

# **Report on the Impacts of the Renewable Portfolio Standard**

## **Docket 5-GF-262**

**Public Service Commission of Wisconsin**

**June 2, 2016**

## Executive Summary

The 10 percent by 2015 statewide goal of the Wisconsin Renewable Portfolio Standard (RPS) was established by 2005 Wisconsin Act 141, which also required electric providers to procure renewable energy in order to meet individual requirements. Electric providers quickly began to construct renewable resources and contract with independent power producers. The statewide goal was exceeded in 2013 and 2014, as well as recently in 2015, when 10.38 percent<sup>1</sup> of total retail sales came from renewable resources. This report fulfills a requirement in Wis. Stat. § 196.378(4r) to estimate revenue requirement and rate impacts of the RPS, and focuses on impacts observed in 2013 and 2014.

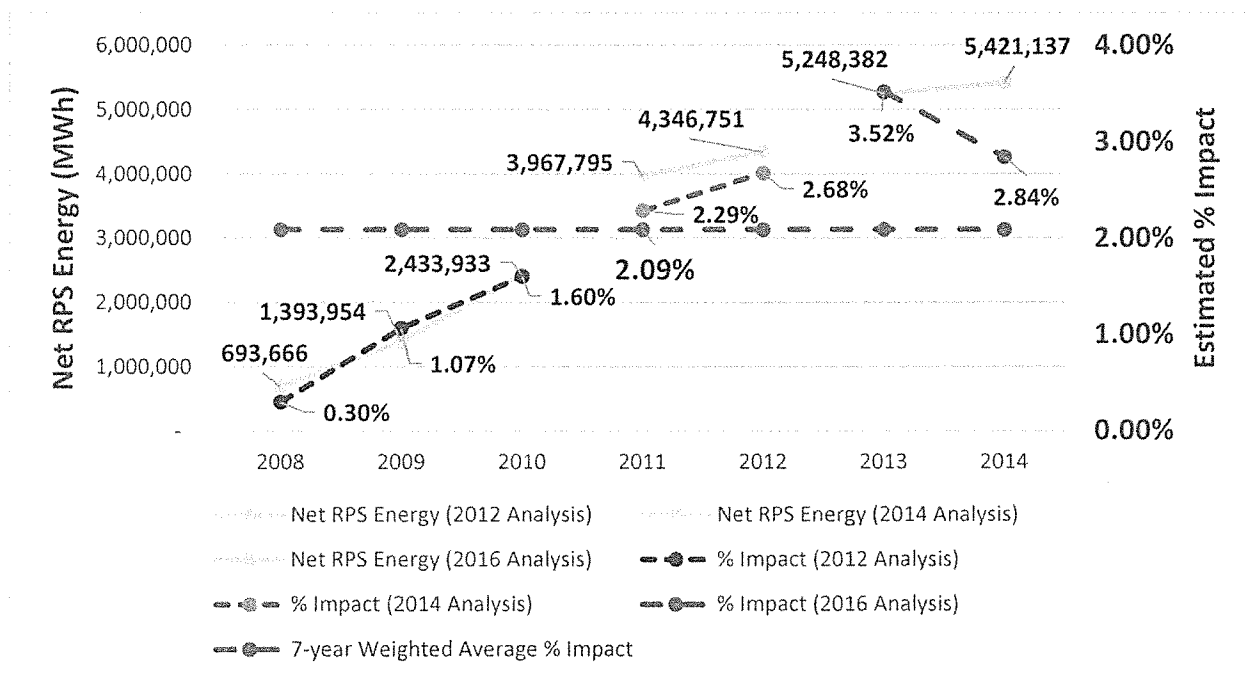
Commission staff used the same methodology to estimate RPS impacts for the years 2013 and 2014 as was used in prior Commission RPS impact reports. RPS costs were compared to wholesale market energy costs. Using this comparison resulted in approximately \$450 million of incremental RPS revenue requirements over the two-year period. The RPS retail rate impacts were estimated to be 3.52 percent for 2013, and 2.84 percent for 2014. The decreased rate impact in 2014 was primarily due to much colder than usual “polar vortex” natural gas prices, which impacted the market for wholesale electric energy.

Using information from prior RPS impacts reports, calculations were also performed for the 2008 to 2014 seven-year period. Over those seven years, about \$982 million in incremental RPS costs were collected by electric providers for their revenue requirements. The seven-year weighted average rate impact of the RPS was 2.09 percent. Figure 1 presents the net RPS energy and rate impacts of 2008 through 2014 from Commission reports.

