.

For the utilities willing to discuss administrative expenses, a wide range of expenses was reported. Two programs reported expenses less than 1% of the total cost to the product. One program reported around one-sixth of the gross revenue for the product, while another reported about 50% of the total cost of the product.

## **7.3 Customers**

### *Customer Segmentation and Research*

Utilities regularly engage in customer segmentation and research, though none wanted to share that research publically. Most programs interviewed reported conducting research every few years and before introducing a new or modified product or marketing campaign. Some utilities conduct research on their green pricing program as part of larger effort to survey customer satisfaction. Examples of customer segmentation and research include:

- One utility that already procures a large amount of non-fossil fuel conducted research to determine important program goals and relevant marketing messages for their green product.
- Another utility includes its green pricing program in its regular customer perception studies, and it tracks results quarterly.
- Utility programs run in part or whole by third-party suppliers often rely on those suppliers to conduct customer segmentation and research.
- One program reported not conducting extensive market research, but it did track its large commercial and industrial customers that have national or international operations with some kind of environmental or sustainability policy.

### *Customer Recognition*

Nearly all programs interviewed currently or historically have provided some form of customer recognition for their large purchasers. Customer recognition most commonly takes the form of a listing on a website, but some programs recognize large purchasers in a newspaper or other publication. A few considerations for publicizing large purchasers include:

- Making sure the customer approves of being publically recognized
- Ensuring that the customer name published is one that is recognizable, not necessarily using the name on the electric account

### *Success Factors*

Overall, program managers cited several broader reasons for the success of their green pricing programs, including:

- Providing an open, transparent, personable, highly visible program
- Having the support of the management team
- Working with an experienced, third-party contractor
- Engaging the community, particularly through community challenges
- Focusing on including local, independent renewable projects in the green pricing supply mix
- Providing an advertising benefit to large customers
- Being responsive to market needs (e.g., changing a residential offer to something that can be easily understood).

### *Future Program Changes*

Moving forward, utility green pricing programs face challenges, particularly because their green pricing offers are usually more expensive than unbundled RECs. To address this and other issues, several utilities indicated they are planning to modify their green pricing programs:

- One utility is pursuing a new lower price for bulk purchases, and it has hired a third-party marketing firm to investigate this option.
- Another utility recently increased its price and will be examining the impact on customer participation. This utility uses some of its own generation to supply the green pricing program, so if sales decrease substantially, it will investigate how to make up the lost revenues.
- Three utilities are planning to revisit their marketing approach.
- One utility program is considering a major revision to its program. The proposal would offer a 3–5 year portfolio-based product at a fixed price. The utility did not want to make public the details of the program at this time.
- One utility is looking to introduce a community solar option, similar to the Sacramento Municipal Utility District’s program except that it would involve selling the RECs from the community solar array to customers. The utility is hoping to launch this option in 2014.

## 8 Conclusions and Observations

Voluntary green power markets provide a way for individuals and institutions to support renewable energy. Emerging methods for support include community solar programs, crowdsourced solar, power-purchase agreements. Based on these emerging methods as well as data from green power programs, competitive markets, and unbundled REC purchases, we have identified the following market trends:

