



**Synapse**  
Energy Economics, Inc.

# **Role of Long-Term Power Purchase Agreements in Fostering Development of Wind Energy Projects in New England**

**December 2007**

**AUTHORS**

**Rick Hornby, Ben Warfield, Robin Maslowski**



22 Pearl Street  
Cambridge, MA 02139

[www.synapse-energy.com](http://www.synapse-energy.com)  
617.661.3248

## Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	1
<b>1. INTRODUCTION</b> .....	1
<b>2. IMPACT OF LONG-TERM PPAS ON THE DEVELOPMENT OF RENEWABLE GENERATION PROJECTS</b> .....	2
A. INDUSTRY STUDIES .....	2
B. EMPIRICAL EVIDENCE .....	3
<b>3. PUBLIC POLICY BENEFITS OF LONG-TERM PPAS FOR RENEWABLE GENERATION</b> .....	4
<b>4. CONCLUSION</b> .....	5
<b>APPENDIX A - WIND PROJECTS OVER 40 MW DEVELOPED FROM 2001 TO 2004</b> .....	6
<b>APPENDIX B - PPAS FOR OUTPUT FROM WIND PROJECTS DEVELOPED BY PPM ENERGY</b> .....	9

## Executive Summary

The Union of Concerned Scientists (UCS) retained Synapse to review, from a public policy perspective, the merits of long-term power purchase agreements (PPAs) between developers of wind power projects and providers of retail electric supply service (“load serving entities” or LSEs) in restructured electric markets. This review found that long-term PPAs encourage the development and/or expansion of wind power projects. Using Massachusetts as a case study, Synapse found that long-term PPAs provide several important benefits to customers of the contracting LSEs in particular, and to the Commonwealth of Massachusetts (Commonwealth) in general. The benefits of the PPAs to the customers of the contracting LSEs include mitigation of price volatility, mitigation of future increases in prices and reduction in the cost of RPS compliance reflected in those prices. In addition, because long-term PPAs encourage the development and/or expansion of wind power projects, they provide additional benefits to the customers of the contracting LSEs, and to the Commonwealth in general, in the form of reductions in dependence on natural gas, increased generation diversity and reductions in emissions of carbon dioxide.

### 1. Introduction

It is generally accepted that increasing the portion of annual electric energy supply met by generation from renewable resources will produce economic and environmental benefits including:

- Reductions in the future environmental impacts of electricity generation, including reductions in air-pollution, greenhouse gas emissions, and other adverse environmental impacts associated with generation from fossil fuel and nuclear units;
- Improvements in future supply security by lessening reliance on imported fuels;
- Reductions in the future volatility of electric supply service prices;
- Reductions in the future levels of electric supply service prices; and
- Increases in economic activity due to a higher percentage of electric energy spending remaining in the region.

Recognizing those benefits, many states have established a Renewable Portfolio Standard (RPS). LSEs subject to an RPS must acquire a specified minimum percentage of their annual electric energy supply from qualified renewable resources, or make an alternative compliance payment (ACP) for failing to do so. Unfortunately, the experience to date in some states with an RPS, such as Massachusetts, has been that some LSEs have not acquired the full percentage specified in the RPS but instead have satisfied their obligation by making the ACP for their shortfall.

For example, Massachusetts has had an RPS requirement in effect since 2003. In 2004 and 2005 the supply of renewable generation to Massachusetts retail customers did not meet the minimum demand set under the RPS. As of 2005, the last year for which



statistics are available only 65 percent of the minimum demand set by the RPS was met with actual renewable generation.<sup>1</sup> The Massachusetts Division of Energy Resources (DOER) expects that shortfall to decline, but not to disappear, in 2007.<sup>2</sup>

In response to that experience, UCS retained Synapse to review the merits of long-term power purchase agreements (PPAs) between developers of wind power projects and LSEs in terms of fostering the development of those projects and on providing benefits to the contracting LSEs.

## 2. Impact of Long-Term PPAs on the Development of Renewable Generation Projects

This section examines the impact of long-term contracts on the development of new renewable electricity projects. We begin with a review of studies done by other energy industry analysts and then present empirical evidence regarding long-term PPAs for wind projects.

### A. Industry Studies

Long-term contracts reduce the financial risk associated with developing any type of new generating facility, including new renewable electricity projects. The predictable cash flow associated with long-term contracts assures project developers of a stable revenue stream which is important for obtaining financing for utility-scale projects. Thus, long-term PPAs between developers of renewable generation projects, such as wind farms, and LSEs provide those developers with an important additional base upon which to finance renewable generation projects and thereby encourage the development and/or expansion of wind power projects .

