



# Green Power Marketing in the United States: A Status Report (11th Edition)

Lori Bird, Claire Kreycik, and Barry Friedman

*Technical Report*  
NREL/TP-6A2-44094  
October 2008

NREL is operated for DOE by the Alliance for Sustainable Energy, LLC

Contract No. DE-AC36-08-GO28308



# Green Power Marketing in the United States: A Status Report (11th Edition)

Lori Bird, Claire Kreycik, and Barry Friedman

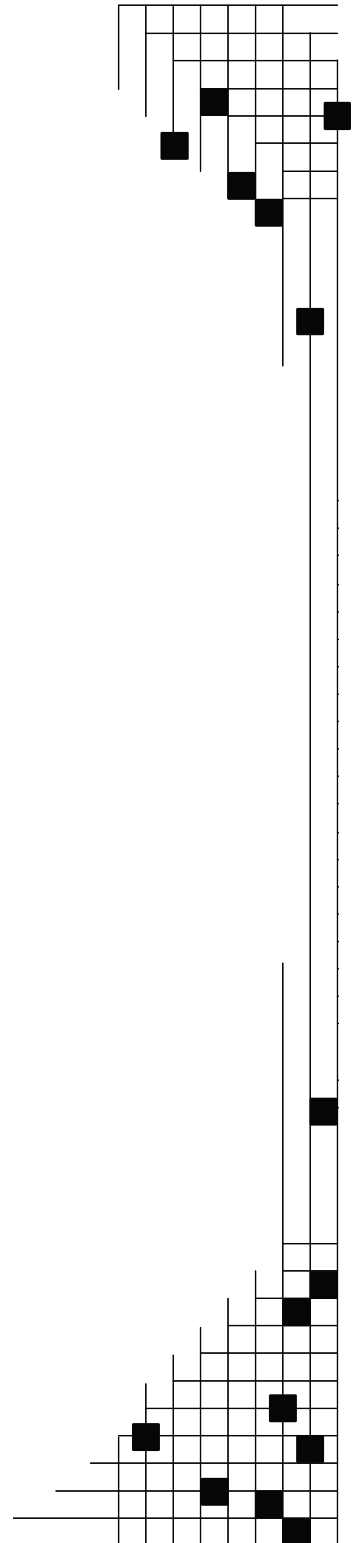
Prepared under Task No. SAO7.8730

*Technical Report*  
NREL/TP-6A2-44094  
October 2008

**National Renewable Energy Laboratory**  
1617 Cole Boulevard, Golden, Colorado 80401-3393  
303-275-3000 • [www.nrel.gov](http://www.nrel.gov)

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

Contract No. DE-AC36-08-GO28308



## 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.

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/ordering.htm>



## **Acknowledgments**

This work was funded by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE). The authors wish to thank Linda Silverman, John Atcheson, and EERE's Office of Planning, Budget and Analysis and the Weatherization and Intergovernmental Program (WIP) for their support of this work. The authors also wish to thank Alex Pennock and Andreas Karelas of the Center for Resource Solutions, Matt Clouse of the U.S. Environmental Protection Agency Green Power Partnership program, Adam Capage of 3Degrees, Inc., and Karlynn Cory of NREL for their thoughtful review of the document, as well as Jennifer Josey of NREL for her editorial support. Finally, the authors thank the many green power marketers and utility contacts that provided the information summarized in this report. Additional information on green power market trends and activities can be found on the U.S. DOE's Green Power Network Web site (<http://www.eere.energy.gov/greenpower/>).

## List of Acronyms

aMW	Average megawatt
DOE	Department of Energy
EEPS	Energy efficiency portfolio standards
EIA	Energy Information Administration
EPA	Environmental Protection Agency
ESC	Energy savings certificate
FCA	Fuel-cost adjustment
kWh	Kilowatt hour
M&V	Measurement and verification
MW	Megawatt
MWh	Megawatt hour
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
OG&E	Oklahoma Gas & Electric
PG&E	Pacific Gas & Electric
REC	Renewable energy certificate
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable portfolio standard
TRC	Tradable renewable certificates

## Table of Contents

List of Figures .....	vi
List of Tables .....	vi
Introduction.....	1
Green Power Market Summary and Trends.....	3
Green Power Sales .....	3
Customer Participation.....	5
Comparison of Voluntary and Compliance Markets .....	6
Utility Green Pricing Programs .....	8
Green Pricing Products and Premiums .....	9
Green Pricing Customer Participation .....	11
Green Pricing Renewable Energy Sales .....	12
Competitive Green Power and REC Markets .....	15
REC and Competitive Market Products and Pricing .....	16
REC and Competitive Market Customer Participation.....	18
REC and Competitive Market Green Power Sales .....	19
Voluntary Green Power Market Trends and Issues .....	21
Fuel Price Stability Benefits in Green Power Programs .....	21
Community Challenges.....	23
Emerging Markets for Energy Savings Certificates .....	23
Voluntary ESC Market Development.....	24
NYSERDA Pilot ESC Program.....	25
Other Voluntary Activity: IBM .....	26
Conclusions and Observations.....	27
References.....	28
Appendix A. Estimates of Renewable Energy Capacity Serving Green Power Markets, 2000-2004.....	30
Appendix B. Top 25 Purchasers in the U.S. EPA Green Power Partnership, July 2008.....	31
Appendix C. Estimated U.S. Green Pricing Customers by State and Customer Class, 2005 and 2006.....	32
Appendix D. Utilities Offering Green Pricing Programs in Regulated Markets, 2007 .....	34
Appendix E. Links to Utility Green Pricing Programs and REC and Competitive Market Green Power Offerings .....	36
Appendix F. Top Ten Utility Green Pricing Programs .....	37

## List of Figures

Figure 1. States with green power programs .....	2
Figure 2. Estimated green power sales by renewable energy source, 2007 .....	3
Figure 3. Comparison of voluntary and compliance markets for renewable energy .....	7
Figure 4. Utility green pricing activities .....	8
Figure 5. Trends in utility green pricing premiums, 2000-2007 .....	10
Figure 6. Annual sales of renewable energy through utility green pricing programs (regulated electricity markets only) .....	13
Figure 7. Green power marketing activity in competitive electricity markets .....	16

## List of Tables

Table 1. Estimated Green Power Sales by Market Sector, 2004-2007 .....	4
Table 2. Estimated Annual Green Power Sales by Customer Segment, 2005-2007 .....	4
Table 3. Estimated Annual Green Power Sales by Customer Segment and Market Sector, 2007 ..	5
Table 4. Estimated Cumulative Renewable Energy Capacity Supplying Green Power Markets, 2006-2007 .....	5
Table 5. Estimated Cumulative Green Power Customers by Market Segment, 2001-2007 .....	6
Table 6. Residential Price Premiums of Utility Green Power Products ( $\$/kWh$ ), 2000-2007 ..	10
Table 7. Estimated Cumulative Number of Customers Participating in Utility Green Pricing Programs (Regulated Electricity Markets Only).....	11
Table 8. Customer Participation Rates in Utility Green Pricing Programs (2001-2007). .....	12
Table 9. Annual Sales of Renewable Energy through Utility Green Pricing Programs (Regulated Electricity Markets Only), Millions of kWh .....	12
Table 10. Average Purchases of Renewable Energy per Customer (kWh per Year) .....	13
Table 11. Renewable Energy Generation and Capacity Supplying Green Pricing Programs (2007). 14	
Table 12. Renewable Energy Sales as a Percent of Utility Electricity Sales (2006-2007).....	14
Table 13. Total Sales of <i>Green-e Energy</i> Certified Renewable Energy, 2006 and 2007, Million kWh.....	18
Table 14. Estimated Cumulative Number of Customers Purchasing RECs or Green Power from Competitive Marketers, 2003-2007 .....	18
Table 15. Retail Sales of Renewable Energy in Competitive Markets and RECs (Million kWh)...	19
Table 16. Renewable Energy Sources Supplying Competitive and REC Markets, 2007.....	20
Table A-1. Estimated Cumulative New Renewable Energy Capacity Supplying Green Power Markets, 2000-2004 (Megawatts).....	30
Table B-1. Top 25 Purchasers in the U.S. EPA Green Power Partnership, July 2008 .....	31
Table C-1. Estimated U.S. Green Pricing Customers by State and Customer Class, 2005 and 2006 ..	32
Table C-2. Estimated U.S. Green Pricing Customers by Customer Class, 2002-2006 .....	33
Table D-1. Utilities Offering Green Pricing Programs in Regulated Markets, 2007 .....	34
Table D-2. Utility/Marketer Green Power Programs in Restructured Electricity Markets, 2007. 35	
Table F-1. Green Pricing Program Renewable Energy Sales (as of December 2007).....	37
Table F-2. Total Number of Customer Participants (as of December 2007) .....	38
Table F-3. Customer Participation Rate (as of December 2007). .....	39
Table F-4. Green Power Sales as Percentage of Total Retail Electricity Sales (as of December 2007)..	40
Table F-5. Price Premium Charged for New, Customer-Driven Renewable Power (as of December 2007).....	41

## Introduction

Voluntary consumer decisions to purchase electricity supplied from renewable energy sources represent a powerful market support mechanism for renewable energy development. Beginning in the early 1990s, a small number of U.S. utilities began offering “green power” options to their customers.<sup>1</sup> Since then, these products have become more prevalent, both from traditional utilities and from marketers operating in states that have introduced competition into their retail electricity markets. Today, more than half of all U.S. electricity customers have an option to purchase some type of green power product from a retail electricity provider.

Currently, more than 850 utilities, or about 25% of utilities nationally, offer green power programs to customers. These programs allow customers to purchase some portion of their power supply as renewable energy—almost always at a higher price—or to contribute funds for the utility to invest in renewable energy development. The term “green pricing” is typically used to refer to these utility programs offered in regulated or noncompetitive electricity markets.

In states with competitive (or restructured) retail electricity markets, electricity customers can often purchase 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.<sup>2</sup> To date, nearly a dozen states that have opened their markets to retail competition have experienced some green power marketing activity. Through the combination of utility green pricing and competitive retail markets, green power is available to most electricity customers living in 47 of the 50 U.S. states (Figure 1).

Finally, regardless of whether they have access to a green power product from their retail power provider, any consumer can purchase green power through renewable energy certificates (RECs), which represent the “attributes” of electricity generated from renewable energy-based projects. Consumers in competitive markets can also support renewable energy development through REC purchases without having to switch to an alternative electricity supplier. Today, several dozen companies actively market RECs to residential or business customers throughout the United States.

This report documents green power marketing activities and trends in the United States. First, we present aggregate green power sales data for all voluntary purchase markets across the United States. The next two sections provide summary data on 1) utility green pricing programs offered in regulated electricity markets and 2) green power marketing activity in competitive electricity markets, as well as green power sold to voluntary purchasers in the form of RECs. These are followed by a discussion of key market trends and issues. The final section offers conclusions

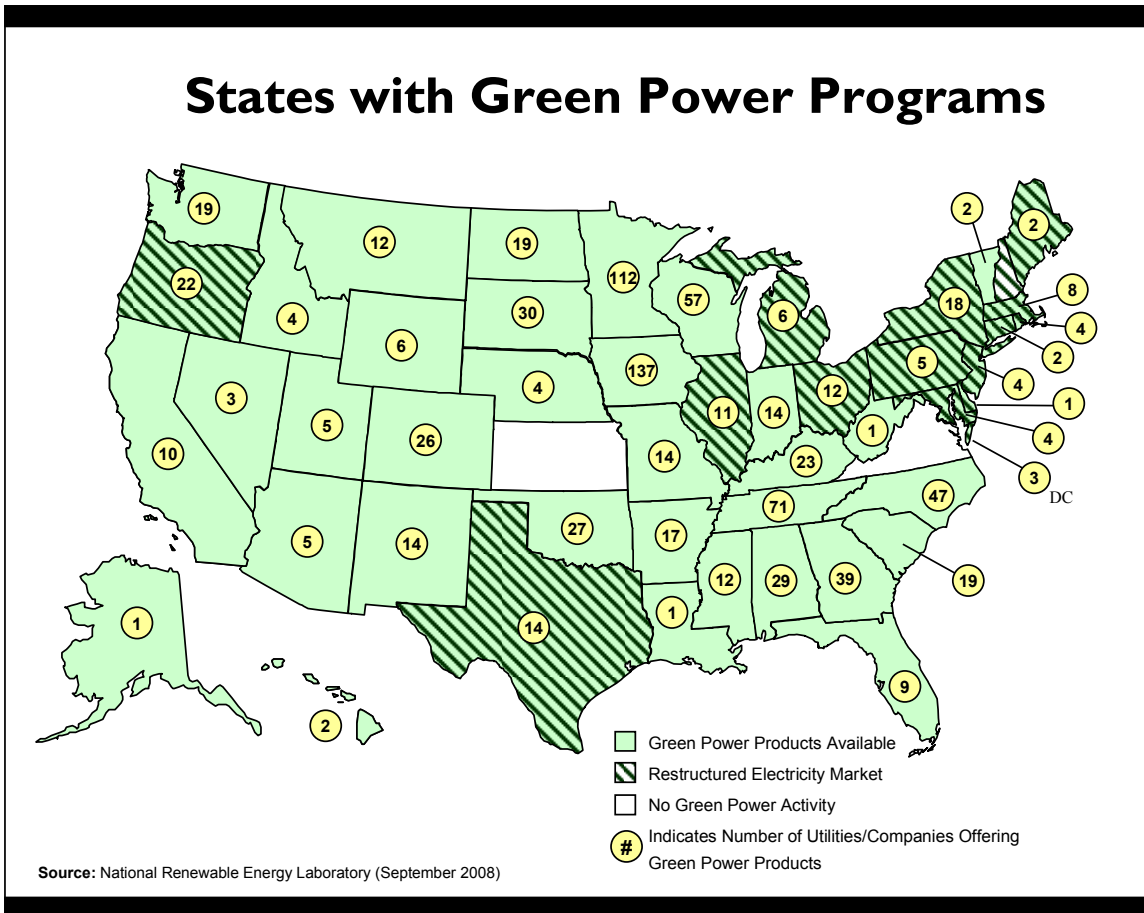
---

<sup>1</sup> The term “green power” generally refers to electricity supplied in whole or in part from renewable energy sources, such as wind and solar power, geothermal, hydropower, and various forms of biomass.