- In 2012, total retail sales of renewable energy in voluntary purchase markets exceeded 48 million MWh and represented approximately 1.3% of total U.S. electricity sales. The figures represent a capacity equivalent of approximately 17,000 MW. Total green power market sales increased by 36% from 2010 to 2012, which translates to a compound annual growth rate of 17%.
- Wind energy continues to provide the most renewable energy to voluntary markets, at 80.1% of total green power sales, followed by landfill gas and biomass (12.8%), hydropower (6.2%), solar (0.6%), and geothermal (0.3%). The percentage of solar used in the voluntary market increased from 0.2% to 0.6% and represents about 2% of sales in utility green pricing programs.
- Utility green pricing sales exhibited growth of 5% in 2012, which is similar to the growth seen in 2010 and 2009.
- Utilities and third parties are developing community solar programs. These programs enable utility customers to purchase a share of a system and receive the benefits of the energy produced by their share. In 2012, 10 new community solar projects were introduced, and as of July 2013, an additional 6 programs had begun. The capacity of existing community solar projects totals more than 14 MW, and an additional 13 MW of projects are under development.
- Competitive markets saw slower growth than in previous years, increasing at a compound annual growth rate of 6% from 2010 to 2012. Some of the downturn may be due to declining voluntary sales in Texas.
- REC markets were the fastest growing and largest market segment, increasing at a compound annual growth rate of 25% from 2010 to 2012. The REC market appears to have rebounded from 2010, when it only grew 6% compared to 2009.
- Nearly 1.9 million customers purchased green power in 2012. The number of customers purchasing unbundled RECs nearly doubled in 2012, driven primarily by residential customers.
- Wholesale RECs used in voluntary markets declined from around \$5/MWh in 2009 to less than \$1/MWh in 2010 through mid-2013. In July 2013, nationally sourced voluntary RECs increased to more than \$1/MWh, as the market in Texas began to tighten.

## References

- Barbose, G. (26 August 2013). Email. Berkeley, CA: Lawrence Berkeley National Laboratory.
- Bird, L.; Kreycik, C.; Friedman, B. (2008). *Green Power Marketing in the United States: A Status Report (Eleventh Edition)*. NREL/TP-6A2-44094. Golden, CO: National Renewable Energy Laboratory. Accessed September 2010: <http://www.nrel.gov/docs/fy09osti/44094.pdf>.
- Bird, L.; C. Kreycik; Friedman, B. (2009). *Green Power Marketing in the United States: A Status Report (2008 Data)*. NREL/TP-6A2-46581. Golden, CO: National Renewable Energy Laboratory. Accessed October 4, 2011: <http://www.nrel.gov/docs/fy09osti/46581.pdf>.
- Bird, L.; Sumner, J. (2010). *Green Power Marketing in the United States: A Status Report (2009 Data)*. NREL/TP-6A20-4940. Golden, CO: National Renewable Energy Laboratory. Accessed September 2011: <http://www.nrel.gov/docs/fy11osti/49403.pdf>.
- “Database of State Incentives for Renewables & Efficiency (DSIRE).” (2013). North Carolina State University. Accessed September 19, 2013: <http://www.dsireusa.org/>.
- Di Capua, M. (May 23 2013). Email. New York, NY: Bloomberg New Energy Finance.
- Energy Information Administration (EIA). (2012). “Annual Electric Utility Data File – EIA-861.” Accessed September 18, 2013: <http://www.eia.gov/electricity/data/eia861/>.
- EIA. (2013). “Retail Sales and Direct Use of Electricity to Ultimate Customers by Sector, by Provider.” Accessed September 13, 2013: [http://www.eia.gov/electricity/annual/html/epa\\_02\\_02.html](http://www.eia.gov/electricity/annual/html/epa_02_02.html).
- Environmental Protection Agency (EPA). (July 11, 2013). Green power partners and sales. Email. Washington, DC. Correspondence with Anthony Amato.
- EPA. (2013). “National Top 50.” Green Power Partnership. Accessed September 18, 2013: <http://www.epa.gov/greenpower/toplists/top50.htm>.
- Environmental Tracking Network of North America (ETNNA). (2011). “Renewable Energy Tracking Systems.” Accessed September 20, 2011: <http://www.etnna.org/learn.html>.
- Google. (2013). “Investing in a clean energy future.” <http://www.google.com/green/energy/investments/>. Accessed October 14, 2013.
- Friedman, B.; Miller, M. (2009). *Green Pricing Program Marketing Expenditures: Finding the Right Balance*. NREL/TP-6A2-46449. Golden, CO: National Renewable Energy Laboratory. Accessed October 18, 2013: <http://www.nrel.gov/docs/fy09osti/46449.pdf>

Heeter, J.; Armstrong, P.; Bird, L. (2012). *Market Brief: Status of the Voluntary Renewable Energy Certificate Market (2011 Data)*. NREL/TP-6A20-51904. Golden, CO: National Renewable Energy Laboratory. Accessed October 9, 2013: <http://www.nrel.gov/docs/fy12osti/56128.pdf>.