Various energy industry analysts have recognized the importance of long-term contracts to the development of renewable generation projects. For example, in 2001 a report prepared by the Lawrence Berkeley National Laboratory (LBL) highlighted the importance of long-term contracts to achievement of the Texas RPS. That report notes<sup>3</sup>

Long-term contracts...ensure developers a stable revenue stream and access to low-cost financing, while delivering to electricity retailers a reliable stream of renewable electricity at stable prices....

More recently, a 2004 report prepared by staff of the Massachusetts Technology Collaborative (MTC) noted that fewer than expected renewables had been developed in New England because of the difficulties developers were facing in securing financing.<sup>4</sup> That report notes that wind projects have higher capital costs than gas-fired plants, and

---

<sup>1</sup> Division of Energy Resources, *Massachusetts Renewable Energy Portfolio Standard Annual RPS Compliance Report for 2005*, Executive Office of Energy and Environmental Affairs, Commonwealth of Massachusetts, February 2007

<sup>2</sup> Ibid.

<sup>3</sup> Wisner, Ryan. *The Renewables Portfolio Standard in Texas: An Early Assessment*, Lawrence Berkeley National Laboratory, 2001. page 11. <http://eetd.lbl.gov/EA/EMP/reports/49107.pdf>. Cory, Karlynn; Bolgen, Nils; and Sheingold, Barry. Long-Term Revenue Support to Help Developers Secure Project Financing, March 2004. <http://www.masstech.org/renewableenergy/mgpp.htm>



that without purchase agreements "...developers are unable to secure project financing because lenders and equity investors are not willing to assume a substantial amount of REC or energy market price risk on a long-term basis."<sup>5</sup> Among its observations the report notes that "Developers are interested in long-term contracts that provide price security."<sup>6</sup>

Another report sponsored by Lawrence Berkeley National Laboratory evaluates the principal structures through which most utility-scale U.S. wind projects have been financed.<sup>7</sup> That report indicates, via an illustrative analysis, that a project financed through a combination of equity and debt offer would produce energy at the lowest cost. It also notes that the duration of a typical loan (i.e., debt) is a function of the underlying power and REC purchase agreement, and that projects with either no PPA or a short-term PPA are considered more risky than those with long-term contracts.

The findings from these reports, combined with the empirical evidence presented below, demonstrate the importance of long-term PPAs to the development of wind and other renewable generation projects.

## **B. Empirical Evidence**

Empirical evidence confirms the importance of long-term contracts to the development of utility-scale wind projects throughout the United States, including the U.S. Northeast.

A review of the contract terms of wind projects developed in the United States between 2001 and 2004 whose capacity was at least 40 MW. Of the 35 projects identified in that review, all but two had contracts or PPAs. Of the 33 projects with contracts, the Synapse review was able to confirm that at least 23 had contract durations ranging from 10 to 25 years. The results of that review are summarized in Appendix A.

A similar review of 18 wind projects with a capacity of 30 MW or more that were developed in the U.S. in 2006 indicates that 15 had contracts or PPAs for either a portion or all of their output. Of those 15, we obtained some contract information with respect to five projects. Of those, four had long term contracts and one was owned by a utility.

In another analysis we reviewed the information publicly available on the wind projects developed by PPM Energy, one of the country's major developers. Of the 19 wind project "success stories" listed on its web site we were able to obtain data regarding the PPAs associated with 18. All of those 18 projects had some or all of their output covered by a long-term PPA with a utility or utility affiliate. That review is summarized in Appendix B.

Our review of projects in the Northeast also identified various developers relied upon long-term contracts for at least a portion of the output from their projects in order to obtain financing. For example, the Massachusetts Renewable Energy Trust within the MTC operates the Massachusetts Green Power Partnership (MGPP). The MGPP encourages the development of renewable projects in Massachusetts by periodically soliciting bids to buy Renewable Energy Credits ("RECs") from project developers under long-term contracts of up to 10 years. The MGPP accomplishes this goal by reviewing the projected

---

<sup>5</sup> Ibid., page 4.

<sup>6</sup> Ibid., page 12.