<sup>2</sup> Under these programs, consumers can purchase renewable energy from independent renewable energy marketing companies without switching their electricity service from the default or standard offer service provider.



and observations. The data presented in this report are based on figures provided to NREL by utilities and independent renewable energy marketers.<sup>3</sup>



**Figure 1. States with green power programs**

<sup>3</sup> Green power market data for previous years are available in Bird et al. (2007), Bird and Swezey (2006), Bird and Swezey (2005a), Bird and Swezey (2004), Bird and Swezey (2003), Swezey and Bird (2000), and Swezey and Bird (1999).

## Green Power Market Summary and Trends

### Green Power Sales

Overall, retail sales of renewable energy in voluntary purchase markets totaled about 18 billion kilowatt-hours (kWh) in 2007, or about 0.5% of total U.S. electricity sales.<sup>4</sup> This includes sales of renewable energy derived from both “new” and “existing” renewable energy sources, with most sales supplied from new sources.<sup>5</sup> In 2007, about 80% of renewable energy sold into voluntary purchase markets was supplied from new renewable energy sources.<sup>6</sup>

Wind energy represented 55% of total green power sales, followed by biomass energy sources, including landfill gas (28%), hydropower (11%), geothermal (3%), solar (<1%), and unknown sources (2.5%) (Figure 2). Based on the sales data presented in this report, we estimate the market value of green power sales in 2007 to be between \$85 million and \$125 million.

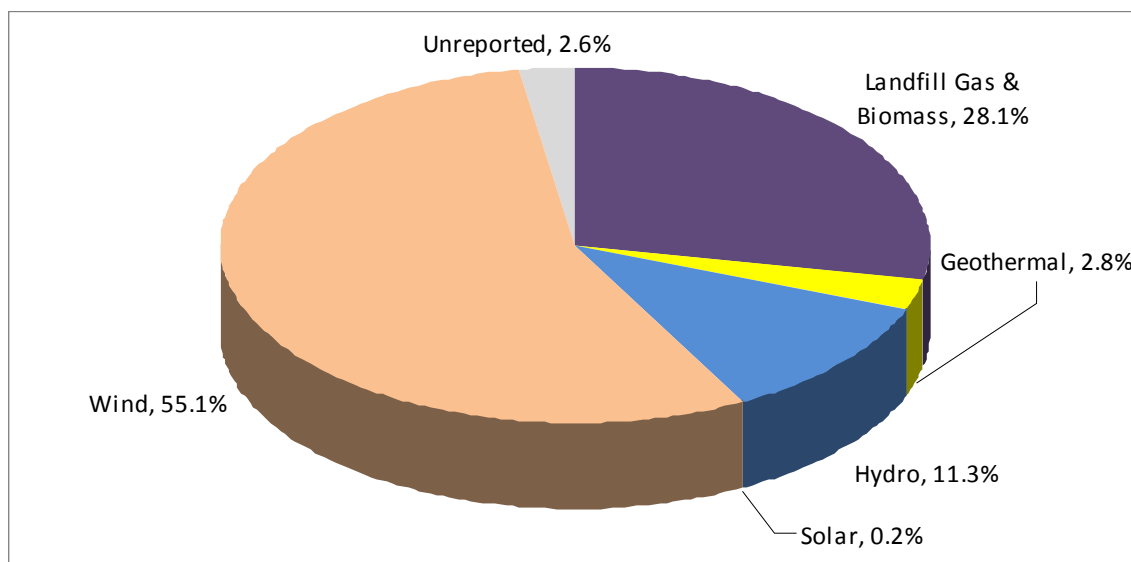


Figure 2. Estimated green power sales by renewable energy source, 2007

Green power sales (in kWh) increased by more than 50% in 2007, with annual growth rates averaging 43% since 2004 (Table 1). REC sales have been driving much of the growth,

<sup>4</sup> U.S. electricity sales totaled 3,670 billion kWh in 2006 (2007 data are not yet available), according to the U.S. Energy Information Administration (EIA). See <http://www.eia.doe.gov/cneaf/electricity/epa/epat7p2.html>. The remaining renewable energy generation is rate-based by utilities or used to meet renewable portfolio standards.

<sup>5</sup> With green power, a distinction is often made based on the vintage of the renewable energy generator. The green power industry generally follows the *Green-e Energy* national standard, which defines a “new” renewable generation facility as one placed in operation or repowered on or after January 1, 1997. Therefore, an “existing” generation facility is one placed in service before January 1, 1997. For more information on the *Green-e Energy* national standard, see [http://www.green-e.org/getcert\\_re\\_stan.shtml](http://www.green-e.org/getcert_re_stan.shtml).

<sup>6</sup> Estimates presented in this report are primarily based on data provided by utilities and marketers and supplemented with other available data. Because we are unable to obtain data from all market participants, the estimates presented here likely underestimate the size of the entire market.

increasing 55% in 2007. Overall, REC markets represent more than half of industry sales.<sup>7</sup> Sales in competitive markets grew substantially in 2007, although some of this difference may be attributed to data gaps that resulted in an underestimate of 2006 competitive market sales. Green pricing programs are growing more slowly than the other market segments.

Sales to nonresidential customers continued to outpace those to residential consumers, with three-quarters of all sales by volume to the nonresidential sector in 2007 (Table 2). Nearly all REC sales were to nonresidential customers, while residential customers played a larger role in green pricing programs and competitive markets, where they accounted for more than 50% of renewable energy sales (Table 3).

**Table 1. Estimated Annual Green Power Sales by Market Sector, 2004-2007\***  
(Millions of kWh)

Market Sector	2004	2005	2006	2007	% Change 2004/2005	% Change 2005/2006	% Change 2006/2007
Utility Green Pricing	1,800	2,500	3,400	4,300	33%	39%	25%
Competitive Markets	2,700	2,200	1,700**	3,200	-19%	-20%**	88%**
REC Markets***	1,700	3,900	6,800	10,600	126%	75%	55%
<b>Retail Total</b>	<b>6,200</b>	<b>8,500</b>	<b>11,900</b>	<b>18,100</b>	<b>37%</b>	<b>41%</b>	<b>53%</b>

\*Includes sales of new and existing renewable energy. Totals and growth rates may not calculate due to rounding.

\*\*2006 sales figures may be underestimated because of data gaps.

\*\*\*Includes only RECs sold to end-use customers separate from electricity.

**Table 2. Estimated Annual Green Power Sales by Customer Segment, 2005-2007\***  
(Millions of kWh)

Customer Segment	2005	2006	2007	%Change 2005/2006	%Change 2006/2007
Residential	3,000	3,200	4,500	8%	39%
Nonresidential	5,500	8,700	13,600	58%	56%
<b>Total</b>	<b>8,500</b>	<b>11,900</b>	<b>18,100</b>	<b>41%</b>	<b>53%</b>
% Nonresidential	65%	73%	75%	--	--

\*Totals and growth rates may not compute due to rounding.

At the end of 2007, kWh-sales of renewable energy in voluntary markets represented a generating capacity equivalent of about 5,100 MW, with about 4,300 MW of that from “new” renewable energy sources (Table 4). Since 2000, the amount of renewable energy capacity serving green power markets has increased more than 30-fold (see Appendix A).

<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 these other categories.

**Table 3. Estimated Annual Green Power Sales by Customer Segment and Market Sector, 2007  
(Millions of kWh)**

Customer Segment	Green Pricing	Competitive Markets	REC Markets	Total
Residential	2,600	1,800	60	4,500
Nonresidential	1,600	1,400	10,500	13,600
<b>Total</b>	<b>4,300</b>	<b>3,200</b>	<b>10,500</b>	<b>18,100</b>
% Residential	60%	56%	1%	25%

Note: Totals may not add due to rounding.

**Table 4. Estimated Cumulative Renewable Energy Capacity Supplying Green Power Markets, 2006-2007 (Megawatts)**

Market	2006 Total Renewables Capacity	2006 "New" Renewables Capacity	2007 Total Renewables Capacity	2007 "New" Renewables Capacity
Utility Green Pricing	1,100	1,000	1,400	1,300
Competitive Markets/RECs	2,400	2,100	3,700	3,000
<b>Total</b>	<b>3,500</b>	<b>3,100</b>	<b>5,100</b>	<b>4,300</b>

Note: "New" renewables capacity is a subset of total renewables capacity supplying green power markets.

## Customer Participation

In 2007, an estimated 860,000 electricity customers nationally purchased green power products through regulated utility companies, from green power marketers in a competitive market setting, or in the form of RECs (Table 5).<sup>8</sup> In aggregate, utility green pricing programs have shown continued growth in customers over time as the number of utility programs has increased and as existing programs have grown; however, growth in 2007 was slower than in previous years. On the other hand, competitive markets have been less consistent. While green power sales have grown in Texas and some northeast states, other markets have failed—notably in California and most recently, Pennsylvania. While REC customers represent a small fraction of the total customer base, REC sales represent more than half of all green power sales and have grown dramatically in recent years as a result of a number of very large purchases (see Appendix B for a list of top green power purchasers).

<sup>8</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 2005 and 2006, see data from U.S. EIA 2007 in Appendix C. 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% to 2%).

**Table 5. Estimated Cumulative Green Power Customers by Market Segment, 2001-2007**

	2001	2002	2003	2004	2005	2006	2007
Utility Green Pricing	170,000	230,000	270,000	330,000	390,000	490,000	550,000
Competitive Markets	>110,000	~150,000	>170,000	>140,000	>180,000	~210,000	300,000
REC Markets*	--	< 10,000	< 10,000	< 10,000	< 10,000	~10,000	>10,000
<b>Retail Total</b>	<b>&gt;280,000</b>	<b>~390,000</b>	<b>~450,000</b>	<b>~480,000</b>	<b>~580,000</b>	<b>~710,000</b>	<b>~860,000</b>
<b>% Change</b>	<b>~-3%</b>	<b>~-39%</b>	<b>~-15%</b>	<b>~-7%</b>	<b>~-21%</b>	<b>~-22%</b>	<b>~-21%</b>

Note: 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.

\*Includes only end-use customers purchasing RECs separate from electricity.

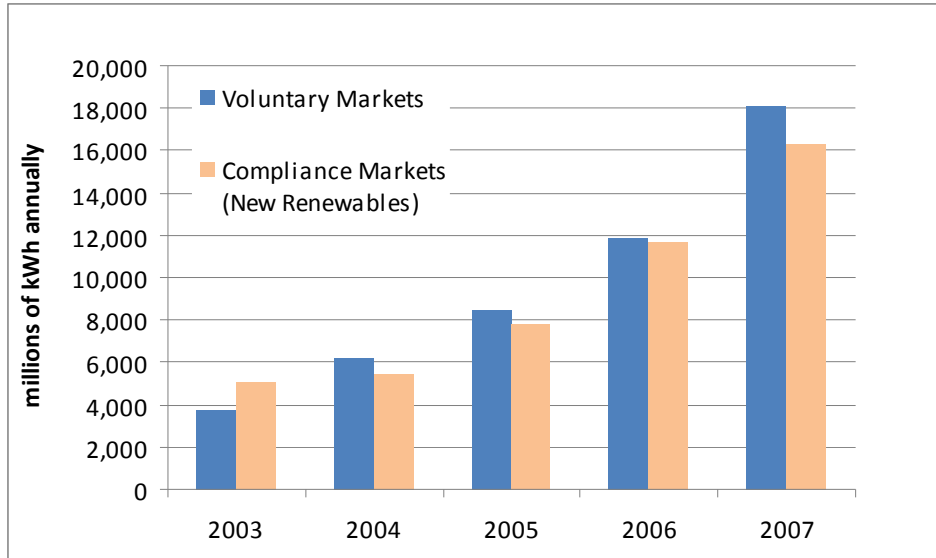
Average participation rates among utility green pricing programs increased slightly to 2.0% in 2007, with a median value of 1.3%; top performing programs have achieved rates ranging from 5% to 20%. Competitive markets have experienced green power customer penetration rates ranging from 1% to 2% in states where the market has been conducive to retail competition. However, participation in competitive markets has been subject to market conditions and rules and has been more volatile than in traditionally regulated markets.

### Comparison of Voluntary and Compliance Markets

In 27 states and the District of Columbia, renewable portfolio standard (RPS) policies require that utilities or load-serving entities include a certain percentage of renewable energy within their power generation mix; the percentages required and eligibility requirements vary among the states. Eligible renewable energy may either be purchased by load serving entities to meet their RPS requirements, or may be purchased by consumers or businesses wishing to buy renewable energy on a voluntary basis, but green power certification programs and state RPS policy rules generally ensure that there is no double counting between the two markets (i.e., that the same kWh is not used for more than one purpose).

In 2007, state RPS policies collectively called for utilities to procure about 16 billion kWh of new renewable energy generation (Barbose 2008), compared to about 18 billion kWh sold into the voluntary green power market.<sup>9</sup> Figure 3 shows that voluntary market demand for renewables has exceeded compliance market demand since 2004. By 2010, RPS policies collectively call for utilities to obtain more than 60 billion kWh of new renewables, rising to 91 billion kWh in 2012; it is unclear whether the voluntary market will continue to outpace this compliance demand.

<sup>9</sup> While RPS policies generally allow pre-existing renewable energy generation sources (i.e., those installed prior to 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.



**Figure 3. Comparison of voluntary and compliance markets for renewable energy**  
 Note: Compliance market data sourced from Lawrence Berkeley National Laboratory (LBNL)(Barbose 2008).