Heeter, J.; McLaren, J. (2012). "Innovations in Voluntary Renewable Energy Procurement: Methods for Expanding Access and Lowering Cost for Communities, Governments, and Businesses." NREL/TP-6A20-54991. Golden, CO: National Renewable Energy Laboratory. Accessed October 14, 2013: <http://www.nrel.gov/docs/fy12osti/54991.pdf>.

Heeter, J.; Bird, L. (2011). *Status and Trends in U.S. Compliance and Voluntary Renewable Energy Certificate Markets (2010 Data)*. NREL/TP-6A20-52925. Golden, CO: National Renewable Energy Laboratory. Accessed October 9, 2013: <http://www.nrel.gov/docs/fy12osti/52925.pdf>.

Hoyt, M. (23 September 2013). "Proposed Enhanced Green Option." Presentation at the Renewable Energy Markets Conference, Austin, Texas.

Marex Spectron. (2013). Data accessed through Vantage database. London, UK. Accessed September 18, 2013: <http://www.marexspectron.com/>.

Mosaic. (2013). "Browse Investments." <https://joinmosaic.com/browse-investments>. Accessed October 14, 2013.

Mudd, S. (27 September 2013). Email. Xcel Energy, Denver, Colorado.

Natural Marketing Institute. (2011). *Consumer Attitudes About Renewable Energy: Trends and Regional Differences*. Work performed by the Natural Marketing Institute: Harleysville, PA. NREL/SR-6A20-50988. Golden, CO: National Renewable Energy Laboratory. Accessed October 4, 2013: <http://www.nrel.gov/docs/fy11osti/50988.pdf>.

Solar Energy Industries Association (SEIA) and GTM Research. (2013). U.S. Solar Market Insight Report: 2012 Year in Review (Full Report). Greentech Media, Inc. and SEIA.

Terada, R. (12 September 2013). Email. Center for Resource Solutions, San Francisco, California.

Terada, R. (23 September 2013). Presentation at the Renewable Energy Markets Conference. Austin, Texas.

Vermont Public Service Commission (PSC). (2009). Rule 5.100 – Relating to Net Metering. [http://psb.vermont.gov/sites/psb/files/rules/OfficialAdoptedRules/5100adoptedrule\\_2.pdf](http://psb.vermont.gov/sites/psb/files/rules/OfficialAdoptedRules/5100adoptedrule_2.pdf). Accessed October 14, 2013.

## Appendix A. Leading Purchasers in the EPA Green Power Partnership Table A-1. Top 25 Purchasers in the EPA Green Power Partnership Program, July 3, 2013

| Organization                                      | Annual Green Power Usage (kWh) | Providers <sup>a</sup>   | Green Power Resources                                    |
|---|--------------------------------|--|--|
| <a href="#">1. Intel Corporation</a>              | 3,100,850,000                  | Sterling Planet <sup>b</sup> , PNM, on-site generation   | biogas, biomass, small-scale hydropower, solar, wind     |
| <a href="#">2. Microsoft Corporation</a>          | 1,935,637,485                  | Sterling Planet <sup>b</sup> , on-site generation  | Biomass, small-scale hydropower, solar, wind             |
| <a href="#">3. Kohl's Department Stores</a>       | 1,536,529,000                  | Nexant <sup>b</sup> , Sterling Planet <sup>b</sup> , Renewable Choice Energy <sup>b</sup> , 3Degrees <sup>b</sup> , on-site generation   | solar  |
| <a href="#">4. Whole Foods Market</a>             | 800,257,623                    | 3Degrees <sup>b</sup> , on-site generation   | solar, wind  |
| <a href="#">5. Walmart Stores, Inc.</a>           | 751,431,792                    | Noble Americas Energy Solutions, Duke Energy, on-site generation, Green Power EMC <sup>b</sup> , Oklahoma Gas & Electric   | biogas, solar, wind                                      |
| <a href="#">6. U.S. Department of Energy</a>      | 698,489,099                    | Various, on-site generation  | biomass, geothermal, small-scale hydropower, solar, wind |
| <a href="#">7. Staples</a>                        | 635,982,674                    | Renewable Choice Energy <sup>b</sup> , 3Degrees <sup>b</sup> , Sterling Planet <sup>b</sup> , Avista Utilities, Pacific Power <sup>b</sup> , Tennessee Valley Authority <sup>b</sup> , on-site generation, Portland General Electric, Florida Power & Light <sup>b</sup> | biogas, solar, wind                                      |
| <a href="#">8. City of Houston, TX</a>            | 622,887,000                    | Reliant Energy <sup>b</sup>  | wind   |
| <a href="#">9. Starbucks Company-Owned Stores</a> | 592,462,522                    | 3Degrees <sup>b</sup> , Nexant <sup>b</sup>  | wind   |