<sup>7</sup> Harper, John P. et al, *Wind Power Financing Structures: A Review & Comparative Analysis*, Lawrence Berkeley National Laboratory, September 2007, <http://eetd.lbl.gov/ea/emp>, page iv.

economics of the proposed project and buying only the portion of the RECs associated with the project's total capacity required for the developer to obtain financing. The MGPP has awarded contracts to 12 projects under this program.<sup>8</sup> (The funds available to the MGPP are limited and therefore its ability to encourage new renewable energy projects is limited.)

A second example of this approach is drawn from New York, where the New York State Energy Research and Development Agency (NYSERDA) purchases RECs under long-term contracts. NYSEDA notes that it has encouraged developers to offer only a portion of the output of their proposed projects in response to the Main Tier solicitations. It goes on to indicate that some developers responded by installing more capacity than required to meet their contract with NYSEDA. In other words, the long-term contracts with NYSEDA for a portion of their projects' output apparently helped those developers to obtain an important level of base financing, and thereby enabled them to build a project that could provide generation for sale under the NYSEDA contract and additional generation for sale under other arrangements. The report cites the Maple Ridge wind farm as a specific example of the leveraging effect of the NYSEDA contract.<sup>9</sup>

Based upon this evidence it is reasonable to conclude that long-term PPAs encourage development of new wind projects, and expansions of existing wind projects. Those developments and expansions represent incremental renewable generation.

### **3. Public Policy Benefits of Long-Term PPAs for Renewable Generation**

This section examines the benefits of long-term PPAs between developers of wind power projects and LSEs to the public in general and to the customers of the contracting LSE in particular.

The benefits of long-term PPAs to the public in general are incremental reductions in reliance on conventional sources of electric generation, e.g., natural gas in Massachusetts, and incremental reductions in the public health and environmental impacts of conventional generation.

In addition to the benefits to the general public, long-term PPAs for renewable electric energy at fixed prices offer three potential benefits to the customers of the contracting LSEs. Those three benefits are

- mitigated price volatility,
- a "hedge" against rising electricity prices, and
- reduced RPS compliance costs.

PPAs at fixed prices help mitigate the volatility of the energy component of retail prices and act as a "hedge" against future increases in that component. These two benefits are attributable to acquiring energy under the PPAs at a fixed price as opposed to market prices subject to change over time. Customers of the contracting LSE will receive the third

<sup>8</sup> MGPP background, [www.masstech.org/renewableenergy/mgpp.htm](http://www.masstech.org/renewableenergy/mgpp.htm) and telephone interview with Nils Bolgen, MGPP, November 2, 2007

<sup>9</sup> \_\_\_\_, New York state Renewable Portfolio Standard, Performance report Program Period ending March 2007; NYSEDA, August 2007, pages 1 and 7; [www.nyserda.org/rps](http://www.nyserda.org/rps)



benefit, i.e., reduced RPS compliance costs, if the renewable energy component of the price under the PPA is less than the price that the LSE would otherwise have paid to comply with the RPS.

It is important to acknowledge and address the potential cost risks associated with a long-term PPA at a fixed price. The analysis of that potential cost risk should begin with a clear definition of the reference point against which cost risk is to be measured, and the timeframe over which it is to be evaluated. The potential cost risk arises because the future prices of electric energy and of RPS compliance are not known with certainty. Thus, it is possible that during the term of a fixed priced PPA, electric energy may be available from conventional generation and/or other renewable projects at a lower price by a material amount for a sustained period. Under those circumstances some might argue that the LSE is paying too much for the renewable energy being purchased under the PPA.

Exposure to such “ex post” views can be reduced through an “ex ante” evaluation of the merits of entering a particular PPA. That evaluation can assess the potential benefits and cost risks of the PPA in light of the LSE’s overall goals of providing reliable supply at reasonable prices over the prospective contract period in compliance with state and federal energy and environmental policies. The point is that the any strategy proposed to satisfy that goal should generally be evaluated over a long-term planning horizon, and any specific element proposed to implement that strategy, such as a specific PPA, should generally be evaluated within the context of that strategy and upon the facts and analyses available at the time the decision has to be made. When assessing the overall merits of the PPAs, it is appropriate to consider their potential benefits as well as their potential cost risk.