## Utility Green Pricing Programs

This section provides information specific to utility green pricing programs, a subset of the entire market. The number of utilities offering green pricing has grown steadily in recent years—today, more than 850 investor-owned, public, and cooperative utilities in most states offer green pricing programs (Figure 4). Appendix D provides a list of utilities offering green pricing while Appendix E provides Web links to all green power product offerings.<sup>10</sup> Because a number of small municipal or cooperative utilities offer programs developed by their power suppliers, the number of distinct green pricing programs is about 150. Initially, some portion of the growth in utility green power offerings was attributable to the threat of retail market competition, while more recent growth has been spurred by state laws requiring utilities to offer green pricing and utility interest in offering clean energy options.<sup>11</sup>

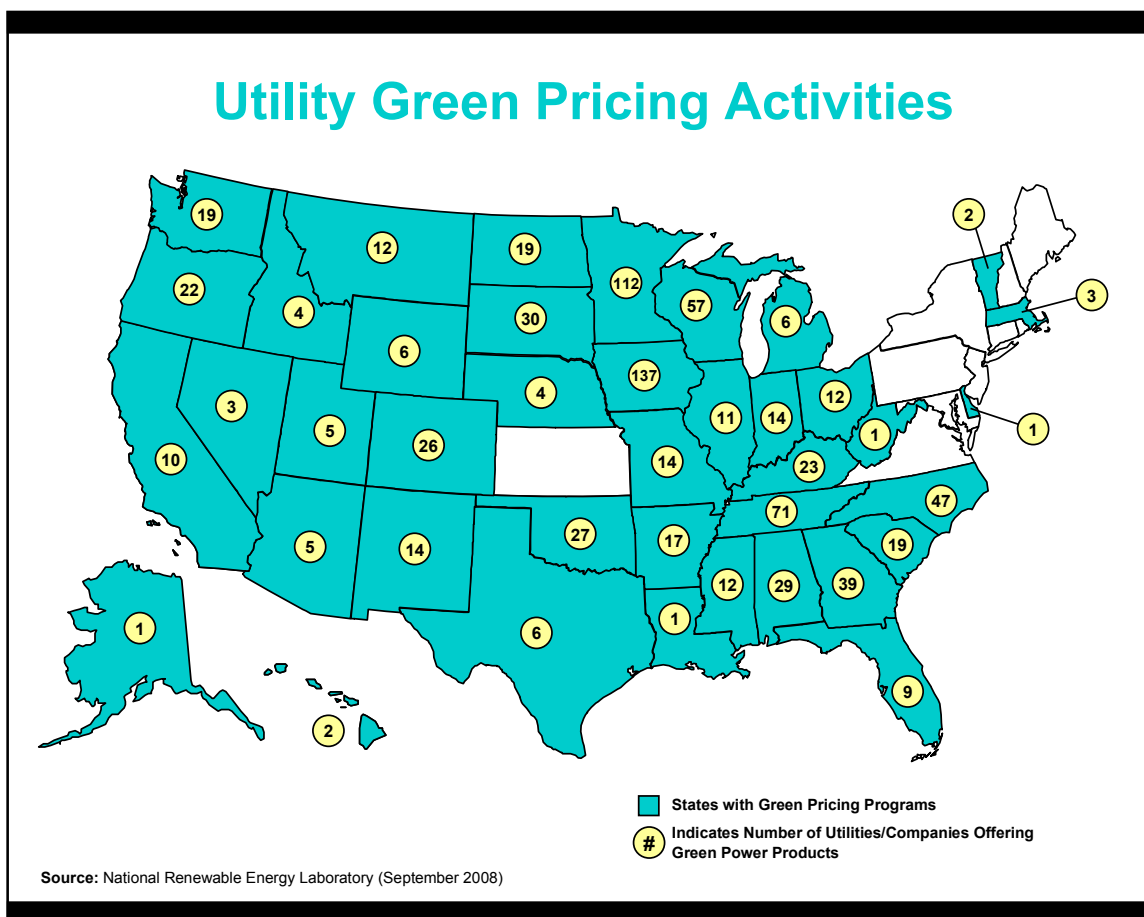


Figure 4. Utility green pricing activities

<sup>10</sup> For an up-to-date list of utilities with green pricing programs, see the U.S. Department of Energy’s Green Power Network Web site at <http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=1>.

<sup>11</sup> These states include Colorado, Iowa, Minnesota, Montana, New Mexico, Oregon, Vermont, and Washington.

## 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 purchase 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 a smaller fraction of their electricity use.

In 2007, the price of green power for residential customers in utility programs ranged from 0.09¢/kWh to 7.5¢/kWh above standard electricity rates, with an average premium of 1.9¢/kWh and a median of 1.5¢/kWh. These premiums have been adjusted to account for any fuel cost exemptions granted to green power program participants.<sup>12</sup> In 2007, the utility programs with the lowest premiums for energy derived from new renewable sources had premiums ranging from 0.09¢/kWh to 0.8¢/kWh. On average, consumers spend about \$6 per month above standard electricity rates for green power through utility programs.

Since 2000, the average price premium has dropped at an average annual rate of 9% (Table 6). Some of this reduction can be attributed to lower market costs for renewable energy supplies. Increases in the price of natural gas have narrowed the price gap between renewables and gas-fired generation alternatives, leading to lower initial premiums for many new programs; however, they have also reduced the effective premiums in programs that exempt participating customers from fuel-related price increases. In addition, a number of utilities have lowered their premiums over time to reflect changing market conditions. Despite the downward trend in premiums, installation costs are increasing for new renewable energy facilities, largely as a result of rising commodity prices, which may affect premiums in coming years.

---

<sup>12</sup> For example, some utilities exempt green pricing customers from monthly or periodic fuel charges imposed to pay higher than expected fossil-fuel costs. For a more detailed discussion of this topic, see Bird et al. (2008).

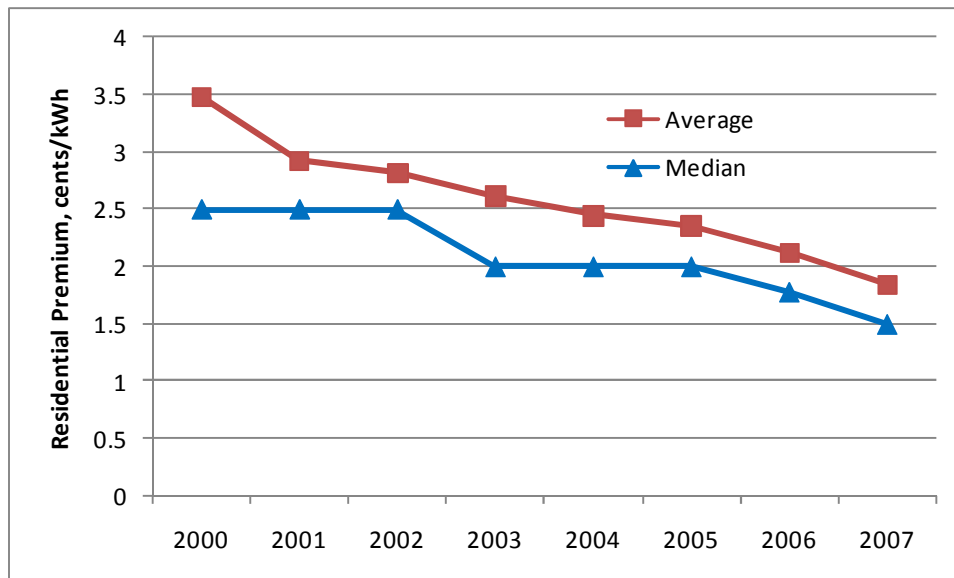


**Table 6. Residential Price Premiums of Utility Green Power Products (¢/kWh), 2000-2007**

	2000	2001	2002	2003	2004	2005	2006	2007*
Average Premium	3.48	2.93	2.82	2.62	2.45	2.36	2.12	1.85
Median Premium	2.50	2.50	2.50	2.00	2.00	2.00	1.78	1.50
Range of Premiums	(0.5)- 20.0	0.9- 17.6	0.7- 17.6	0.6- 17.6	0.33 - 17.6	(0.7)- 17.6	(0.1)- 17.6	0.09- 7.50
10 Programs with Lowest Premiums**	(0.5)- 2.5	1.0-1.5	0.7-1.5	0.6-1.3	0.33- 1.0	(0.7)- 0.9	(0.1)- 1.0	0.09-0.8
Number of Programs Represented	50	60	80	91	101	104	97	71

\*In 2007, calculations of premiums were based on programs that responded to the questionnaire. In previous years, a larger sample of programs was used to calculate the premium, as data were available.

\*\*Represents the 10 utility programs with the lowest price premiums for new customer-driven renewable energy. This includes only programs that have installed—or announced firm plans to install or purchase power from—new renewable energy sources. In 2001 the discrepancy between the low end of the range for all programs and the Top 10 programs results from the program with the lowest premium (0.9¢/kWh) not being eligible for the Top 10 because it was either selling some existing renewables or had not installed any new renewable capacity for its program.



**Figure 5. Trends in utility green pricing premiums, 2000-2007**

## Green Pricing Customer Participation

At the end of 2007, more than 540,000 customers were participating in utility green pricing programs in regulated electricity markets (Table 7).<sup>13</sup> As in the past, a relatively small number of green power programs account for the majority of customers, with just 10 programs accounting for 60% of all participants (Appendix F).<sup>14</sup> From 2001 to 2007, the number of customer participants increased more than threefold, but growth in the number of new customers slowed in 2007 compared to rates exhibited in previous years.

**Table 7. Estimated Cumulative Number of Customers Participating in Utility Green Pricing Programs (Regulated Electricity Markets Only)**

Customer Segment	2001	2002	2003	2004	2005	2006	2007
Residential	166,300	224,500	258,700	323,700	383,400	470,800	526,700
Nonresidential	2,500	3,900	6,500	8,100	11,300	15,500	20,200
<b>Total</b>	<b>168,800</b>	<b>228,400</b>	<b>265,200</b>	<b>331,800</b>	<b>394,700</b>	<b>486,300</b>	<b>546,900</b>
<b>% Total Annual Growth</b>	<b>27%</b>	<b>35%</b>	<b>16%</b>	<b>25%</b>	<b>19%</b>	<b>23%</b>	<b>12%</b>
% Residential Growth	27%	35%	15%	25%	18%	23%	12%
% Nonresidential Growth	47%	56%	67%	25%	40%	37%	30%

Table 7 delineates residential and nonresidential customer participation in utility green pricing programs over time. The vast majority of participants are residential customers, with nonresidential customers accounting for only 4% of all participants. However, nonresidential participation is growing at a faster rate than residential participation, which is having a significant positive impact on overall sales volume because of the larger size of nonresidential purchases.

At the end of 2007, the average participation rate in utility green pricing programs among eligible utility customers was 2.0%, with a median of 1.3% (Table 8). These industry-wide rates have shown very little change in recent years. The overall lack of improvement in participation rates results from a number of factors, including a lack of customer awareness of the green power program,<sup>15</sup> customer unwillingness to pay a premium for green power, customer uncertainty regarding the actual benefits of the program, and varied levels of interest among utilities in marketing and promoting the program (Holt and Holt 2004, Swezey and Bird 2001). However, the top performing programs continue to show improvement, with participation rates

<sup>13</sup> NREL obtained consumer response data for about 60% of utility green pricing programs in 2007, including all of the major programs. The remaining programs, which are smaller in size, do not have a large impact on overall participant numbers.

<sup>14</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 renewables development. These lists can be found at <http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=3>.

<sup>15</sup> A number of utilities have reported that only 20% to 30% of their customers are aware that a green power option is offered.

ranging from about 5% to 20% in 2007, compared to a range of 3% to 6% in 2002. The 20% participation threshold was exceeded for the first time in 2007.

**Table 8. Customer Participation Rates in Utility Green Pricing Programs, 2001-2007**

<b>Participation Rate</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Average	1.3%	1.2%	1.2%	1.3%	1.5%	1.8%	2.0%
Median	0.7%	0.8%	0.9%	1.0%	1.0%	1.0%	1.3%
Top 10 Programs	3.0% - 7.0%	3.0% - 5.8%	3.9% - 11.1%	3.8% - 14.5%	4.6% - 13.6%	5.1% - 16.9%	5.2%- 20.4%

In 2007, utilities reported that an average and a median of 8% of customers dropped out of green pricing programs. While these figures are higher than drop-out rates reported in 2006, retention is still relatively high despite the fact that electricity and energy prices have remained high in most regions of the country. This finding suggests that customers tend to be “sticky” and maintain participation in green power programs, despite electricity and other energy cost increases.

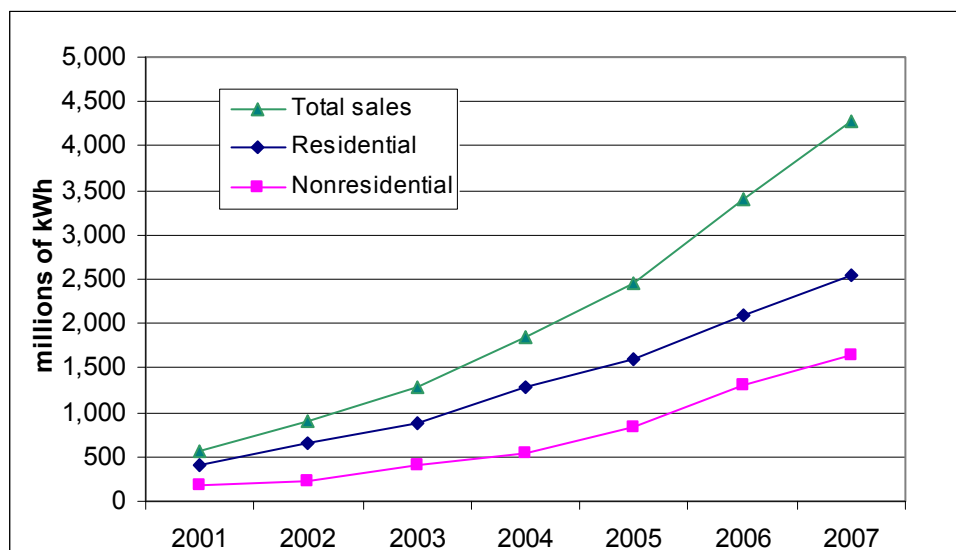
### **Green Pricing Renewable Energy Sales**

Utility green pricing sales continue to exhibit reasonably strong growth, but slower than in previous years. Collectively, utilities in regulated electricity markets sold about 4.3 billion kWh of green power to customers in 2007 (Table 9). Green pricing program sales to all customer classes grew by 26% in 2007, compared to rates ranging from 33% to 56% in recent years (Table 9; Figure 6). Sales growth is attributed to both continued expansion of the green power customer base, particularly increases in the number of nonresidential customers, and larger purchases (Table 10). About 95% of the renewable energy sold to consumers through green pricing programs was supplied from projects meeting the generally accepted industry definition of “new.”