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

| Organization  | Annual Green Power Usage (kWh) | Providers <sup>a</sup>   | Green Power Resources  |
|---|--------------------------------|--|--|
| <a href="#">10. Apple Inc.</a>                          | 537,393,667                    | 3 Phases Renewables <sup>b</sup> , TerraPass / NC GreenPower <sup>b</sup> , Constellation, on-site generation, Austin Energy <sup>b</sup> , Sacramento Municipal Utility District <sup>b</sup> , Iberdrola Renewables <sup>b</sup> , Pacific Power <sup>b</sup> , NV Energy, Central Electric Cooperative, Silicon Valley Power <sup>b</sup> | biogas, biomass, geothermal, small-scale hydropower, solar, wind |
| <a href="#">11. District of Columbia</a>                | 534,084,977                    | Washington Gas Energy Services <sup>b</sup>  | wind   |
| <a href="#">12. Cisco Systems, Inc.</a>                 | 459,005,742                    | Sterling Planet <sup>b</sup> , NextEra Energy Resources <sup>b</sup> , Austin Energy <sup>b</sup> , Ameren Missouri <sup>b</sup> , on-site generation  | solar, wind  |
| <a href="#">13. Unilever</a>                            | 439,105,000                    | Renewable Choice Energy <sup>b</sup>   | biomass, wind  |
| <a href="#">14. Lockheed Martin Corporation</a>         | 431,108,840                    | Sterling Planet <sup>b</sup> , 3Degrees <sup>b</sup> , EDF Industrial Power Services <sup>b</sup> , GDF Suez Energy Resources NA <sup>b</sup> , Champion Energy Services <sup>b</sup> , Noble Americas Energy Solutions <sup>b</sup> , City of Palo Alto Utilities <sup>b</sup> , South Alabama Electric Cooperative <sup>b</sup>            | biomass, solar, wind   |
| <a href="#">15. U.S. Department of Veterans Affairs</a> | 400,000,000                    | Renewable Choice Energy  | biogas   |
| <a href="#">16. BD</a>                                  | 382,462,000                    | Renewable Choice Energy <sup>b</sup> , 3Degrees <sup>b</sup> , Rocky Mountain Power <sup>b</sup> , Bloom Energy <sup>b</sup> , on-site generation  | solar, wind  |
| <a href="#">17. City of Austin, TX</a>                  | 374,086,079                    | Austin Energy <sup>b</sup>   | wind   |
| <a href="#">18. Hilton Worldwide</a>                    | 315,000,000                    | Renewable Choice Energy <sup>b</sup>   | small-scale hydropower, wind                                     |
| <a href="#">19. McDonald's USA LLC</a>                  | 309,185,000                    | 3Degrees <sup>b</sup> , Sterling Planet <sup>b</sup>   | wind   |
| <a href="#">20. City of Dallas, TX</a>                  | 282,961,000                    | TXU Energy <sup>b</sup>  | wind   |

Source: EPA 2013

<sup>a</sup> Listed in descending order by kWh supplied to partner

<sup>b</sup> Indicates Provider is selling Partner a third-party certified green power product

## Appendix B. Estimated U.S. Green Pricing Customers and Sales by State

Figures reported in this appendix do not include all sales and customers from competitive retailers, and they therefore underestimate sales and customers in states that allow retail competition.