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<sup>1</sup> Details for 2015 RPS compliance and renewable resource statistics can be found in the Commission memorandum (PSC REF#: 285744) in docket 5-GF-260.

**Figure 1 Net RPS Energy and Rate Impacts (2008-2014)**



According to electric provider forecasts, growth of RPS energy is projected to flatten through 2020, causing the 10 percent goal to continually be met while also limiting rate impacts in the future. Commission staff estimates that average RPS rate impacts will remain around 3 percent going forward.

## Methodology

The methodology to estimate RPS impacts for 2013 and 2014 is based on language in Wis. Stat. § 196.378(4r) stating that RPS costs shall be compared to “market forces” that electric providers would be subject to in the absence of the RPS. Using the same analytical approach established in two prior RPS impact reports,<sup>2</sup> Commission staff compared RPS costs to energy prices in the Midcontinent Independent System Operator, Inc. (MISO), energy market.

Wholesale market energy prices, as the basis of comparison, became the “counterfactual”

<sup>2</sup> A 2012 report (PSC REF#: 166782) on RPS impacts for years 2008-2010 is filed in docket 5-GF-220, and a 2014 report (PSC REF#: 207029) on RPS impacts for years 2011 and 2012 is filed in docket 5-GF-245.

scenario, in that electric providers and their retail customers would have had more exposure to wholesale energy prices in absence of the RPS.

Commission staff established weighted average statewide costs for a megawatt-hour (MWh) per renewable resource by performing an analysis of data request responses by Wisconsin electric providers in docket 5-GF-262. Statewide costs were then applied to net RPS energy by performing additional analysis of electric provider RPS compliance reports for 2013 and 2014. Net RPS energy per renewable resource was distributed through 2013 and 2014 on a seasonal and hourly basis using the same Commission staff renewable generator output analysis performed in 5-GF-245, as summarized in Appendix A.

Commission staff then acquired MISO data on day-ahead energy market prices to determine the counterfactual. Rather than applying net RPS energy to RPS costs, the counterfactual scenario applies net RPS energy to day-ahead Locational Marginal Prices (LMP) that were observed at Wisconsin load zones in 2013 and 2014. The incremental amount of revenue requirement for the RPS equals “RPS costs” minus “LMP costs.”

Energy Information Administration (EIA) data for 2013 and 2014 were used as well to finalize rate impact analyses. Limited to all Wisconsin electric providers, EIA-reported total revenues collected were divided by total retail sales of energy to determine actual statewide average retail rates for 2013 and 2014. Additional revenue required due to the RPS, as mentioned in the previous paragraph, was then subtracted from total revenues to determine the counterfactual revenue requirement. This counterfactual revenue requirement was then divided by the same total retail sales to establish the counterfactual statewide average rates for those years. The percent difference between the counterfactual and actual rate determines the rate impact of the RPS for 2013 and 2014. Using information established in two prior RPS impacts

reports, Commission staff were also able to estimate total revenue requirements and weighted average impacts of the RPS over the 2008 to 2014 seven-year period.

### **RPS and Wholesale Energy Market Costs**

Electric provider RPS costs reflect a mix of procurement practices that include utility-owned generation, Purchase Power Agreements (PPA), and feed-in tariffs with their retail customers. Electric providers noted that some PPAs were based on short-term agreements reflecting temporary supply and demand, and some tariffs are based on avoided market costs. As a result of this mix of procurement practices, average electric provider costs do not represent the true cost of owning and operating renewable resources. However, it is an accurate representation of RPS costs passed on to customers through retail rates. Electric provider responses were weighted based on electric provider share of total generation as reported in annual RPS compliance reports, and statewide averages are presented in Table 1.

**Table 1      Statewide Average Electric Provider RPS Procurement Costs (2013-2014)**

<b>Resource</b>	<b>\$/MWh</b>
Wind <sup>3</sup>	\$58.66
Biogas	\$88.77
Biomass	\$173.29
Solar	\$173.28

Wisconsin load zone LMPs were analyzed to determine the counterfactual for this report, or what would have occurred if the RPS were never enacted. Table 2 is a summary of 2013 and 2014 seasonal on-peak and off-peak LMPs.<sup>4</sup>

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<sup>3</sup> One hydro facility's costs are embedded in wind costs to ensure PPA costs are confidential.