**Table 9. Annual Sales of Renewable Energy through Utility Green Pricing Programs (Regulated Electricity Markets Only), Millions of kWh**

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Sales to Residential customers	661	874	1,295	1,606	2,103	2,554
Sales to Nonresidential customers	234	410	544	842	1,302	1,633
<b>Total Sales to All customers</b>	<b>895</b>	<b>1,284</b>	<b>1,839</b>	<b>2,448</b>	<b>3,404</b>	<b>4,287</b>
<b>% Annual Growth in Total Sales</b>	<b>56%</b>	<b>43%</b>	<b>43%</b>	<b>33%</b>	<b>39%</b>	<b>26%</b>
% Nonresidential of Total Sales	26%	32%	30%	34%	38%	38%

Note: Totals may not add due to rounding.



**Figure 6. Annual sales of renewable energy through utility green pricing programs (regulated electricity markets only)**

**Table 10. Average Purchases of Renewable Energy per Customer (kWh per Year)**

	2002	2003	2004	2005	2006	2007
Residential Customers	2,900	3,400	4,000	4,200	4,400	4,900
Nonresidential Customers	60,000	63,100	67,200	74,500	85,700	77,400
All Customers	3,900	4,800	5,500	6,200	6,700	7,400

Renewable energy sold through green pricing programs in 2007 represents an equivalent renewable energy capacity of nearly 1,400 MW, with more than 1,300 MW of this represented by “new” renewable energy resources (Table 11). Wind, solar, landfill gas, and other forms of biomass are the renewable resources most commonly included in utility programs, although solar, in particular, may be used to supply a small fraction of kWh-sales. Wind energy represents the largest portion of the total capacity. In 2006, sales of renewable energy through green pricing programs represented more than 1,100 MW of renewable energy capacity, with about 1,000 MW of that from new renewable energy sources. In 2005, green pricing sales represented about 800 MW of renewable energy capacity, with about 740 MW of that from “new” renewable energy sources. Appendix A presents estimates of new capacity serving green pricing programs in earlier years.

**Table 11. Renewable Energy Generation and Capacity Supplying Green Pricing Programs (2007)**

	Landfill Gas	Other Biomass	Geo-thermal	Hydro	Solar	Wind	Unknown	Total
Sales MWh	301,000	363,000	175,000	66,000	12,200	3,238,000	133,000	4,287,000
% of Total Sales	7%	8%	4%	2%	0.3%	76%	3%	100%
Total MW	38	52	22	15	7	1232	30	1,396
MW New RE	35	35	22	2	7	1229	--	1,329

In 2007, green power sales represented a small but increasing proportion of a utility company's overall energy sales. Table 12 shows that, on average, renewable energy sold through green pricing programs represented less than 1% of total utility electricity sales (on a kWh basis) in 2007, while a few utilities reported fractions as high as about 5% to 6% of total retail electricity sales. On a residential basis, green power sales represented a higher fraction of total utility electricity sales, with one utility reporting a fraction as high as 17%.

**Table 12. Renewable Energy Sales as a Percent of Utility Electricity Sales (2006-2007)**

Customer Class	2006			2007		
	Avg.	Med.	Range	Avg.	Med.	Range
Residential	1.0%	0.4%	0% - 13.4%	1.4%	0.6%	0% - 17.4%
Nonresidential	0.4%	0.1%	0% - 6.6%	0.5%	0.2%	0% - 6.3%
All customers	0.5%	0.3%	0% - 5.2%	0.8%	0.3%	0% - 5.7%

## Competitive Green Power and REC Markets

This section provides greater detail on green power sold in competitive (or restructured) electricity markets as well as in the form of RECs—subsets of the entire green power market. About one-third of U.S. states have restructured their electricity markets to introduce retail service competition. Currently, electricity consumers in the following states can purchase competitively marketed green power: Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Texas, and the District of Columbia (Figure 7).<sup>16,17</sup> Competitively marketed green power offerings are also available to nonresidential consumers in a few other states.

Initially, buying green power in competitive retail markets entailed switching electricity service from the incumbent utility to a green power supplier. However, with few exceptions, green power marketers have found it difficult to compete or to persuade customers to switch suppliers. As a remedy, a number of states now require default suppliers (which are often the incumbent distribution utilities) to offer green power options to their customers. These load serving entities typically provide customers with underlying electricity generation, combined with a choice of several green products offered by competing green power marketers. In addition, several utility suppliers have voluntarily teamed with a single green power marketer to offer a green power option to their customers. Utility/marketer partnership programs are now offered in Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, and Rhode Island.

RECs provide another alternative to switching electricity suppliers. Also known as “green tags” or tradable renewable certificates (TRCs), RECs represent the “green” attributes of renewable energy generation and can be sold separately from commodity electricity. REC-based products may be supplied from a variety of renewable energy sources throughout the country and sold to customers nationally, or they may be supplied from renewable energy sources in a particular region or locality and marketed as such to local customers. More than 25 companies offer certificate-based green power products to retail customers via the Internet, and a number of other companies market RECs solely to commercial and industrial customers.<sup>18</sup>

RECs are also sold in the wholesale market and are frequently used by utilities and marketers who bundle RECs with commodity electricity to sell green power to retail customers. In fact, RECs are used to supply most of the programs where default suppliers have teamed with green

---

<sup>16</sup> For an up-to-date list of products offered by competitive green power marketers, see the U.S. Department of Energy’s Green Power Network Web site at:

<http://apps3.eere.energy.gov/greenpower/markets/marketing.shtml?page=1>.

<sup>17</sup> We do not include Oregon and Virginia in this list. In Oregon, only large commercial and industrial customers are able to switch to competitive green power providers; residential and small commercial customers have access to green power options offered by the incumbent utilities, which we categorize as green pricing. In Virginia, at least one retail electricity provider provided green power options in 2007 and earlier, but does not do so currently.

<sup>18</sup> For an up-to-date list of companies offering REC-based green power products, see the U.S. Department of Energy’s Green Power Network Web site at:

<http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=1>. For a list of REC suppliers serving commercial or wholesale customers, see:

<http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=4>.

power marketers. Therefore, it can be difficult to distinguish REC products from other green power offerings. This is particularly true when REC products are supplied from renewable sources located in the same region where they are marketed.

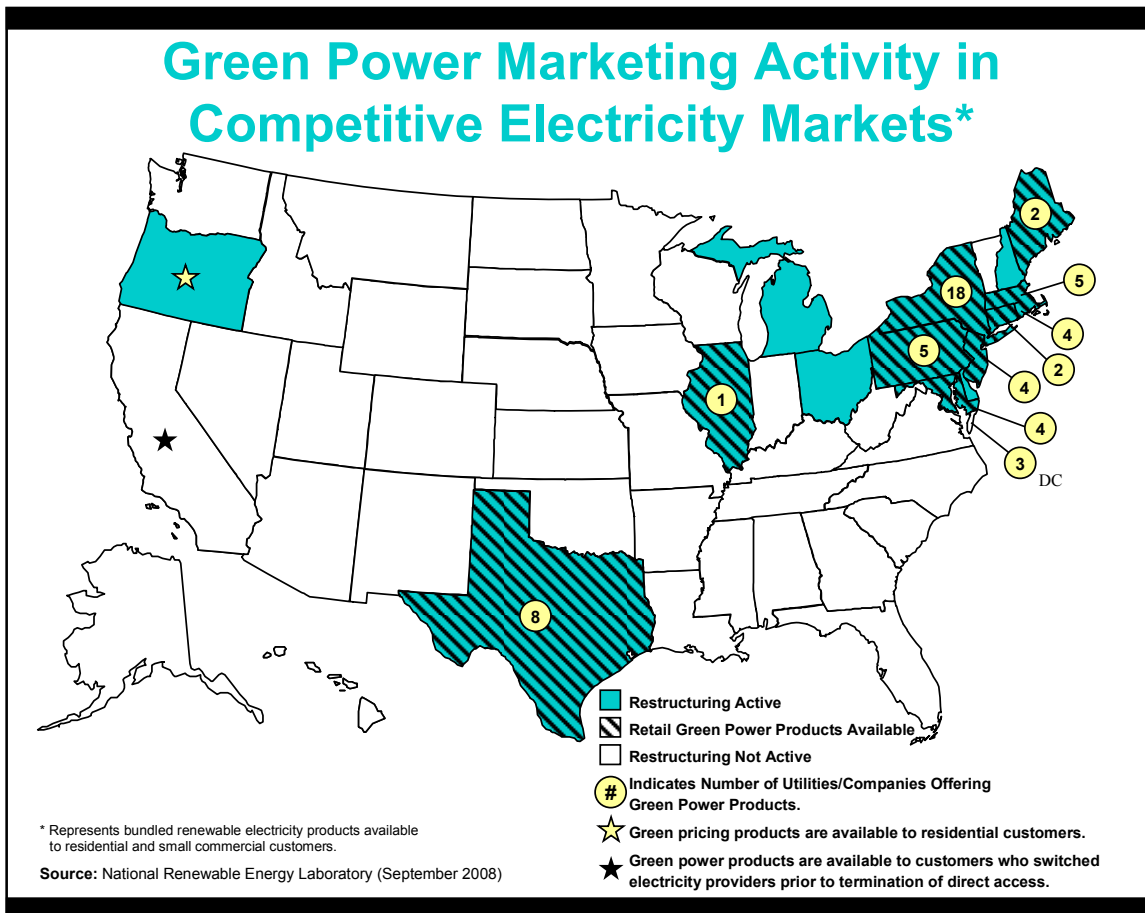


Figure 7. Green power marketing activity in competitive electricity markets

### REC and Competitive Market Products and Pricing

Green power products offered in competitive markets tend to differ from those offered by utilities in regulated markets as they may contain a mix of electricity generated from new and preexisting renewable energy projects, whereas utility green pricing programs generally utilize only “new” renewable energy supplies. One reason for this difference is that competitive suppliers are subject to price competition, and existing resources are typically available at lower costs. Also, when markets initially opened to competition, green power marketers often were forced to offer existing renewables because of a lack of “new” renewable energy supplies.

As new renewable energy facilities have come online, the fraction of new renewables in competitive retail products has increased; in 2007, about 75% of competitive market and REC sales were supplied from new renewable energy sources. This movement toward increased reliance on new renewables has also been encouraged by green power product certification programs, which set standards for product quality, and have required increasing amounts of

“new” renewables. Beginning January 1, 2007, the *Green-e Energy* certification program began requiring that all certified products be supplied exclusively from “new” renewable energy projects.<sup>19</sup> *Ecopower*, the Environmental Resources Trust certification program, also requires “new” renewable projects. Similarly, the U.S. Environmental Protection Agency’s (EPA) Green Power Partnership now requires its partners to purchase “new” renewables to meet its minimum purchase criteria.<sup>20</sup>

The price premium charged for competitive market products depends on several factors such as the price of standard offer or default service, the availability of incentives to green power marketers or suppliers, and the cost of renewable energy generation available in the regional market. Some marketers have charged prices close to or even below the default market price in recent years (e.g., in Texas); 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 of between 1¢/kWh and 2.5¢/kWh for residential and small commercial customers, although offerings have ranged from discounts to a premium of about 10¢/kWh in recent years. 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.

Similar to competitively marketed products, retail prices charged for REC products typically range from about 1¢/kWh to 2.5¢/kWh for residential and small commercial customers, although some are priced as high as 5.0¢/kWh. In most cases, larger 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.

REC purchasers often seek certification out of concerns over “double counting” and to ensure a level of oversight and auditing because RECs are generally not subject to the same regulatory scrutiny as electricity and mandatory renewable requirements. Table 13 shows *Green-e Energy* certified retail and wholesale transactions in 2006 and 2007. Because some kWh of renewable energy are certified at more than one level—both at the retail and wholesale levels—we adjust the *Green-e Energy* data when determining the fraction of the overall market that is *Green-e Energy* certified. According to *Green-e Energy*, about 12.1 million kWh of renewable energy was certified in 2007, when adjusted for kWh of renewable energy certified at more than one level. Based on this figure, about two-thirds of the kWh that are sold retail in the overall green power market are *Green-e Energy* certified at some level (Karelas 2008). Also, note that the *Green-e Energy* and NREL REC figures differ because some of the wholesale *Green-e Energy* certified RECs are used to supply green pricing programs or competitively marketed retail products, and are counted in the other categories in the NREL figures.

---

<sup>19</sup> Administered by the San Francisco-based Center for Resource Solutions, the *Green-e Energy* program certifies retail and wholesale green power products that meet its environmental, product content, and marketing standards. For details on the *Green-e Energy* National Standard, see the *Green-e* Web site at: <http://www.green-e.org/>.

<sup>20</sup> See the EPA’s Green Power Web site at: <http://www.epa.gov/greenpower>.



**Table 13. Total Sales of Green-e Energy Certified Renewable Energy, 2006 and 2007, Million kWh**

Year	Residential		Commercial		Wholesale		Total	
	2006	2007	2006	2007	2006	2007	2006	2007
RECs	39	82	3,495	7,305	5,223	6,468	8,757	13,855
Green Pricing	484	834	125	367	0	0	609	1,201
Competitive Electricity	84	148	273	250	148	239	505	637
<b>Total</b>	<b>607</b>	<b>1,064</b>	<b>3,893</b>	<b>7,922</b>	<b>5,371</b>	<b>6,707</b>	<b>9,871</b>	<b>15,693</b>

Source: Center for Resource Solutions 2007; Karelis 2008

### REC and Competitive Market Customer Participation

Based on data received from green power marketers, we estimate that about 310,000 retail customers were purchasing green power from competitive suppliers or as unbundled RECs at the end of 2007 (Table 14). This number includes nearly 125,000 participants in utility/marketer programs available in competitive markets. The number of customers participating in utility/marketer programs grew faster than utility green pricing programs as a whole (52% compared to 12%, respectively), likely because many of these programs are still relatively new.