**Table B-1. Estimated U.S. Green Pricing Customers and Programs by State, 2010 and 2011**

| State | Customers (2010) | Customers (2011) | Electric Industry Participants (2011) |
|-------|------------------|------------------|---------------------------------------|
| AK    | -                | -                | -                                     |
| AL    | 1,679            | 1,832            | 27                                    |
| AR    | 23               | 94               | 7                                     |
| AZ    | 7,839            | 5,771            | 4                                     |
| CA    | 82,848           | 84,520           | 15                                    |
| CO    | 51,677           | 45,231           | 29                                    |
| CT    | 23,956           | 26,854           | 12                                    |
| DC    | 2,814            | -                | 5                                     |
| DE    | 2,280            | 2,923            | 9                                     |
| FL    | 2,668            | 2,517            | 5                                     |
| GA    | 8,032            | 8,054            | 24                                    |
| HI    | -                | -                | 0                                     |
| IA    | 8,391            | 8,207            | 19                                    |
| ID    | 4,803            | 4,727            | 32                                    |
| IL    | 5,460            | 8,269            | 6                                     |
| IN    | 6,908            | 6,873            | 13                                    |
| KS    | 174              | 104              | 6                                     |
| KY    | 3,641            | 3,230            | 26                                    |
| LA    | 531              | -                | 2                                     |
| MA    | 15,349           | 19,736           | 12                                    |
| MD    | 12,495           | 16,154           | 11                                    |
| ME    | 2,302            | 1,302            | 2                                     |
| MI    | 34,384           | 37,153           | 13                                    |
| MN    | 33,981           | 31,476           | 86                                    |
| MO    | 6,823            | 7,154            | 18                                    |
| MS    | 1,254            | 174              | 17                                    |
| MT    | 497              | 831              | 10                                    |
| NC    | 12,915           | 11,901           | 32                                    |

| <b>State</b> | <b>Customers<br/>(2010)</b> | <b>Customers<br/>(2011)</b> | <b>Electric Industry<br/>Participants (2011)</b> |
|--------------|-----------------------------|-----------------------------|--|
| ND           | 1,526                       | 1,622                       | 7  |
| NE           | 160                         | 1                           | 4  |
| NH           | 90                          | 480                         | 4  |
| NJ           | 1,705                       | 3,807                       | 8  |
| NM           | 19,600                      | 16,911                      | 12   |
| NV           | 26                          | 24                          | 2  |
| NY           | 91,532                      | 90,167                      | 17   |
| OH           | 3,891                       | 1,363                       | 11   |
| OK           | 16,849                      | 16,872                      | 14   |
| OR           | 122,671                     | 126,741                     | 27   |
| PA           | 35,397                      | 37,621                      | 17   |
| RI           | 4,580                       | 4,458                       | 2  |
| SC           | 5,925                       | 7,189                       | 22   |
| SD           | 514                         | 498                         | 8  |
| TN           | 9,502                       | 10,213                      | 72   |
| TX           | 411,615                     | 465,439                     | 30   |
| UT           | 30,060                      | 32,611                      | 9  |
| VA           | 12,817                      | 12,800                      | 7  |
| VT           | 4,692                       | 4,471                       | 2  |
| WA           | 53,074                      | 52,316                      | 25   |
| WI           | 51,361                      | 49,970                      | 66   |
| WV           | 310                         | 3                           | 2  |
| WY           | 4,961                       | 5,372                       | 8  |
| <b>Total</b> | <b>1,216,582</b>            | <b>1,276,036</b>            | <b>819</b>                                       |