<sup>4</sup> On-peak LMPs were hours ending 9-20, and off-peak LMPs were hours ending 1-8 and 21-24.

**Table 2            Average Wisconsin LMPs by Season and Time-of-Day**

<b>2013 Average Wisconsin LMPs</b>		
<b>Season</b>	<b>On-Peak</b>	<b>Off-Peak</b>
Winter	\$35.84	\$28.40
Spring	\$37.82	\$29.13
Summer	\$39.43	\$24.70
Autumn	\$37.92	\$25.89

<b>2014 Average Wisconsin LMPs</b>		
<b>Season</b>	<b>On-Peak</b>	<b>Off-Peak</b>
Winter	\$56.39	\$43.37
Spring	\$47.94	\$36.04
Summer	\$42.72	\$26.39
Autumn	\$40.22	\$28.79

2014 experienced an increase in prices primarily due to temporary higher natural gas prices. The natural gas market was impacted by extremely cold polar vortex<sup>5</sup> conditions that occurred during the winter of 2014. More detail on LMP fluctuation is available in Appendix B.

### **RPS Impacts**

Net RPS energy was established by taking reported generation in 2013 and 2014 RPS compliance reports, then removing energy that occurred from “baseline” facilities that were in service before the current RPS took effect in 2006. Baseline facility identification was done using electric provider information, and generation data from those baseline facilities was downloaded using regulatory access to the Midwest Renewable Energy Tracking System.

Net RPS energy was then applied to RPS procurement costs for the actual RPS scenario, and net RPS energy was applied to LMP costs for the counterfactual scenario. Table 3 presents the incremental revenue requirement of the RPS above and beyond the counterfactual scenario, and

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<sup>5</sup> MISO released an issue summary on the polar vortex subject that can be found here: <https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/ENGCTF/2014/20141009/20141009%20ENGCTF%20Issue%20Summary%20Paper%20-%20Polar%20Vortex.docx>.

more detailed calculations can be found in Appendix C. Although there was an increase in net RPS energy from 2013 to 2014, this was outweighed by 2014 LMP cost impacts due to the polar vortex, which decreases the incremental revenue requirement for the RPS in 2014.

**Table 3            2013 and 2014 Incremental Revenue Requirements of the RPS**

2013	\$247,100,741
2014	\$203,082,946
2-Year Total	\$450,183,687

Finally, EIA information of actual revenue and total retail sales for Wisconsin were used for the RPS scenario in 2013 and 2014, and incremental revenue requirements of the RPS were removed for counterfactual revenues. Results with average actual and counterfactual total costs and average retail rates are presented in Table 4.

**Table 4            Actual and Counterfactual Costs of the RPS**

<b>Actual Totals with RPS Costs Included</b>			
<b>Wisconsin Total</b>	<b>Revenues Collected</b>	<b>Retail Sales</b>	<b>Average Rate Across Classes</b>
<b>Year</b>	<b>\$</b>	<b>kWh</b>	<b>\$/kWh</b>
2013	\$7,264,825,800	69,124,043,000	\$0.1051
2014	\$7,345,214,300	69,494,755,000	\$0.1057
2-Year Total	\$14,610,040,100	138,618,798,000	\$0.1054

<b>Counterfactual Totals with Incremental RPS Costs Removed</b>			
<b>Wisconsin Total</b>	<b>Revenues Collected</b>	<b>Retail Sales</b>	<b>Average Rate Across Classes</b>
<b>Year</b>	<b>\$</b>	<b>kWh</b>	<b>\$/kWh</b>
2013	\$7,017,725,059	69,124,043,000	\$0.1015
2014	\$7,142,131,354	69,494,755,000	\$0.1028
2-Year Total	\$14,159,856,413	138,618,798,000	\$0.1021

Calculating the percentage difference between the counterfactual and actual scenarios (using either revenues collected or average retail rates) determines the rate impact of the RPS, which are presented in Table 5. The rate impact actually decreased in 2014 due to higher LMP costs as described above.