## 4. Conclusion

Based upon a review of industry analyses and empirical evidence from actual projects it is reasonable to conclude that long-term PPAs encourage development of new wind projects, and expansions of existing wind projects. Those developments and expansions represent incremental renewable generation and provide benefits to the general public in the form of incremental reductions in dependence on electric generation from conventional sources, increased generation diversity and incremental reductions in emissions of carbon dioxide. In addition, long-term fixed price PPAs can provide customers of the contracting LSEs potential benefits in terms of mitigating price volatility, mitigating future increases in retail service prices and reducing the cost of RPS compliance.

## Appendix A - Wind Projects Over 40 MW Developed from 2001 to 2004





	Project Name	Size (MW)	State	Date Online	Owner	Purchaser	Financing	Length
1	Woodward Mt. I & II	159.70	TX	Apr-01	FPL Energy	TXU Electric & Gas	contract	
2	Green Mountain Energy Wind Farm	160.00	TX	Oct-03	Shell WindEnergy, Padoma Resources I	TXU Energy, Green Mountain Energy	contract	
3	Gray County Wind Farm	112.20	KS	Dec-01	FPL Energy	UtiliCorp	contract	
4	Flying Cloud	43.50	IA	Oct-03	PPM Energy	Alliant (Interstate Power & Light)	contract	
5	Colorado Green	162.00	CO	Dec-03	Shell WindEnergy, PPM Energy, Inc	Xcel Energy	contract	
6	Mountain View Power Partners I	44.40	CA	Oct-01	PGE-NEG	Pacific Gas & Electric	contract	
7	Wyoming Wind Energy Center	144.00	WY	Jun-04	FPL Energy/ Orion Energy	PPM Energy	long-term contract	10-25 yrs
8	Stateline Wind Project, Phase I	180.20	WA/OR	Dec-01	FPL Energy, Vansycle	PPM Energy	long-term contract	25 yrs
9	Trent Wind Farm	150.00	TX	Aug-01	American Electric Power	TXU	long-term contract	at least 10 yrs
10	Desert Sky Wind Farm (previously Indian Mesa)	160.50	TX	Dec-01	American Electric Power	City Public Service of San Antonio	long-term contract	15 yrs
11	Highmore	40.50	SD	Jan-03	FPL Energy	Basin Electric	long-term contract	25 yrs
12	Combine Hills	41.00	OR	Dec-03	Eurus	PacificCorp	long-term contract	20 yrs
13	Stateline Energy Center	83.16	OR	Dec-01	FPL Energy, Vansycle	PPM Energy	long-term contract	10-25 yrs
14	Oklahoma Wind Energy Center	102.00	OK	Jan-03	FPL Energy	OK Gas & Electric/OK Muni Power Authority	long-term contract	15 yrs
15	New Mexico Wind Energy Center	204.00	NM	Jan-03	FPL Energy	Public Service of New Mexico	long-term contract	10-25 yrs
16	Edgeley	40.50	ND	Jan-03	FPL Energy	Basin Electric	long-term contract	10-25 yrs
17	High Winds	162.00	CA	Jan-03	FPL Energy	PPM Energy	long-term contract	10-25 yrs
18	Rock River I	50.00	WY	Oct-01	Shell Renewables	PacificCorp	PPA	20 yrs
19	Mountaineer Wind Energy Center	66.00	WV	Jan-02	FPL Energy	Exelon Power Team	PPA	20 yrs
20	Nine Canyon Wind Farm	48.00	WA	Sep-02	Energy Northwest	9 Public Utility Districts	PPA	
21	Llano Estacado Wind Ranch	80.00	TX	Nov-01	Shell WindEnergy	Southwestern Public Service	PPA	15 yrs
22	Waymart Wind Farm	64.50	PA	Jan-03	FPL Energy	Exelon Power Team	PPA	20 yrs
23	Blue Canyon Wind Power	74.25	OK	Jan-03	Zilkha Renewable & Kirmart Corp	Western Farmer's Electric Cooperative	PPA	20 yrs
24	Blue Canyon Wind Power II	151.50	OK		Zilkha Renewable	PSCo of OK (AEP)	PPA	10 yrs
25	San Juan Mesa	120.00	NM	Dec-05	Padoma Wind Power	Xcel Energy	PPA	20 years
26	Moraine Wind Power Project	51.00	MN	Oct-03	PPM Energy	Xcel Energy (Northern States Power)	PPA	
27	Chanarambie	85.50	MN	Oct-03	enXco	Xcel Energy	PPA	
28	Trimont	100.00	MN	Sep-05	PPM Energy	Great River Energy	PPA	15 years
29	Top of Iowa Wind Farm	80.10	IA	Dec-01	Energy (with Horizon Wind [formerly Zilkha] & Midwest Renewable)	Alliant (IPC)	PPA	15 yrs
30	Hancock County Wind Farm	97.68	IA	Jan-02	FPL Energy	Alliant Energy (44 MW)	PPA	20 yrs
31	Cabazon	40.92	CA	Dec-02	Shell WindEnergy	Dept of Water Resources	PPA	
32	Whitewater Hill	61.50	CA	Dec-02	Shell WindEnergy	Dept of Water Resources	PPA	12 yrs
33	King Mountain Wind Ranch	278.20	TX	Dec-01	FPL Energy	Austin Energy, Reliant Energy	turn-key, resale	10-25 yrs
34	Intrepid Wind Project	159.00	IA	Oct-04	MidAmerican Energy	MidAmerican Energy	open market grid	
35	Mendota Hills	50.40	IL	Oct-03	Navitas Energy	Commonwealth Edison (Exelon)		