Sources: EIA 2011, 2012

**Table B-2. Estimated U.S. Green Pricing Customers by Customer Class, 2002–2011**

| Year              | Electric Industry Participants | Participating Customers |                |           |
|-------------------|--------------------------------|-------------------------|----------------|-----------|
|                   |                                | Residential             | Nonresidential | Total     |
| 2002              | 212                            | 688,069                 | 23,481         | 711,550   |
| 2003              | 308                            | 819,579                 | 57,547         | 877,126   |
| 2004              | 403                            | 864,794                 | 63,539         | 928,333   |
| 2005              | 442                            | 871,774                 | 70,998         | 942,772   |
| 2006 <sup>a</sup> | 484                            | 606,919                 | 35,937         | 642,856   |
| 2007              | 591                            | 773,391                 | 62,260         | 835,651   |
| 2008              | 643                            | 918,284                 | 64,711         | 982,995   |
| 2009              | 722                            | 1,058,185               | 65,593         | 1,123,778 |
| 2010              | 776                            | 1,137,047               | 79,535         | 1,216,582 |
| 2011              | 811                            | 1,187,867               | 91,117         | 1,278,984 |

<sup>a</sup> In 2006, the single largest provider of green pricing services in the country discontinued service in two states. More than 297,600 customers in green pricing programs reverted to standard service tariffs, predominantly in Ohio and Pennsylvania.

Nonresidential may include some customers for whom no customer class is specified.

Sources: EIA 2010, EIA 2011, EIA 2012

**Table B-3. EIA Estimated U.S. Green Pricing Sales (MWh) by State, 2011**

| State | 2011 Sales (MWh) | State | 2011 Sales (MWh) |
|-------|------------------|-------|------------------|
| TX    | 8,305,485        | GA    | 76,246           |
| OR    | 1,206,335        | MO    | 75,143           |
| NY    | 678,060          | IA    | 65,304           |
| CA    | 665,943          | SC    | 64,748           |
| WA    | 583,456          | NJ    | 63,101           |
| IL    | 459,249          | OH    | 40,416           |
| WI    | 451,449          | WY    | 38,937           |
| OK    | 441,684          | ID    | 37,914           |
| CO    | 353,549          | NC    | 23,685           |
| CT    | 292,155          | AR    | 23,069           |
| PA    | 269,114          | FL    | 18,461           |
| MN    | 253,027          | VT    | 16,595           |
| MD    | 196,889          | SD    | 12,126           |
| IN    | 188,656          | ME    | 8,181            |
| MI    | 182,658          | ND    | 6,469            |
| AZ    | 178,798          | MT    | 6,078            |
| UT    | 173,925          | AL    | 6,049            |
| RI    | 160,558          | KS    | 3,931            |
| MA    | 148,128          | NH    | 2,211            |
| VA    | 124,702          | MS    | 1,094            |
| NM    | 121,757          | NE    | 133              |
| KY    | 95,394           | NV    | 71               |
| TN    | 80,261           | WV    | 19               |
| DE    | 76,300           | LA    | -                |
|       |                  | Total | 16,277,513       |

Source: EIA 2012

## Appendix C. Top 10 Utility Green Pricing Programs

**Table C-1. Green Pricing Program Renewable Energy Sales, December 2012**

| Rank | Utility   | Sales (MWh/year) |
|------|---|------------------|
| 1    | Portland General Electric                             | 834,125          |
| 2    | Austin Energy   | 744,443          |
| 3    | PacifiCorp  | 604,007          |
| 4    | Sacramento Municipal Utility District                 | 416,477          |
| 5    | Xcel Energy   | 390,056          |
| 6    | Puget Sound Energy                                    | 365,796          |
| 7    | Connecticut Light and Power Co. / United Illuminating | 254,838          |
| 8    | Dominion Virginia Power                               | 250,364          |
| 9    | Oklahoma Gas & Electric Co.                           | 210,187          |
| 10   | CPS Energy  | 179,786          |