In competitive markets, the vast majority of customers purchasing green power are residential customers. Of the approximately 310,000 retail customers, more than 13,000 purchase REC-only products. While most of the REC purchasers are also residential customers, the vast majority of REC sales on a kWh-basis are made to nonresidential customers due to the much larger purchase sizes.

**Table 14. Estimated Cumulative Number of Customers Purchasing RECs or Green Power from Competitive Marketers, 2003-2007**

	2003	2004	2005	2006	2007
Competitive Markets	~170,000	<140,000	>180,000	~ 210,000	~300,000
RECs*	<10,000	<10,000	<10,000	~ 10,000	~13,000
<b>Total</b>	<b>~180,000</b>	<b>&lt;150,000</b>	<b>~190,000</b>	<b>~ 220,000</b>	<b>&gt;310,000</b>
% Change	13%	-17%	27%	16%	37%

\*Includes only end-use customers purchasing RECs separate from electricity. Totals may not add due to rounding.

In recent years, most of the customer gains in competitive markets resulted from utility/marketer partnership programs in the northeast as well as customers who switched from default service to retail green power providers in a few states, most notably Texas. These gains have been tempered by losses in some states, where marketers have struggled to provide electricity service to consumers amidst adverse market conditions and increasing costs. During 2006, EIA data show declines in the number of green power customers in Washington, D.C. and Virginia but gains in Texas, Maryland, and Pennsylvania (see Appendix C).

## REC and Competitive Market Green Power Sales

An estimated 14 billion kWh of renewable energy was sold to retail customers by competitive green power and REC marketers in 2007 (Table 15). This figure includes renewable energy from both pre-existing and new sources. In 2007, about three-quarters of the REC and green power competitive market retail kWh-sales were supplied from new renewable energy sources.

About 3.2 billion kWh were sold as a bundled green power product in competitive electricity markets—a significant increase from 2006. However, 2006 sales figures are underestimated because of data gaps; thus data limitations may explain some of the overall difference in volumes in recent years. Nevertheless, most marketers reported gains in 2007. The competitive market sales figure includes renewable energy sales through default utility/marketer programs or individual utility/marketer partnership in competitive markets, which amounted to approximately 700 million kWh in 2007, an increase of about two-thirds over 2006. Retail REC sales increased by 55%, reaching 10.5 billion kWh in 2007. Most of the growth in REC-only sales is attributable to the nonresidential sector.

**Table 15. Retail Sales of Renewable Energy in Competitive Markets and RECs\***  
(Million kWh)

	2004	2005	2006	2007
<b>Competitive Markets</b>				
Residential	2,140	1,330	1,000	1,800
Nonresidential	510	820	710	1,400
<b>Subtotal</b>	<b>2,650</b>	<b>2,150</b>	<b>1,720**</b>	<b>3,200</b>
% Change	40%	-19%	-20%**	88%**
% Residential	81%	62%	59%	56%
<b>Unbundled RECs***</b>				
Residential	40	40	110	60
Nonresidential	1,690	3,840	6,700	10,500
<b>Subtotal</b>	<b>1,720</b>	<b>3,890</b>	<b>6,810</b>	<b>10,500</b>
% Change	160%	126%	75%	55%
% Residential	2%	1%	2%	1%
<b>Total Sales</b>	<b>4,370</b>	<b>6,040</b>	<b>8,530</b>	<b>13,800</b>
<b>% Change</b>	<b>71%</b>	<b>38%</b>	<b>41%</b>	<b>62%</b>

\*Totals may not add due to rounding.

\*\*2006 sales figures are likely underestimated because of data gaps.

\*\*\*Includes only RECs sold to end-use customers separate from electricity.

Table 15 also delineates green power sales by customer segment. In 2007, about 55% of green power sales in competitive markets were to residential customers. In contrast, nearly all unbundled REC sales were to nonresidential customers. Generally, nonresidential customers find REC-only products attractive because of their flexibility and the greater potential for cost savings because they can be sourced from renewable energy projects in more favorable resource locations and the electricity need not be delivered directly to the customer, lowering transaction costs. On the other hand, residential customers may not be aware that RECs are available or may not understand them. 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>21</sup>

In 2007, renewable energy sold in competitive markets or as unbundled RECs represented an equivalent renewable energy capacity of nearly 3,800 MW, with nearly 3,000 MW of this total coming from “new” renewable energy resources (Table 16). This is up from 2,400 MW of equivalent capacity and 2,100 MW of new capacity in 2006. Equivalent figures for 2005 are 1700 MW and 1300 MW, respectively. Capacity estimates for earlier years are provided in Appendix A.

**Table 16. Renewable Energy Sources Supplying Competitive and REC Markets, 2007**

	<b>Biomass/ Landfill Gas</b>	<b>Geothermal</b>	<b>Hydro</b>	<b>Solar</b>	<b>Wind</b>	<b>Unknown</b>	<b>Total</b>
<b>MWh Sales</b>	4,412,000	326,000	1,973,000	19,000	6,730,000	336,000	13,795,000
<b>% of Total Sales</b>	32%	2%	14%	0.1%	49%	2%	100%
<b>Total MW</b>	<b>592</b>	<b>41</b>	<b>450</b>	<b>11</b>	<b>2,561</b>	<b>77</b>	<b>3,732</b>
<b>MW New RE</b>	<b>438</b>	<b>41</b>	<b>120</b>	<b>9</b>	<b>2,386</b>	<b>--</b>	<b>2,994**</b>

\*\*Information on new content is unavailable in some instances.

<sup>21</sup> For example, the EPA Green Power Partnership reports that the majority of its top 25 partners purchase RECs (Appendix B), see <http://www.epa.gov/greenpower/>. In addition, the Green Power Market Development Group promotes the purchase of RECs among its members, see the organization’s Web site at: <http://www.thegreenpowergroup.org/>.

## Voluntary Green Power Market Trends and Issues

The voluntary green power market continues to exhibit strong growth. This section briefly describes several key issues that are contributing to the industry's growth, including utility programs that offer fuel price stability benefits to consumers and community challenges that encourage consumers to purchase green power. Green power markets are also affected by other related markets. For example, emerging markets for energy savings certificates (ESC)—the energy efficiency parallel to RECs—may have implications for the green power market, if they gain market traction. In this section, we discuss experience with ESCs to date and barriers and opportunities for voluntary ESC markets to develop in the United States.

### Fuel Price Stability Benefits in Green Power Programs

The overall success of the voluntary green power market rests on the willingness of large numbers of individual consumers to pay a premium for these electricity products. Accordingly, electric utilities must present a compelling value proposition for their green power products. The stable-price characteristic of renewable energy generation offers an important and appealing benefit for many consumers and businesses. However, the availability of stable-price green power products does not guarantee program success. Other factors are important as well, such as program awareness, the extent and effectiveness of program marketing, and the pricing of the product compared to conventional electricity rates.

Nevertheless, fuel price stability has been a key design element for a number of successful utility green pricing programs. For example, Austin Energy's green pricing program has led the nation in terms of green power sales since 2001 and its program represented about 15% of all green pricing sales nationally in 2006 (Bird and Kaiser 2007). In addition, a number of utilities that offer some form of fuel price protection to their green power customers have been ranked among the top 10 U.S. green pricing programs in recent years with respect to green power sales or participation, including Xcel Energy, Edmond Electric, Holy Cross, Oklahoma Gas & Electric (OG&E), and We Energies (NREL 2008). Programs that offer protection from price volatility also tend to have lower price premiums, in part as a consequence of the stable-price benefit. According to the most recent rankings based on 2007 data, about half of the utilities offering the lowest premiums for new renewables exempted customers from fossil-fuel charges or offered a fixed green rate (NREL 2008).

Several approaches exist to provide green power customers with the stable-price benefits of renewables and provide a hedge against increasing fossil fuel prices (Bird et al. 2008). The most straightforward method is to establish a separate green power rate that substitutes for a utility's conventional energy or fuel rate.

Austin Energy has used this approach in pricing its *GreenChoice* product, which is supplied primarily with wind energy. A key characteristic of the *GreenChoice* product is the establishment of a separate green charge, which substitutes directly for the utility's fuel charge. The fuel charge is a line item on the customer's bill, consisting of forecasted annual fuel and purchased power costs, and estimated fees and charges from the Electric Reliability Council of

Texas (ERCOT) incurred to meet service-area obligations.<sup>22</sup> The green charge, on the other hand, is determined by the cost of the renewable energy power purchase contracts Austin Energy signs to supply the program, plus additional costs such as ancillary services and product marketing, and is currently fixed for 15 years.

The key factor that allows Austin Energy to offer a fixed -rate green power product is that the renewable energy supply is locked in at a fixed rate for 10 to 20 years, depending on the associated supply contracts. Accordingly, business customers, who are the primary target of the program, must commit to the GreenChoice program for a 15-year period,<sup>23</sup> reducing the risk for the utility that demand for the renewable energy project will fluctuate. The utility also has an unbundled rate structure, allowing the green charge to directly substitute for the fuel charge on customer bills.

The challenges with this approach are that it requires both an unbundled rate structure and that the utility enter into long-term contracts for the renewable energy resources used. The latter condition presents some risk to the utility and its ratepayers if the program is undersubscribed.

An alternative approach is to exempt green power customers from fossil fuel-cost adjustments (FCAs). For example, in Wisconsin, Second Nature customers served by Wisconsin Power & Light (WP&L) were exempted from FCA surcharges that were instituted after January 1, 2001. Two fuel cost increases totaling 0.58¢/kWh lowered the net green power premium from 2¢/kWh to 1.42¢/kWh by the middle of 2001, but a fuel-cost decrease of 0.19¢/kWh increased the premium to 1.61¢/kWh in March 2002.

However, because FCAs are an interim measure for addressing fuel-cost changes between rate cases, this approach only provides longer-term fuel-price protection if properly structured. In the short-term, FCA exemption provides a stable-price benefit to green power customers, but the benefit is negated if higher fuel prices become embedded in base rates without a comparable downward adjustment of the green power premium. OG&E addressed this issue by including in its green power wind rider rate schedule that the rider needs to be modified to reflect any changes in the base cost of fuel (OG&E 2006).

Finally, utilities can simply revisit the green power price premium when significant fuel price changes occur, or when base rates are adjusted, and consider whether the green power premium should also be adjusted as a result. This is the most common approach used by utilities over the years. There is an open question whether or not green power customers should also be exempted from rate changes resulting from utility expenditures to reduce air emissions from fossil fuel combustion or from state RPS requirements.

The key challenges with all three approaches is in accurately determining the conventional generation costs that are displaced by the increased utilization of the renewable energy resources

---

<sup>22</sup> Like many other utilities, Austin Energy also includes some portion of its energy costs in base rates and thus its *GreenChoice* customers are not fully excluded from paying these costs.

<sup>23</sup> Originally, this was a minimum 10-year commitment.

and designing price structures that are fair to both green power consumers and nonparticipating ratepayers.<sup>24</sup>

## **Community Challenges**

Over the past two years, utilities and their marketing partners have increased the use of “green power challenges” to increase participation and awareness for their green pricing programs. The utility typically develops the challenge in partnership with local governments, who make their own purchase in conjunction with the challenge, and environmental nonprofit organizations, who can help communicate the challenge. Utility and local government decision-makers typically agree on a goal for a fixed number of sign-ups within a specified time, usually about six months.

In 2007, at least 14 utilities offered challenges, mostly in small- to mid-sized communities, and several more have done so in 2008. Many of these utilities have used challenges in more than one of the communities within their service territories. For example, Pacific Power and its sister company, Rocky Mountain Power, have launched 11 challenges in their combined Washington, Oregon, and Utah communities. Some programs, like Xcel Energy's *Windsource*, have conducted a second challenge in a subsequent year in the same community, as a result of their success with the first.

Several green power challenges have exceeded their stated goals. For example, in 2007, Puget Sound Energy launched a Bellingham, Washington challenge that produced 2,000 new customers, pushing the community's participation rate to 11% (City of Bellingham 2007). In Beaverton, Oregon, Portland General Electric's 2007 challenge set a goal of 250 enrollments and reached twice that number (PGE 2007). Generally, challenges have been particularly successful in small towns because of the greater ease in communicating the challenge to utility customers, the greater likelihood that the mayor will prioritize the challenge, and the sense of community pride the challenge can engender.

The EPA's Green Power Partnership recognizes Green Power Communities that achieve collective green power purchases of 2%, 3%, or 6% of the community's purchased electricity needs, depending on the size of the community. Recently, the agency recognized 16 communities, including those of Bellingham and Beaverton, as well as Santa Clara, CA, Palo Alto, CA, and Bend, OR.

## **Emerging Markets for Energy Savings Certificates**

For a number of years, the concept of creating, and even trading, verified fixed units of energy savings has been proffered as a vehicle to increase the amount of energy efficiency implemented in the United States. However, the country has only started to adopt energy savings certificates (ESCs), sometimes referred to as “white tags<sup>TM</sup>,” in the past two years. An ESC—the energy efficiency analog to RECs—is an instrument representing a unit of energy savings (such as 1 MWh of savings) that has been measured and verified. ESCs have the potential to bring the same market-based flexibility to energy efficiency that RECs have brought to renewable energy, but at the same time, could potentially pose competition to the voluntary REC market, as ESCs could trade at lower prices.<sup>25</sup>

---

<sup>24</sup> For more discussion of these issues, see Bird et al. (2008).

<sup>25</sup> For more detailed discussion of ESCs, see Friedman et al. (2008).