**Table 5            2013 and 2014 Rate Impacts of the RPS**

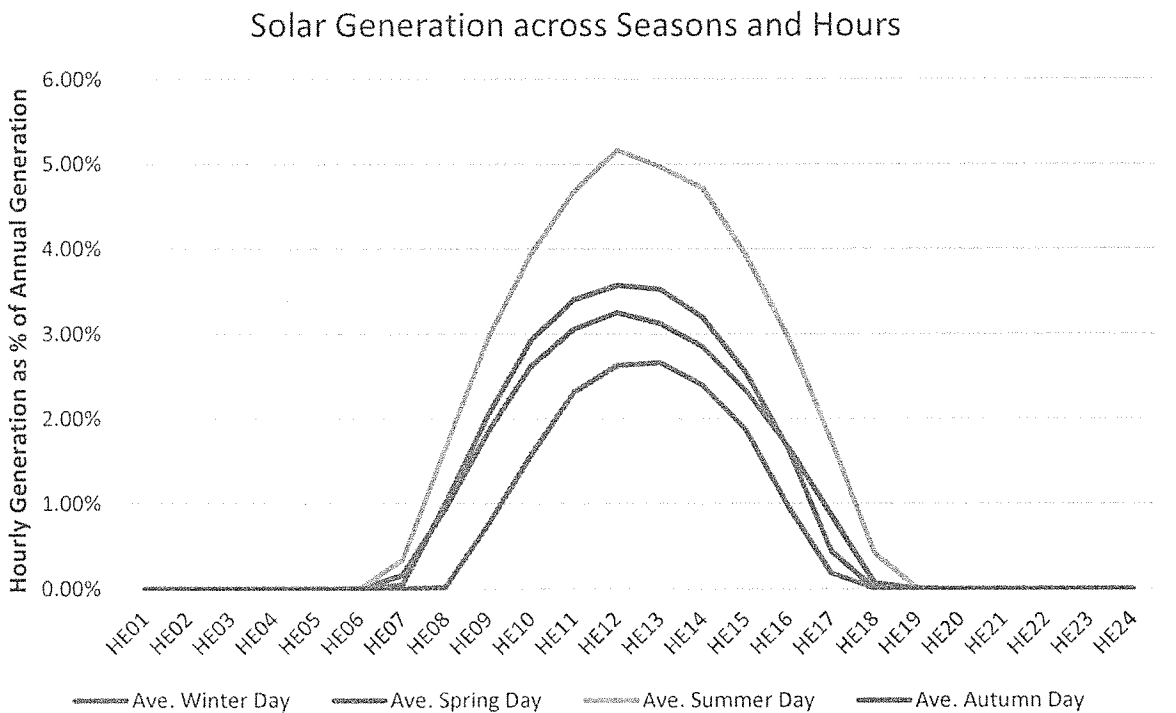
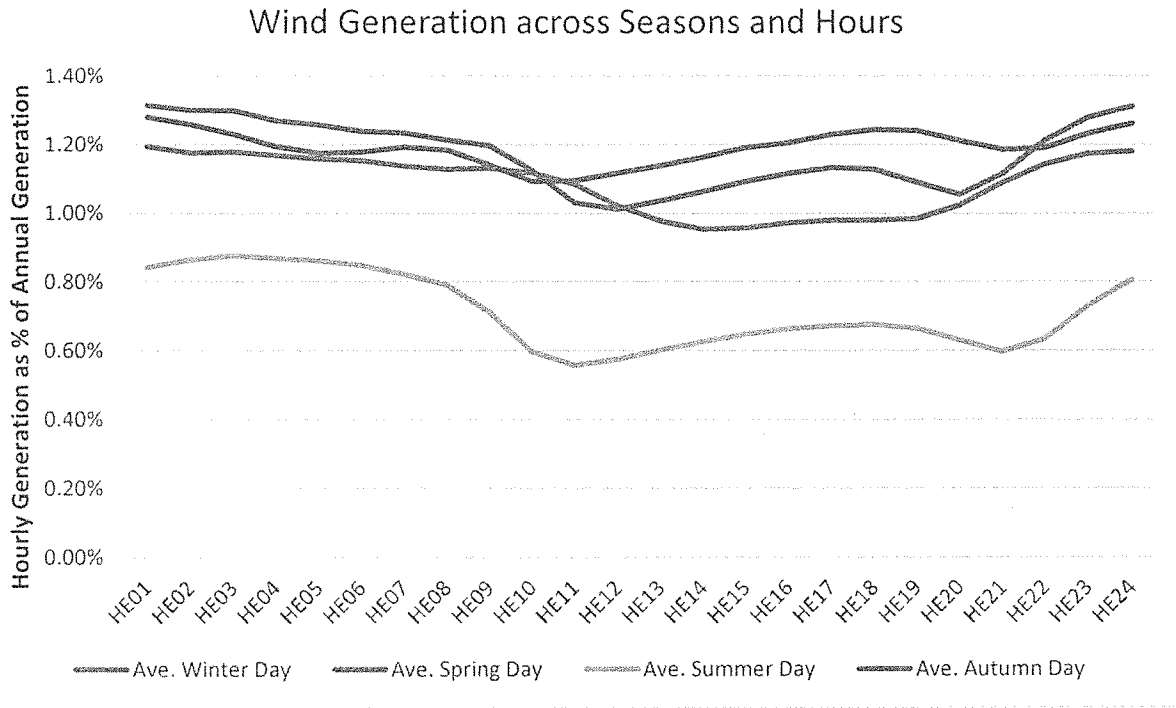
2013	3.52%
2014	2.84%
2-Year Average	3.18%