**Table C-2. Green Pricing Program Total Number of Customer Participants, December 2012**

| Rank | Utility   | Participants |
|------|---|--------------|
| 1    | Portland General Electric                             | 87,987       |
| 2    | PacifiCorp - Blue Sky Usage, Block, and Habitat       | 87,919       |
| 3    | Xcel Energy   | 61,315       |
| 4    | Sacramento Municipal Utility District                 | 55,207       |
| 5    | Puget Sound Energy                                    | 34,962       |
| 6    | Connecticut Light and Power Co. / United Illuminating | 27,664       |
| 7    | Iberdrola: NYSEG and RG&E                             | 21,201       |
| 8    | We Energies   | 20,066       |
| 9    | National Grid   | 18,302       |
| 10   | Dominion Virginia Power                               | 15,179       |

**Table C-3. Green Power Sales as a Percentage of Total Retail Electricity Sales (kWh), December 2012**

| <b>Rank</b> | <b>Utility</b>                          | <b>% of Load</b> |
|-------------|---|------------------|
| 1           | Waterloo Utilities                      | 23.9%            |
| 2           | Edmond Electric                         | 10.7%            |
| 3a          | City of Palo Alto                       | 8.1%             |
| 3           | River Falls Municipal Utilities         | 7.3%             |
| 4           | Austin Energy                           | 6.0%             |
| 5           | Portland General Electric               | 4.4%             |
| 6           | Madison Gas & Electric Co.              | 4.1%             |
| 6           | PacifiCorp - Blue Sky Usage and Habitat | 4.1%             |
| 8           | Sacramento Municipal Utility District   | 3.9%             |
| 9           | Stoughton Utilities                     | 2.9%             |
| 10          | Silicon Valley Power                    | 2.8%             |

<sup>a</sup> City of Palo Alto provided an updated response after the submission deadline. The updated ranking is provided here but the remaining rankings have been unchanged.

**Table C-4. Price Premium Charged for New, Residential Customer-Driven Renewable Power, December 2012**

| <b>Rank</b> | <b>Utility</b>  | <b>Net Premium</b> |
|-------------|---|--------------------|
| 1           | City of Ponca (Oklahoma)                              | -0.87¢/kWh         |
| 2           | Public Service Co. of New Mexico                      | 0.04¢/kWh          |
| 3           | Edmond Electric                                       | 0.14¢/kWh          |
| 4           | Indianapolis Power & Light Co.                        | 0.15¢/kWh          |
| 5           | Avista Corp. (Washington and Idaho)                   | 0.33¢/kWh          |
| 6           | Arizona Public Service                                | 0.40¢/kWh          |
| 7           | Xcel Energy (Minnesota only)                          | 0.66¢/kWh          |
| 8           | Oklahoma Gas & Electric Co.                           | 0.86¢/kWh          |
| 9           | Connecticut Light and Power Co. / United Illuminating | 0.99¢/kWh          |
| 10          | CPS Energy  | 1.00¢/kWh          |
| 10          | WPPI Energy   | 1.00¢/kWh          |

The average net premium for City of Ponca over 2012 was -0.08¢/kWh.

**Table C-5. Customer Participation Rate, December 2012**

| <b>Rank</b> | <b>Utility</b>                        | <b>Customer Participation Rate</b> |
|-------------|---------------------------------------|------------------------------------|
| 1           | City of Palo Alto (California)        | 18.2%                              |
| 2           | Portland General Electric             | 12.4%                              |
| 3           | Madison Gas & Electric Co.            | 9.4%                               |
| 4           | Sacramento Municipal Utility District | 9.2%                               |
| 5           | City of Naperville (Illinois)         | 7.6%                               |
| 6           | Pacific Power (Oregon)                | 7.6%                               |
| 7           | Silicon Valley Power                  | 6.9%                               |
| 8           | River Falls Municipal Utilities       | 6.1%                               |
| 9           | Stoughton Utilities                   | 5.1%                               |
| 10          | Cuba City Light & Water               | 5.0%                               |