While experience with ESCs has been limited to date in the United States, four U.S. states and several European countries (Italy, France, and the United Kingdom) have incorporated ESCs into policies that establish energy efficiency targets, often referred to as energy efficiency portfolio standards (EEPS). As of October 2008, EEPS policies that create long-term targets for energy efficiency have emerged in 15 U.S. states, and all but three were adopted within the last three years. So far, Connecticut, Michigan, Nevada, and Pennsylvania allow the use of ESCs to meet their EEPS, but only in Connecticut have ESCs been actively traded for compliance purposes. At least a few other states (North Carolina and Illinois) have opened dockets or are gathering input on ESC trading for their consideration within an EEPS policy.

### ***Voluntary ESC Market Development***

Experience with REC markets has shown that gaining traction in voluntary markets can be partly a function of the success of compliance markets. The development of compliance markets may be more important for ESCs because they are perhaps even more tenuous in their ability to be understood and accepted as a credible instrument demonstrating real, additional environmental benefits. Unlike RECs, ESCs cannot rely on readily verified metered data to demonstrate measurable results, but instead depend on comparatively complex measurement and verification (M&V) protocols, which can vary from one compliance regime to another.

It is unclear at this early stage whether a voluntary market for ESCs will develop as it has for RECs. There have been some spot transactions, particularly of ESCs in the form of carbon offsets. In this form, the energy savings can be certified by credible third parties through established protocols not yet available to ESCs in non-carbon contexts. But there has been neither momentum nor structural support for a standalone ESC voluntary market. There are several reasons why the voluntary ESC market has not yet become a significant market tool in the United States.

The first is communicating the value proposition. The concept of ESCs as a tradable commodity may be a more difficult concept to communicate, and therefore to market, than even RECs, their renewable energy counterpart. In a time when institutional energy users are highly motivated to reduce their carbon footprint and “green” their public brand, a purchase of RECs to displace electricity use is a fairly straightforward means of accomplishing both. Although energy efficiency is at least as effective a means, the buying, and especially the selling, of the results of energy efficiency measures in certificate form could invite accusations of “greenwashing.”

At the least, voluntarily buying or selling ESCs would tend to generate a level of confusion and scrutiny aimed at market participants that would not apply to a company merely deploying its own energy efficiency program and “keeping” the certificates that demonstrate saved energy. For example, could a seller claim its energy savings for branding or carbon purposes? Or, would a buyer choosing ESCs over more costly on-site energy efficiency measures want to make energy savings claims under those circumstances? Both scenarios could invite the possibility of negative attention during a time when many companies are paying close attention to both their carbon footprint and the “greenness” of their brand.

Second, as has been discussed, measuring and verifying energy savings always comes with challenges. But voluntary markets tend to be national instead of confined to states or smaller geographic regions, increasing the risk that a given ESC, or a MWh of savings for a given project, does not carry the same value to the buyer as it does to the seller. For example, the same project could have a shorter payback period in one region of the country, where energy prices are higher, than in another region. Voluntary markets may require even more stringent additionality requirements than compliance programs, particularly if the ESCs are procured for their carbon benefits. If consumers voluntarily pay a premium for the ESCs, they need some assurance that they are supporting efficiency measures and savings that would not have otherwise occurred. Otherwise, consumers simply may be helping the bottom line of corporations where efficiency measures are installed, without actually driving the development of new projects.

The third issue is that no objective third party has stepped into the role of “certifying body” to address M&V and additionality issues, on a de facto if not officially recognized basis. Environmental Resources Trust-Winrock has promulgated a set of draft rules for the voluntary market, with an ESC certification called “Ecopower,” including a model “certification template.” As of September 2008, ERT-Winrock has not yet certified any transactions and was still in a comment period for the model rules.

Despite these issues, a few voluntary ESC pilot programs are beginning to emerge. Below, we describe a program under development in New York as well as a partnership between IBM and Neuwing Energy Ventures.

### ***NYSERDA Pilot ESC Program***

The New York State Energy Research and Development Authority (NYSERDA) is currently developing a pilot voluntary ESC program, expected to be officially launched with its first ESC auction by spring 2009. The program is designed to create environmental benefits by increasing the implementation of energy efficiency measures, improving the transparency and credibility of ESC markets, and addressing potential emissions “leakage” (i.e., shifting power generation to outside of the regulated region) that could undermine the goals of the Regional Greenhouse Gas Initiative (RGGI), in which New York is a participating state.

Under the program, NYSERDA will acquire ESCs from qualifying energy efficiency projects, auction them to brokers or consumers, and use the proceeds to fund additional energy efficiency projects. The revenues from the ESC sales will supplement funds available under NYSERDA’s public benefit fund program for energy efficiency. Historically, the fund was known as the “Peak Load Reduction” Program; it is currently being redesigned and will be re-launched as the “Existing Facilities Program.” Once the ESC program is operational, efficiency projects installed through the NYSERDA programs may sell ESCs equivalent to the calculated savings and use the revenues to shorten the payback period of efficiency projects. In this way, the sale of ESCs should provide greater incentives for efficiency measures and enable a greater volume of energy efficiency projects to be implemented, both in terms of size and number of projects.

NYSERDA plans to use the M&V system already in place for its existing energy efficiency program to determine the savings and number of ESCs issued for projects. Therefore, the ESC program will require very little additional cost with respect to M&V, but it is expected to be well



served by NYSERDA's robust project database and rigorous established protocols. One of the stated goals of the program is to ensure that savings are scrutinized and determined to be real and additional. Savings for small projects are calculated based on deemed savings, while medium projects require engineering analysis. Large projects require both an engineering analysis and actual measurement (e.g., using data loggers).

There are several key features to be culled out of the NYSERDA ESC program and potentially emulated. Most important, NYSERDA is relying on its existing efficiency programs and infrastructure to provide a foundation for credible ESCs. It is leveraging existing M&V data and protocols to minimize transaction costs and to streamline the process of verifying and issuing ESCs. In this way, the NYSERDA program is a model that could potentially be replicated by other funds that are devoted to implementing efficiency measures.

### ***Other Voluntary Activity: IBM***

In the private sector, IBM launched another kind of pilot program to create the market flexibility that ESCs can provide and help move projects forward in their clients' energy-intensive data centers. Because of cooling and other equipment needs, these operations require as much as 15 times more energy per square foot than a typical office building.

In November 2007, IBM created a relationship with Neuwing Energy Ventures to help measure energy-reduction measures and create certificates from the reductions. The goal is to make the efficiency certificates program available to users of IBM's systems and data storage offerings, providing clients with the option to either keep and retire the certificates or make them available for purchase, first in the United States and later in Europe. The certificates program is part of IBM's \$1 billion per year "Project Big Green" initiative, aimed at increasing the efficiency of IBM products as well as delivering technologies that help customers increase energy efficiency in their data centers and physical plants.

Under the program, Neuwing first establishes an energy consumption baseline for an interested data center based on industry estimates for the servers and the data center's energy profile. The energy decision maker for the center can then choose from several preidentified projects aimed at reducing electricity consumption in data centers, including the use of virtualization technologies to reduce the number of physical systems and methods for correcting design flaws. Once the measure is implemented, Neuwing creates certificates based on the savings (MWh) and keeps a portion of the certificates or a "per MWh-saved" fee in exchange for their assessment services. It is too soon to gauge the effectiveness of the IBM program, but its outline presents an interesting set of ideas for a very important sector of the energy efficiency market.

Early examples of voluntary activity with ESCs suggest an emerging interest to coincide with the renewed broader interest in the importance of energy savings. However, for the voluntary market to build momentum, there is a need for an independent, national certification body. Voluntary markets also can benefit from lessons learned in compliance markets, particularly with regard to M&V protocols and certification processes.

## Conclusions and Observations

The green power market continues to exhibit strong growth and provide an important demand-driven stimulus for renewable energy development. Green power markets provide an additional revenue stream for renewable energy projects, and raise consumer awareness of the benefits of renewable energy. Based on this review, we have identified the following market trends:

- In 2007, total retail sales of renewable energy in voluntary purchase markets exceeded 18 billion kWh, representing a capacity equivalent of 5,100 MW of renewable energy, including 4,300 MW from “new” renewable energy sources.
- Wind energy provided 55% of total green power sales, followed by biomass energy sources including landfill gas (28%), hydropower (11%), geothermal (3%), solar (<1%), with the remainder unknown (3%).
- Total market sales increased by more than 50% in 2007, dominated by REC sales to nonresidential consumers. Commercial and institutional REC markets now represent more than half of total green power market sales, surpassing sales in competitive electricity markets and utility green pricing programs.
- Utility green pricing programs in regulated electricity markets continued to grow, but at a slower rate, with sales increasing by about 25% in 2007, compared to nearly 40% in 2006. A relatively small number of utility programs continue to dominate sales and customer numbers. This suggests both that many programs are not achieving their full potential and that stronger performance is possible with effective program design and implementation along with dedicated marketing.
- Utility green pricing premiums have continued to fall, owing to a combination of higher prices of conventional generation fuels and lower renewable resource costs.
- Competitive markets grew substantially in 2007. These gains were primarily in Texas and the Northeast. Programs where marketers have teamed with default suppliers continued to exhibit strong growth in both sales and customers during 2007, showing that utility/marketer partnerships hold promise for future growth.
- In 2007, sales to nonresidential customers continued to outpace those to residential consumers, bringing the fraction of nonresidential sales to nearly three-quarters of all green power sales on a kWh-basis. The growing dominance of nonresidential sales is a departure from the early history of green power markets when most products and programs were oriented toward residential customers. Looking forward, demand by the nonresidential sector appears to be increasing and will likely continue to drive future voluntary market growth.
- Overall, the total number of customers purchasing green power increased by roughly 20%, with gains primarily in competitive markets and utility green pricing programs. REC markets continue to represent a very small fraction of total customers, although they dominate sales.

## References

Barbose, G. 2008. Lawrence Berkeley National Laboratory, data provided via email communication, June 3, 2008.

Bird, L.; Swezey, B.; Cory, K. (2008). *Renewable Energy Price-Stability Benefits in Utility Green Power Programs*, NREL/TP-670-43532. Golden, CO: National Renewable Energy Laboratory, August. <http://apps3.eere.energy.gov/greenpower/resources/pdfs/43532.pdf>

Bird, L.; Kaiser, M. (2007). *Trends in Utility Green Pricing Programs (2006)*, 2007. NREL/TP-670-42287. Golden, CO: National Renewable Energy Laboratory, October.

Bird, L.; Dagher, L.; Swezey, B. (2007). *Green Power Marketing in the United States: A Status Report (Tenth Edition)*, NREL/TP-670-42502. Golden, CO: National Renewable Energy Laboratory, December. <http://apps3.eere.energy.gov/greenpower/resources/pdfs/42502.pdf>

Bird, L.; Swezey, B. (2006). *Green Power Marketing in the United States: A Status Report (Ninth Edition)*, NREL/TP-620-40904. Golden, CO: National Renewable Energy Laboratory, November. <http://www.eere.energy.gov/greenpower/resources/pdfs/40904.pdf>

Bird, L.; Swezey, B. (2005a). *Green Power Marketing in the United States: A Status Report (Eighth Edition)*, NREL/TP-620-38994. Golden, CO: National Renewable Energy Laboratory, October. <http://www.eere.energy.gov/greenpower/resources/pdfs/38994.pdf>

Bird, L.; Swezey, B. (2005b). *Estimates of New Renewable Energy Capacity Serving U.S. Green Power Markets*, National Renewable Energy Laboratory, September. [http://www.eere.energy.gov/greenpower/resources/tables/new\\_gp\\_cap.shtml](http://www.eere.energy.gov/greenpower/resources/tables/new_gp_cap.shtml)

Bird, L.; Swezey, B. (2004). *Green Power Marketing in the United States: A Status Report (Seventh Edition)*, NREL/TP-620-36823. Golden, CO: National Renewable Energy Laboratory, September. <http://www.eere.energy.gov/greenpower/pdfs/36823.pdf>

Bird, L.; Swezey, B. (2003). *Green Power Marketing in the United States: A Status Report (6<sup>th</sup> Edition)*, NREL/TP-620-35119. Golden, CO: National Renewable Energy Laboratory, October. <http://www.eere.energy.gov/greenpower/resources/pdfs/35119.pdf>

City of Bellingham (October 26, 2007). "Bellingham recognized nationally for renewable energy leadership." <http://www.cob.org/features/2007-10-26-renewable-energy.aspx>, Accessed August 10, 2008.

Center for Resource Solutions (CRS) (2007). *2006 Green-e Verification Report*, San Francisco, California, November. <http://www.green-e.org/publications.shtml>

Friedman, B.; L. Bird; Barbose, G. *Considerations for Emerging Markets for Energy Savings Certificates*, NREL/TP-670-44072, Golden, CO: National Renewable Energy Laboratory, October.

Holt, E.A.; Holt, M. (2004). *Green Pricing Resource Guide (2nd Edition)*, Ed Holt & Associates, Inc., Harpswell, Maine. Prepared for the American Wind Energy Association, Washington DC, September. <http://www.awea.org/greenpower/greenPricingResourceGuide040726.pdf>

Karelas, Andreas, Center for Resource Solutions, San Francisco, California, personal communication, August 29, 2008.

NREL (April 22, 2008). "NREL Highlights Leading Utility Green Power Programs." News release. Accessed April 28, 2008. [http://www.eere.energy.gov/greenpower/resources/tables/pdfs/0408\\_topten\\_pr.pdf](http://www.eere.energy.gov/greenpower/resources/tables/pdfs/0408_topten_pr.pdf)

Oklahoma Gas & Electric (OG&E). (May 1, 2006). "Standard Pricing Schedule: GPWR State of Oklahoma." *Green Power Wind Rider*.

Portland General Electric (September 24, 2007). "City of Beaverton becomes EPA Green Power Community." [http://www.portlandgeneral.com/about\\_pge/news/09\\_24\\_2007\\_city\\_of\\_beaverton\\_becomes\\_epa.asp](http://www.portlandgeneral.com/about_pge/news/09_24_2007_city_of_beaverton_becomes_epa.asp) Accessed August 10, 2008.