Using information from prior Commission reports, seven-year impacts of the RPS can also be calculated over the 2008 to 2014 period. Just over \$982 million in incremental revenues were collected due to the RPS, which results in a weighted average 2.09 percent impact over those seven years. Going forward, net RPS energy growth will flatten out due to the RPS goal being met, and LMPs are now observed to be lower than what occurred in 2014. This should result in future rate impacts of the RPS being near 3 percent on an annual basis.

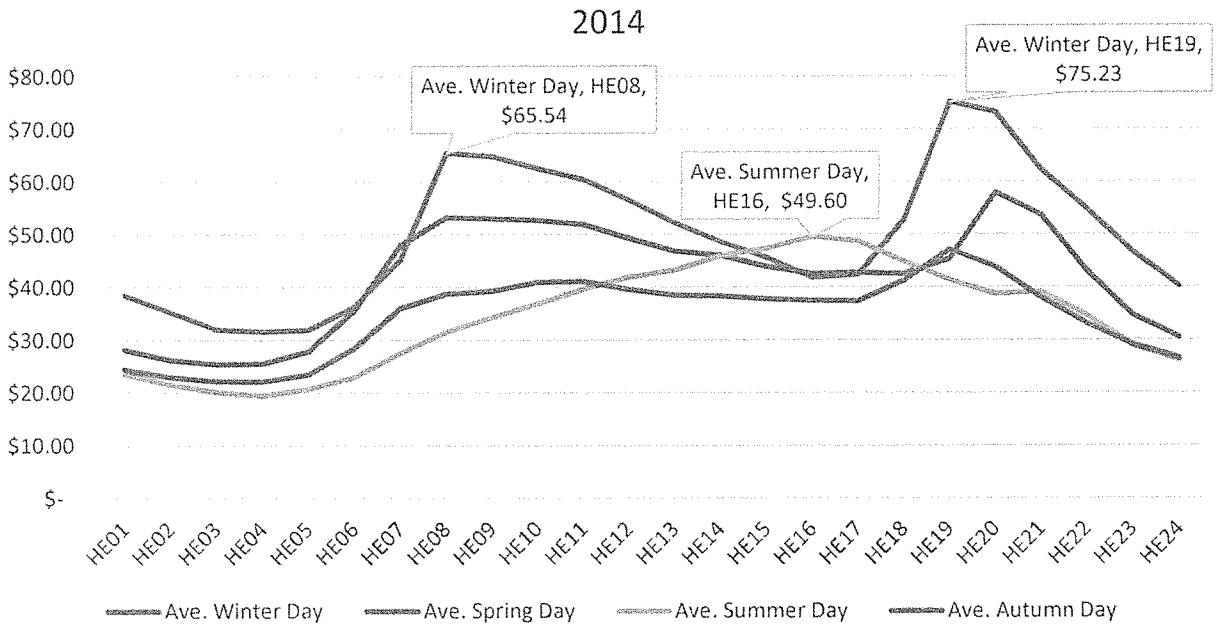
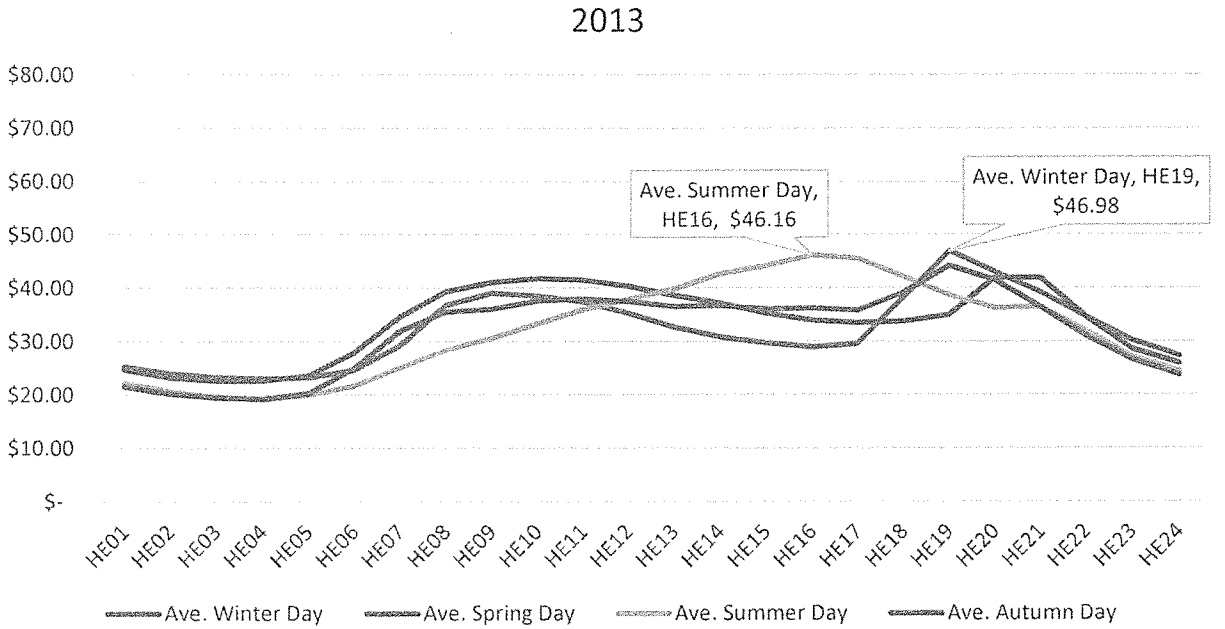
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## Appendix A Renewable Resource Seasonal and Hourly Output Analysis