Project Name		Sources
1	Woodward Mt. I & II	email - Steve Stengel at FPL Energy
2	Green Mountain Energy Wind Farm	<a href="http://www.shell.com/home/content/rw-br/news_and_library/press_releases/2003/brazos_0723.html">http://www.shell.com/home/content/rw-br/news_and_library/press_releases/2003/brazos_0723.html</a>
3	Gray County Wind Farm	<a href="http://www.bizjournals.com/wichita/stories/2001/05/14/daily29.html">http://www.bizjournals.com/wichita/stories/2001/05/14/daily29.html</a>
4	Flying Cloud	<a href="http://www.ppmenergy.com/rel_03.04.16.html">http://www.ppmenergy.com/rel_03.04.16.html</a>
5	Colorado Green	<a href="http://www.ppmenergy.com/rel_03.10.27.html">http://www.ppmenergy.com/rel_03.10.27.html</a>
6	Mountain View Power Partners I	<a href="http://www.centennialenergy.com/mvp.html">http://www.centennialenergy.com/mvp.html</a>
7	Wyoming Wind Energy Center	<a href="http://www.ppmenergy.com/rel_03.09.10.html">http://www.ppmenergy.com/rel_03.09.10.html</a>
8	Stataline Wind Project, Phase I	<a href="http://www.mp.org/Projects/stataline.html">http://www.mp.org/Projects/stataline.html</a>
9	Trent Wind Farm	<a href="http://www.trentmesa.com/faq.htm">http://www.trentmesa.com/faq.htm</a>
10	Desert Sky Wind Farm (previously Indian Mesa)	<a href="http://www.desertskywind.com/faqs.htm">http://www.desertskywind.com/faqs.htm</a>
11	Highmore	<a href="http://www.lakeregion.coop/Publications/October%202003/October%2010-11.pdf">http://www.lakeregion.coop/Publications/October%202003/October%2010-11.pdf</a>
12	Combine Hills	<a href="http://www.mp.org/News/pr_EurusCombine0603.html">http://www.mp.org/News/pr_EurusCombine0603.html</a>
13	Stataline Energy Center	email - Steve Stengel at FPL Energy
14	Oklahoma Wind Energy Center	<a href="http://price.ou.edu/magazine/fall04/index.asp?content=page24">http://price.ou.edu/magazine/fall04/index.asp?content=page24</a>
15	New Mexico Wind Energy Center	<a href="http://www.wapa.gov/es/pubs/esb/2003/03Apr/esb046.htm">http://www.wapa.gov/es/pubs/esb/2003/03Apr/esb046.htm</a>
16	Edgeley	<a href="http://www.wapa.gov/es/pubs/esb/2004/april/apr0410.htm">http://www.wapa.gov/es/pubs/esb/2004/april/apr0410.htm</a>
17	High Winds	<a href="http://www.ppmenergy.com/rel_03.09.18.html">http://www.ppmenergy.com/rel_03.09.18.html</a>
18	Rock River I	<a href="http://www.pacificcorp.com/Navigation/Navigation551.html">http://www.pacificcorp.com/Navigation/Navigation551.html</a>
19	Mountaineer Wind Energy Center	<a href="http://www.electricityforum.com/news/jan03/exelonwind">http://www.electricityforum.com/news/jan03/exelonwind</a>
20	Nine Canyon Wind Farm	<a href="http://www.energy-northwest.com/gen/ninecanyon/">http://www.energy-northwest.com/gen/ninecanyon/</a>
21	Llano Estacado Wind Ranch	<a href="http://austin.bizjournals.com/austin/stories/2002/01/21/daily42.html">http://austin.bizjournals.com/austin/stories/2002/01/21/daily42.html</a>
22	Waymart Wind Farm	<a href="http://www.exeloncorp.com/generation/newsroom/2001/20010509.shtml">http://www.exeloncorp.com/generation/newsroom/2001/20010509.shtml</a>
23	Blue Canyon Wind Power	<a href="http://www.wfec.com/operations/blue_canyon.asp">http://www.wfec.com/operations/blue_canyon.asp</a>
24	Blue Canyon Wind Power II	
25	San Juan Mesa	<a href="http://www.padoma.com/press030505.html">http://www.padoma.com/press030505.html</a>
26	Moraine Wind Power Project	<a href="http://www.livepowernews.com/stories/1125/101.htm">http://www.livepowernews.com/stories/1125/101.htm</a>
27	Chanarambie	<a href="http://www.enxco.com/company_projects_chanarambie.php">http://www.enxco.com/company_projects_chanarambie.php</a>
28	Trimont	<a href="http://www.ppmenergy.com/rel_04.10.05.html">http://www.ppmenergy.com/rel_04.10.05.html</a>
29	Top of Iowa Wind Farm	<a href="http://www.iowadnr.com/energy/renewable/files/top_casesstudy.pdf">http://www.iowadnr.com/energy/renewable/files/top_casesstudy.pdf</a>
30	Hancock County Wind Farm	<a href="http://www.humboldtnews.com/News/2002/1024/Front_Page/0103.html">http://www.humboldtnews.com/News/2002/1024/Front_Page/0103.html</a>
31	Cabazon	<a href="http://solsstice.crest.org/discussion/green-power/200205/msg00006.html">http://solsstice.crest.org/discussion/green-power/200205/msg00006.html</a>
32	Whitewater Hill	<a href="http://www.padoma.com/pr072002.htm">http://www.padoma.com/pr072002.htm</a>
33	King Mountain Wind Ranch	<a href="http://www.res-ldr.com/news/24-08-00.htm">http://www.res-ldr.com/news/24-08-00.htm</a>
34	Intrepid Wind Project	<a href="http://www.midamericanenergy.com/wind/html/news.asp">http://www.midamericanenergy.com/wind/html/news.asp</a>
35	Mendota Hills	email - Steve Stengel at FPL Energy phone call - Mark Reinders, MidAmerican Communications Manager - 1/12/05