Swezey, B.; Bird, L. (2001). *Utility Green Pricing Programs: What Defines Success?* NREL/TP-620-29831. Golden, CO: National Renewable Energy Laboratory, August. <http://www.eere.energy.gov/greenpower/29831.pdf>

Swezey, B.; Bird, L. (2000). *Green Power Marketing in the United States: A Status Report (5<sup>th</sup> Edition)*, NREL/TP-620-28738. Golden, CO: National Renewable Energy Laboratory, August. <http://www.eere.energy.gov/greenpower/resources/pdfs/28738.pdf>

Swezey, B.; Bird, L. (1999). *Information Brief on Green Power Marketing, 4th Edition*. NREL/TP-620-26901. Golden: CO: National Renewable Energy Laboratory, August. <http://www.eere.energy.gov/greenpower/resources/pdfs/26901.pdf>

U.S. Energy Information Administration (EIA) (2008). *Green Pricing and Net Metering Programs, 2006*. July. [http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/green\\_pricing.html](http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/green_pricing.html) Accessed August 15, 2008.

U.S. Environmental Protection Agency. *EPA Green Power Partnership*. "National Top 25: as of July 8, 2008." <http://www.epa.gov/greenpower/toplists/top25.htm> Accessed August 15, 2008.

## Appendix A. Estimates of New Renewable Energy Capacity Serving Green Power Markets, 2000-2004

Prior to 2005, estimates of the capacity serving green power markets were estimated based on renewable energy projects used to serve green pricing programs rather than derived from renewable energy sales. Therefore, the 2005 and 2006 capacity estimates are not directly comparable to capacity estimates from previous years. However, the two approaches yield relatively consistent results.

Bird and Swezey (2005b) provide details on the derivation of capacity estimates for years 2004 and earlier. Table A-1 presents estimates of the cumulative new renewable energy capacity serving voluntary markets from 2000 to 2004. A brief description of the methodology is included below.

**Table A-1. Estimated Cumulative New Renewable Energy Capacity Supplying Green Power Markets, 2000-2004\* (Megawatts)**

Market	2000	2001	2002	2003	2004
<b>Utility Green Pricing</b>	77	221	279	510	706
<b>Competitive Markets/RECs</b>	<b>90</b>	<b>542</b>	<b>695</b>	<b>1,126</b>	<b>1,528</b>
Total**	167	764	974	1,636	2,233

\*Data not directly comparable with Table 4.

\*\*Totals may not add due to rounding.

Source: Bird and Swezey (2005b).

The 2004 and earlier estimates of capacity serving green power markets focus on *new* renewable resources used to serve green power customers. New renewable resources are defined as projects or portions of projects built specifically to serve green power customers or recently constructed projects that are used to supply green power customers and meet the regional *Green-e Energy* standards for new renewables. The estimates do not include pre-existing renewable energy projects used for green power supply or capacity used to meet state RPS requirements or other renewable energy mandates.

These estimates generally include the entire capacity of a given renewable energy project, irrespective of whether the output has been fully subscribed by green power purchasers (i.e., if a utility or developer completed a project before the entire output was sold to prospective customers). Therefore, the estimates may include some capacity for which a green power buyer was not yet secured. However, in cases where a portion of a project is used to meet a renewable energy mandate, only the remainder of the project is counted.

## Appendix B. Top 25 Purchasers in the U.S. EPA Green Power Partnership, July 2008

Table B-1. Top 25 Purchasers in the U.S. EPA Green Power Partnership, July 2008

Rank	Organization	Green Power Usage (kWh)	% of Total Electricity	Organization Type	Resources
1	Intel Corporation	1,302,040,000	47%	Information Technology	Biomass, Geothermal, Solar, Wind
2	PepsiCo	1,144,773,154	100%	Food & Beverage	Various
3	U.S. Air Force	899,143,000	9%	Government (Federal)	Biogas, Biomass, Geothermal, Solar, Wind
4	Wells Fargo & Co.	550,000,000	42%	Banking & Fin. Services	Wind
5	Whole Foods Market	509,104,786	100%	Retail	Biogas, Solar, Wind
6	The Pepsi Bottling Group	470,216,838	100%	Food & Beverage	Various
7	Johnson & Johnson	434,854,733	38%	Health Care	Biomass, Small-hydro, Solar, Wind
8	Cisco Systems, Inc.	378,000,000	44%	Information Technology	Biogas, Biomass, Solar, Wind
9	City of Houston, TX	350,400,000	27%	Government (Local, Municipal)	Wind
10	City of Dallas, TX	333,659,840	40%	Government (Local, Municipal)	Wind
11 (tie)	Commonwealth of Pennsylvania	300,000,000	30%	Government (State)	Biomass, Wind
11 (tie)	HSBC North America	300,000,000	93%	Banking & Financial Services	Wind
13	U.S. EPA	299,331,375	100%	Government (Federal)	Biogas, Biomass, Geothermal, Wind
14	Kohl's Department Stores	236,017,000	20%	Retail	Various
15	Starbucks	205,000,000	22%	Restaurants & Food Services	Wind
16	University of Pennsylvania	192,727,000	46%	Education (Higher)	Wind
17	DuPont Co.	180,063,500	4%	Chemical	Biomass, Solar, Wind
18	Los Angeles County Sanitation Districts	171,144,000	54%	Government (Local, Municipal)	Biogas
19	U.S. DOE	157,964,000	3%	Government (Federal)	Biogas, Biomass, Geothermal, Small-hydro, Wind
20	PepsiAmericas	157,062,875	100%	Food & Beverage	Various
21	Vail Resorts	151,311,000	100%	Travel & Leisure	Wind
22	New York University	132,000,000	100%	Education (Higher)	Wind
23	NatureWorks, LLC	130,000,000	100%	Consumer Products	Various
24	Staples	127,322,000	21%	Retail	Biomass, Solar, Wind
25	Dell Inc.	116,116,000	33%	Information Technology	Biogas, Solar, Wind

Source: U.S. EPA Green Power Partnership (<http://www.epa.gov/greenpower/toplists/top25.htm>)

## Appendix C. Estimated U.S. Green Pricing Customers by State and Customer Class, 2005 and 2006

Table C-1. Estimated U.S. Green Pricing Customers by State and Customer Class, 2005 and 2006

State	Electric Industry Participants 2006 <sup>a</sup>	Participating Customers			
		2006			2005
		Residential	Non-Residential	Total	Total
Alabama	4	157	6	163	975
Alaska	1	351	5	356	325
Arizona	3	1,894	39	1,933	5,896
Arkansas					
California	11	45,557	1,970	47,527	40,436
Colorado	25	46,948	1,145	48,093	40,409
Connecticut					
Delaware	6	1,676	892	2,568	
District of Columbia	2	2,500	1,216	3,716	7,049
Florida	6	29,269	32	29,301	23,599
Georgia	19	5,846	137	5,983	3,795
Hawaii	3	4,416	50	4,466	4,279
Idaho	6	4,003	127	4,130	3,878
Illinois	7	2,763	7	2,770	1,227
Indiana	11	2,014	25	2,039	1,427
Iowa	47	7,801	761	8,562	8,050
Kansas					
Kentucky	10	873	16	889	809
Louisiana					
Maine	2	1,939	207	2,146	2,019
Maryland	2	30,712	6,336	37,048	32,727
Massachusetts	3	5,448	207	5,655	4,709
Michigan	9	7,833	159	7,992	2,014
Minnesota	99	31,838	504	32,342	24,688
Mississippi	1	3	0	3	3
Missouri	14	453	6	459	451
Montana	7	451	9	460	400
Nebraska	4	4,825	62	4,887	3,768
Nevada	3	379	0	379	384
New Hampshire					
New Jersey	4	96	267	363	1,692
New Mexico	11	14,225	1,352	15,577	9,852
New York	9	21,604	827	22,431	6,577
North Carolina	22	9,124	356	9,480	7,887
North Dakota	12	5,824	22	5,846	6,857
Ohio	3	250	2	252	402,433
Oklahoma	9	10,657	635	11,292	10,754
Oregon	13	78,648	2,085	80,733	63,755

State	Electric Industry Participants 2006 <sup>a</sup>	Participating Customers			
		2006			2005
		Residential	Non-Residential	Total	Total
Pennsylvania	4	36,520	835	37,355	29,758
Rhode Island	2	4,410	106	4,516	3,477
South Carolina	13	3,229	306	3,535	2,455
South Dakota	7	620	20	640	715
Tennessee					
Texas	9	88,670	12,280	100,950	87,224
Utah	7	19,716	472	20,188	16,713
Vermont	2	4,297	240	4,537	2,095
Virginia	2	2,661	17	2,678	3,009
Washington	25	35,145	841	35,986	31,351
West Virginia					
Wisconsin	57	30,037	1,298	31,335	39,701
Wyoming	7	3,531	75	3,606	3,150
<b>Total</b>	<b>484</b>	<b>609,213</b>	<b>35,954</b>	<b>645,167</b>	<b>942,772</b>

<sup>a</sup> Includes entities with green pricing programs in more than one state.

Note: Nonresidential may include some customers for whom no customer class is specified. Blank cells indicate no data was reported for the state or the number of customers in a class was zero. Totals may not sum due to rounding.

Source: Energy Information Administration, Green Pricing and Net Metering Programs, 2006. July 2008.

[http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/table4\\_1.pdf](http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/table4_1.pdf)

**Table C-2. Estimated U.S. Green Pricing Customers by Customer Class, 2002-2006**

Year	Electric Industry Participants	Participating Customers		
		Customer Class		Total**
		Residential	Non-residential*	
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	484	609,213	35,954	645,167

\*Note: Nonresidential may include some customers for whom no customer class is specified.

\*\*Totals may not sum due to rounding.

Source: Energy Information Administration, Green Pricing and Net Metering Programs, 2006.

July 2008. [http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/table4\\_h1.pdf](http://www.eia.doe.gov/cneaf/solar.renewables/page/greenprice/table4_h1.pdf)



## Appendix D. Utilities Offering Green Pricing Programs in Regulated Markets, 2007

Table D-1. Utilities Offering Green Pricing Programs in Regulated Markets, 2007

<b>Investor-Owned Utilities</b>	Corn Belt Power Cooperatives	City of Eldridge (IA)
AEP Ohio	Dairyland Power Cooperative*	Electricities
Alabama Power Company	Dakota Electric Association	Emerald People's Utility District
Alliant Energy	Delaware Electric Cooperative	Estes Park Light & Power
AmerenUE	Deseret Power	Eugene Water & Electric Board
Arizona Public Service	East Kentucky Power Cooperative*	Fort Collins Utilities
Avista Utilities	Farmers Electric Cooperative	Gainesville Regional Utilities
Central Vermont Public Service	Georgia Electric Membership Corporation*	Grant County PUD
Cheyenne Light, Fuel and Power Company	Golden Valley Electric Association	Grays Harbor PUD
Connecticut Light and Power	Great River Energy*	Heartland Consumers Power District
Consumers Energy	Gunnison County Electric Association	Iowa Association of Municipal Utilities*
Dominion North Carolina Power	Holy Cross Energy	Keys Energy Services
DTE Energy	Hoosier Energy*	Lakeland Electric
Duke Energy	Intermountain Rural Electric Association	Lansing Board of Water and Light
El Paso Electric Company	KAMO Electric Cooperative	Lenox Municipal Utilities
Entergy Gulf States	Kauai Island Utility Cooperative (KIUC)	Lewis County PUD
FirstEnergy	La Plata Electric Association	Lodi Utilities
Florida Power & Light Company	Lower Colorado River Authority	Longmont Power & Communications
Georgia Power	Lower Valley Energy	Los Alamos County (NM)
Green Mountain Power	Midstate Electric Cooperative	Los Angeles Department of Water and Power
Gulf Power Company	Minnkota Power Cooperative*	Loveland Water & Power
Hawaiian Electric Company	New-Mac Electric Cooperative	Mason County PUD No. 3
Idaho Power Company	Orcas Power & Light	Missouri Joint Municipal Electric Utility
Indianapolis Power & Light Company	Oregon Trail Electric Cooperative	Missouri River Energy Services*
Kansas City Power & Light	Park Electric Cooperative	Moorhead Public Service
Kentucky Utilities Company	Pedernales Electric Cooperative	Muscatine Power and Water
Louisville Gas and Electric Company	Peninsula Light Company	City of Naperville
Madison Gas & Electric	PNGC Power*	City of New Smyrna Beach
MidAmerican Energy	Prairie Power*	Northern Wasco County PUD
Minnesota Power	Southern Montana Electric G&T Cooperative	Oklahoma Municipal Power Authority
Nevada Power	Tri-State Generation and Transmission Association*	Omaha Public Power District
NorthWestern Energy	Vigilante Electric Cooperative	Owatonna Public Utilities
OG&E Electric Services	Wabash Valley Power Association*	Pacific County PUD
Otter Tail Power Company	Western Farmers Electric Cooperative	City of Palo Alto Utilities
Pacific Gas and Electric Company	Yampa Valley Electric Association	Pasadena Water & Power
PacifiCorp		Platte River Power Authority*
Portland General Electric Company		Rochester Public Utilities (MN)
Progress Energy Carolinas	<b>Federal</b>	Roseville Electric
Public Service Company of New Mexico	Tennessee Valley Authority*	Sacramento Municipal Utility District
Puget Sound Energy		Salt River Project
Savannah Electric	<b>Municipal/Public Utilities</b>	Santee Cooper
Sierra Pacific Power Company	City of Alameda	Seattle City Light
Tampa Electric Company	American Municipal Power-Ohio	Shrewsbury Electric and Cable Operations
Tucson Electric Power Company	Anaheim Public Utilities	Silicon Valley Power
UniSource Energy Services	City of Ashland	Snohomish County Public Utility District
United Illuminating	Austin Energy	Southern Minnesota Municipal Power Agency*
Upper Peninsula Power Company	Austin Utilities (MN)	City Utilities of Springfield (MO)
Vectren Energy Delivery of Indiana	Benton County Public Utility District	Springfield Utility Board
We Energies	City of Bowling Green	City of St. Charles
Wisconsin Public Service Corporation	Burbank Water and Power	City of St. George
Xcel Energy	Cedar Falls Utilities	Tacoma Power
	Central Minnesota Municipal Power Agency	City of Tallahassee
<b>Electric Cooperatives</b>	Chelan County Public Utility District	Traverse City Light & Power
Alabama Electric Cooperative	Clallam County PUD	Waverly Light and Power
Associated Electric Cooperative, Inc.	Clark Public Utilities	Wisconsin Public Power Inc.
Bandera Electric Cooperative	Colorado Springs Utilities	
Basin Electric Power Cooperative*	Columbia River PUD	
Boone Electric Cooperative	Concord Municipal Light Plant	
Buckeye Power	Cowlitz PUD	
Central Electric Cooperative	CPS Energy (San Antonio)	
Central Iowa Power Cooperative	Edmond Electric	