## Appendix B Average Hourly Wisconsin LMPs per Season (2013 and 2014)



**Appendix C**  
**RPS and LMP Cost Tables**

**2013 Statewide Incremental RPS Costs**  
**“RPS Costs” Minus “LMP Costs”**

<b>Resource</b>	<b>MWh</b>	<b>Average \$/MWh</b>	<b>Costs to Procure Generation</b>
Wind*	4,204,600	\$58.66	\$246,640,050
Biogas	146,005	\$88.77	\$12,960,937
Biomass	897,264	\$173.29	\$155,484,721
Solar	512	\$173.28	\$88,806
<b>Total</b>	<b>5,248,382</b>	<b>N/A</b>	<b>\$415,174,514</b>

<b>Counterfactual</b>	<b>MWh</b>	<b>Average \$/MWh</b>	<b>Costs to Procure Generation</b>
LMP Purchases	5,248,382	Varies by Hour	\$168,073,773

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<b>2013 Total RPS Incremental Costs</b>	<b>\$247,100,741</b>
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**2014 Statewide Incremental RPS Costs**  
**“RPS Costs” Minus “LMP Costs”**

<b>Resource</b>	<b>MWh</b>	<b>Average \$/MWh</b>	<b>Costs to Procure Generation</b>
Wind*	4,432,102	\$58.66	\$259,993,579
Biogas	128,282	\$88.77	\$11,387,672
Biomass	860,153	\$173.29	\$149,053,872
Solar	601	\$173.28	\$104,058
<b>Total</b>	<b>5,421,137</b>	<b>N/A</b>	<b>\$420,539,181</b>

<b>Counterfactual</b>	<b>MWh</b>	<b>Average \$/MWh</b>	<b>Costs to Procure Generation</b>
LMP Purchases	5,421,137	Varies by Hour	\$217,456,235

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<b>2014 Total RPS Incremental Costs</b>	<b>\$203,082,946</b>
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\* One hydro facility’s costs are embedded in wind costs to ensure PPA costs are confidential.