## **Appendix B - PPAs for Output from Wind Projects Developed by PPM Energy**



**PPAs for Output from Wind Projects developed by PPM Energy**

Number	Wind Project	Capacity (MW)	Ultimate Customer(s)	MW	Contract Duration
	<b>Operating</b>				
1	Big Horn (Klickitat County, WA)	200	MSR Public Power Agency	200	"Long Term"
2	Colorado Green (Lamar County, CO)	162	Xcel Energy	162	"Long Term"
3	Elk River (Butler County, KS)	150	Empire District Electric Company	150	20 years
4	Flying Cloud (Spirit Lake, IA)	44	Interstate Power and Light	44	15 years
5	High Winds (Solano County, CA)	162	City of Alameda City of Sacramento City of Anaheim City of Pasadena City of Glendale City of Azusa City of Colton		"Long Term" "Long Term" "Long Term" "Long Term" "Long Term" "Long Term"
6	Klondike (Sherman County, OR)	24	Bonneville Power Administration	24	20 years
7	Klondike 2 (Sherman County, OR)	75	Portland General Electric	75	30 years
8	Leaning Juniper	101	PacifiCorp	101	"Long Term"
9	Maple Ridge (Lewis County, NY)	321	NYSERDA	231 90	10 years unknown
10	Moraine (Pipestone and Murray counties, MN)	51	Northern States Power	51	"Long Term"
11	Mountain View III (near Palm Springs, CA)	22	SDG&E	22	15 years
12	Shiloh (Solano County, CA)	150	PG&E Modesto Irrigation District (MID) City of Palo Alto Utilities	75 50 25	15 years 10 years 15 years
13	Stateline Wind (near Walla Walla, WA)	300	Bonneville Power Administration Seattle City Light Eugene Water & Electric Board Avista Utilities	90 175 25 10	25 years 20 years 25 years 10 years
14	Southwest Wyoming (Uinta County, WY)	144	Customers in UT,WY,CO	144	"Long Term"
15	Trimont (Jackson and Martin counties, MN)	100	Great River Energy	100	unknown
16	Twin Buttes (Lamar County, CO)	75	Xcel Energy	75	20 years
	<b>Sub Total</b>	<b>2081</b>			
	<b>Under Construction:</b>				
17	Casselman (Somerset County, PA)	35	FirstEnergy Solutions	35	23 years
18	Klondike III (Sherman County, OR)	221	PG&E Puget Sound Energy Eugene Water & Electric Board	85 50 25	15 years 20 years "Long Term"
19	MinnDakota Wind Power Project	150	Xcel Energy	150	"Long Term"
	<b>Sub Total</b>	<b>406</b>			
	<b>TOTAL</b>	<b>2486</b>			