\*denotes program offered through multiple utilities or distribution cooperatives

**Table D-2. Utility/Marketer Green Power Programs in Restructured Electricity Markets,  
2007**

Atlantic City Electric  
Consumers Energy  
Connecticut Light & Power  
JP&L  
[Kennebunk Light and Power District](#)  
Long Island Power Authority  
National Grid (Massachusetts Electric, Nantucket  
Electric, Narragansett Electric, Niagara Mohawk)  
NYSEG  
Rochester Gas and Electric  
Rockland Electric  
PECO Energy  
PSE&G  
United Illuminating

## **Appendix E. Links to Utility Green Pricing Programs and REC and Competitive Market Green Power Offerings**

Table of Utility Green Pricing Programs by State:

<http://www.eere.energy.gov/greenpower/markets/pricing.shtml?page=1>

Renewable Energy Certificate Retail Products:

<http://www.eere.energy.gov/greenpower/markets/certificates.shtml?page=1>

Retail Green Power Product Offerings in States with Retail Competition:

<http://www.eere.energy.gov/greenpower/markets/marketing.shtml?page=1>

## Appendix F. Top Ten Utility Green Pricing Programs

Table F-1. Green Pricing Program Renewable Energy Sales (as of December, 2007)

Rank	Utility	Resources Used	Sales (kWh/year)	Sales (aMW) <sup>a</sup>
1	Austin Energy	Wind, landfill gas	577,636,840	65.9
2	Portland General Electric <sup>b</sup>	Geothermal, biomass, wind	553,677,903	63.2
3	PacifiCorp <sup>cde</sup>	Wind, biomass, landfill gas, solar	383,618,885	43.8
4	Florida Power & Light <sup>b</sup>	Biomass, wind, landfill gas, solar	373,596,000	42.6
5	Xcel Energy <sup>ef</sup>	Wind	326,553,866	37.3
6	Sacramento Municipal Utility District <sup>e</sup>	Wind, landfill gas, small hydro, solar	275,481,584	31.4
7	Puget Sound Energy <sup>e</sup>	Wind, solar, biomass, landfill gas	246,406,200	28.1
8	Basin Electric Power Cooperative	Wind	226,474,000	25.9
9	National Grid <sup>gh</sup>	Biomass, wind, small hydro, solar	180,209,571	20.6
10	PECO <sup>i</sup>	Wind	160,000,000	18.3

<sup>a</sup> An "average megawatt" (aMW) is a measure of continuous capacity equivalent (i.e., operating at a 100% capacity factor).

<sup>b</sup> Marketed in partnership with Green Mountain Energy Company. For Portland General Electric, some products marketed in partnership with Green Mountain Energy Company.

<sup>c</sup> Includes Pacific Power and Rocky Mountain Power.

<sup>d</sup> Some Oregon products marketed in partnership with 3Degrees Group, Inc.

<sup>e</sup> Product is *Green-e Energy* certified ([www.green-e.org](http://www.green-e.org)).

<sup>f</sup> Includes Northern States Power, Public Service Company of Colorado, and Southwestern Public Service.

<sup>g</sup> Includes Niagara Mohawk, Massachusetts Electric, Narragansett Electric, and Nantucket Electric.

<sup>h</sup> Marketed in partnership with Community Energy, Inc., EnviroGen, Green Mountain Energy Company, Mass Energy, People's Power & Light, and Sterling Planet.

<sup>i</sup> Marketed in partnership with Community Energy, Inc.

**Table F-2. Total Number of Customer Participants (as of December, 2007)**

<b>Rank</b>	<b>Utility</b>	<b>Program(s)</b>	<b>Participants</b>
1	Xcel Energy <sup>a</sup>	<i>Windsource<sup>b</sup> Renewable Energy Trust</i>	75,534
2	Portland General Electric <sup>cg</sup>	<i>Clean Wind Green Source</i>	61,543
3	PacifiCorp <sup>de</sup>	<i>Blue Sky Block<sup>b</sup> Blue Sky Usage<sup>b</sup> Blue Sky Habitat</i>	60,539
4	Sacramento Municipal Utility District	<i>Greenergy<sup>b</sup></i>	43,543
5	PECO <sup>f</sup>	<i>PECO WIND</i>	38,548
6	Florida Power & Light <sup>g</sup>	<i>Sunshine Energy</i>	37,184
7	National Grid <sup>hi</sup>	<i>GreenUp</i>	24,429
8	Los Angeles Department of Water and Power	<i>Green Power for a Green LA</i>	22,788
9	Puget Sound Energy	<i>Green Power Program<sup>b</sup></i>	20,457
10	Energy East (NYSEG/RGE) <sup>f</sup>	<i>Catch the Wind</i>	19,520

<sup>a</sup> Includes Northern States Power, Public Service Company of Colorado, and Southwestern Public Service.

<sup>b</sup> Product is *Green-e Energy* certified ([www.green-e.org](http://www.green-e.org)).

<sup>c</sup> Some products marketed in partnership with Green Mountain Energy Company.

<sup>d</sup> Includes Pacific Power and Rocky Mountain Power.

<sup>e</sup> Some Oregon products marketed in partnership with 3Degrees Group, Inc.

<sup>f</sup> Marketed in partnership with Community Energy, Inc.

<sup>g</sup> Marketed in partnership with Green Mountain Energy Company.

<sup>h</sup> Includes Niagara Mohawk, Massachusetts Electric, Narragansett Electric, and Nantucket Electric.

<sup>i</sup> Marketed in partnership with Community Energy, EnviroGen, Green Mountain Energy Company, Mass Energy, People's Power & Light, and Sterling Planet.

**Table F-3. Customer Participation Rate (as of December 2007)**

<b>Rank</b>	<b>Utility</b>	<b>Customer Participation Rate</b>	<b>Program(s)</b>	<b>Program Start Year</b>
1	City of Palo Alto Utilities <sup>ab</sup>	20.4%	<i>Palo Alto Green</i>	2003
2	Lenox Municipal Utilities <sup>c</sup>	14.3%	<i>Green City Energy</i>	2003
3	Silicon Valley Power <sup>ab</sup>	8.7%	<i>Santa Clara Green Power</i>	2004
4	Portland General Electric <sup>d</sup>	8.5%	<i>Clean Wind, Green Source, Renewable Future</i>	2002
5	Sacramento Municipal Utility District <sup>b</sup>	7.4%	<i>Greenergy</i>	1997
6	City of Naperville Public Utilities <sup>e</sup>	6.7%	<i>Renewable Energy Program</i>	2005
7	Montezuma Municipal Light & Power <sup>c</sup>	6.2%	<i>Green City Energy</i>	2003
8	Pacific Power (Oregon only) <sup>ab</sup>	5.7%	<i>Blue Sky Usage, Habitat, Block</i>	2002
9	River Falls Municipal Utilities <sup>f</sup>	5.3%	<i>Renewable Energy Program</i>	2001
10	Holy Cross Energy	5.2%	<i>Wind Power Pioneers Local Renewable Energy Pool</i>	1998 2002

<sup>a</sup> Marketed in partnership with 3Degrees Group, Inc.

<sup>b</sup> Product is *Green-e Energy* certified ([www.green-e.org](http://www.green-e.org)).

<sup>c</sup> Program offered in association with the Iowa Association of Municipal Utilities.

<sup>d</sup> Some products marketed in partnership with Green Mountain Energy Company.

<sup>e</sup> Marketed in partnership with Community Energy, Inc.

<sup>f</sup> Power supplied by Wisconsin Public Power, Inc.

**Table F-4. Green Power Sales as a Percentage of Total Retail Electricity Sales (in kWh) (as of December 2007)**

<b>Rank</b>	<b>Utility</b>	<b>Program Name</b>	<b>% of Load</b>
1	Edmond Electric <sup>a</sup>	<i>Pure &amp; Simple</i>	5.7%
2	Austin Energy	<i>GreenChoice</i>	5.0%
3	City of Palo Alto Utilities <sup>bd</sup>	<i>PaloAltoGreen</i>	4.6%
4	Portland General Electric <sup>c</sup>	<i>Clean Wind, Green Source, Renewable Future</i>	2.9%
5	Silicon Valley Power, City of Santa Clara <sup>bd</sup>	<i>Santa Clara Green Power</i>	2.8%
6	Sacramento Municipal Utility District <sup>d</sup>	<i>Greenergy</i>	2.6%
7	Basin Electric Power Cooperative	<i>PrairieWinds</i>	1.9%
7	Pacific Power (Oregon only) <sup>bde</sup>	<i>Blue Sky Usage, Habitat, Block</i>	1.9%
9	Emerald People's Utility District	<i>EPUD Renewables</i>	1.8%
10	Public Service Company of New Mexico	<i>PNM Sky Blue</i>	1.5%
10	Roseville Electric <sup>bd</sup>	<i>Green Roseville</i>	1.5%

<sup>a</sup> Power supplied by Oklahoma Municipal Power Authority.

<sup>b</sup> Marketed in partnership with 3Degrees Group, Inc.

<sup>c</sup> Marketed in partnership with Green Mountain Energy Company.

<sup>d</sup> Product is *Green-e Energy* certified ([www.green-e.org](http://www.green-e.org)).

<sup>e</sup> Renewable portfolio options offered to Oregon customers.

**Table F-5. Price Premium Charged for New, Customer-Driven Renewable Power<sup>a</sup> (as of December 2007)**

Rank	Utility	Resources Used	Premium (¢/kWh)
1	Edmond Electric <sup>bc</sup>	Wind	0.09
2	OG&E Electric Services <sup>b</sup>	Wind	0.10
3	Austin Energy <sup>be</sup>	Wind, landfill gas	0.16
4	Indianapolis Power and Light	Wind, landfill gas	0.20
5	Park Electric Cooperative	Wind	0.22
6	Avista Utilities	Wind, landfill gas, biomass	0.33
7	Xcel Energy (Minnesota) <sup>bdf</sup>	Wind	0.58
8	Clallam County Public Utility District <sup>b</sup>	Landfill gas	0.70
9	PacifiCorp <sup>dg</sup>	Wind, biomass, landfill gas, solar	0.78
10	Portland General Electric <sup>h</sup>	Biomass, Geothermal, Wind	0.80
10	Emerald People's Utility District	Wind	0.80

<sup>a</sup> Includes only programs that have installed or announced firm plans to install or purchase power from 100% new renewable resources.

<sup>b</sup> Premium is variable; customers in these programs are exempt or otherwise protected from changes in utility fuel charges.

<sup>c</sup> Power supplied by Oklahoma Municipal Power Authority.

<sup>d</sup> Product is *Green-e Energy* certified ([www.green-e.org](http://www.green-e.org)).

<sup>e</sup> The price for new customers enrolling in the program (fourth batch of renewable energy capacity).

<sup>f</sup> Net premium of the Minnesota *Windsources* program.

<sup>g</sup> Pacific Power *Blue Sky Usage* product; only available in Oregon. Product marketed in partnership with 3Degrees Group, Inc.

<sup>h</sup> Portland General Electric *Green Source* Product. Product marketed in partnership with Green Mountain Energy Company.



# REPORT DOCUMENTATION PAGE

*Form Approved*  
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Executive Services and Communications Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.**

<b>1. REPORT DATE (DD-MM-YYYY)</b> October 2008		<b>2. REPORT TYPE</b> Technical Report		<b>3. DATES COVERED (From - To)</b>	
<b>4. TITLE AND SUBTITLE</b> Green Power Marketing in the United States: A Status Report (11th Edition)			<b>5a. CONTRACT NUMBER</b> DE-AC36-08-GO28308		
			<b>5b. GRANT NUMBER</b>		
			<b>5c. PROGRAM ELEMENT NUMBER</b>		
<b>6. AUTHOR(S)</b> Lori Bird, Claire Kreycik, and Barry Friedman			<b>5d. PROJECT NUMBER</b> NREL/TP-6A2-44094		
			<b>5e. TASK NUMBER</b> SAO7.8730		
			<b>5f. WORK UNIT NUMBER</b>		
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> National Renewable Energy Laboratory 1617 Cole Blvd. Golden, CO 80401-3393			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> NREL/TP-6A2-44094		
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>			<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b> NREL		
			<b>11. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>		
<b>12. DISTRIBUTION AVAILABILITY STATEMENT</b> National Technical Information Service U.S. Department of Commerce 5285 Port Royal Road Springfield, VA 22161					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT (Maximum 200 Words)</b> This report documents green power marketing activities and trends in the United States. It presents aggregate green power sales data for all voluntary purchase markets across the United States. It also provides summary data on utility green pricing programs offered in regulated electricity markets and green power marketing activity in competitive electricity markets, as well as green power sold to voluntary purchasers in the form of renewable energy certificates. Key market trends and issues are also discussed.					
<b>15. SUBJECT TERMS</b> NREL; Green Power Marketing; utility green pricing programs; renewable energy certificates; renewable electricity; green power; market trends; Lori Bird; Claire Kreycik; Barry Friedman					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>  UL	<b>18. NUMBER OF PAGES</b>	<b>19a. NAME OF RESPONSIBLE PERSON</b>
<b>a. REPORT</b> Unclassified	<b>b. ABSTRACT</b> Unclassified	<b>c. THIS PAGE</b> Unclassified			<b>19b. TELEPHONE NUMBER (Include area code)</b>

Standard Form 298 (Rev. 8/98)  
Prescribed by ANSI Std. Z39.18