**Sources**

- 1 [http://www.ppmenergy.com/re1\\_07.05.21.html](http://www.ppmenergy.com/re1_07.05.21.html) [http://www.ppmenergy.com/news/re1\\_05.10.13.pdf](http://www.ppmenergy.com/news/re1_05.10.13.pdf)
- 2 [http://www.ppmenergy.com/re1\\_03.10.27.html](http://www.ppmenergy.com/re1_03.10.27.html)
- 3 [http://www.ppmenergy.com/cs\\_elkriver.html](http://www.ppmenergy.com/cs_elkriver.html)
- 4 <http://www.alliantenergy.com/docs/groups/public/documents/pub/p014405.hcsp>
- 5 [http://www.ppmenergy.com/re1\\_03.09.18.html](http://www.ppmenergy.com/re1_03.09.18.html)
- 6 [http://www.bpa.gov/Power/PGC/wind/Wind\\_Project\\_Summary\\_Klondike.pdf](http://www.bpa.gov/Power/PGC/wind/Wind_Project_Summary_Klondike.pdf)
- 7 [http://www.ppmenergy.com/re1\\_05.10.28b.html](http://www.ppmenergy.com/re1_05.10.28b.html)
- 8 [http://www.ppmenergy.com/re1\\_06.07.27.html](http://www.ppmenergy.com/re1_06.07.27.html)
- 9 [http://www.ppmenergy.com/re1\\_06.09.26.html](http://www.ppmenergy.com/re1_06.09.26.html);  
New York State RPS Performance Report Program Period Ending March 2007, NYSERDA, August 2007
- 10 [http://www.ppmenergy.com/re1\\_04.01.09.html](http://www.ppmenergy.com/re1_04.01.09.html)
- 11 [http://findarticles.com/p/articles/mi\\_hb5265/is\\_200311/ai\\_n20432216](http://findarticles.com/p/articles/mi_hb5265/is_200311/ai_n20432216)
- 12 [http://www.ppmenergy.com/re1\\_05.07.07.html](http://www.ppmenergy.com/re1_05.07.07.html)  
[http://www.ppmenergy.com/re1\\_05.10.13.html](http://www.ppmenergy.com/re1_05.10.13.html)
- 13 <http://www.ppmenergy.com/stateline.html>  
[http://www.ppmenergy.com/re1\\_02.05.14.html](http://www.ppmenergy.com/re1_02.05.14.html)  
[http://www.ppmenergy.com/re1\\_01.12.14.html](http://www.ppmenergy.com/re1_01.12.14.html)  
[http://www.ppmenergy.com/re1\\_04.04.07.html](http://www.ppmenergy.com/re1_04.04.07.html)
- 14 [http://www.ppmenergy.com/re1\\_03.09.10.html](http://www.ppmenergy.com/re1_03.09.10.html)
- 15 [http://www.ppmenergy.com/re1\\_06.07.08.html](http://www.ppmenergy.com/re1_06.07.08.html)
- 16 [http://www.ppmenergy.com/pdf/Twin\\_Buttes\\_Fact\\_Sheet.pdf](http://www.ppmenergy.com/pdf/Twin_Buttes_Fact_Sheet.pdf)
- 17 [http://www.ppmenergy.com/re1\\_06.12.18.html](http://www.ppmenergy.com/re1_06.12.18.html)
- 18 [http://www.ppmenergy.com/re1\\_07.07.24.html](http://www.ppmenergy.com/re1_07.07.24.html)
- 19 [http://www.ppmenergy.com/re1\\_06.09.21.html](http://www.ppmenergy.com/re1_06.09.21.html)

