2010 Annual Report

Alternative Energy Portfolio Standards Act of 2004

Prepared by the
PA Public Utility Commission
in cooperation with the
PA Department of Environmental Protection

PENNSYLVANIA PUC
PUBLIC UTILITY COMMISSION

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

2010 Annual Report
Alternative Energy Portfolio Standards Act of 2004

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* *As of August 11, 2011, the Bureau of CEEP has been eliminated and the functions/staff have been transferred to the newly created* ***Bureau of Technical Utility Services.***

EXECUTIVE SUMMARY

INTRODUCTION

The Alternative Energy Portfolio Standards (AEPS) Act of 2004 requires electric distribution companies (EDCs) and electric generation suppliers (EGSs) to supply 18 percent of electricity using alternative energy resources by 2021.[1] The percentage of Tier I, Tier II and solar alternative energy credits that must be included in sales to retail customers gradually increases over this period.[2] The solar photovoltaic requirement is a component of the Tier I obligation. Act 35 of 2007 subsequently adjusted the photovoltaic percentages to smooth out the yearly increments needed to obtain the 2021 goal. EDCs and EGSs meet their AEPS requirements through the purchase of alternative energy credits (AECs) in amounts corresponding to the percentage of electricity that is required from alternative energy sources. One AEC represents one megawatt hour (MWh) of electricity generated from a qualified alternative energy source and can be purchased separate from the electricity.

Section 7(c) of the AEPS Act requires that the Pennsylvania Public Utility Commission (Commission or PUC) and the Department of Environmental Protection (DEP) work cooperatively to monitor the performance of all aspects of the act and prepare an annual report to the chairman and minority chairman of the Environmental Resources and Energy Committee of the Senate and the chairman and minority chairman of the Environmental Resources and Energy Committee of the House of Representatives. Act 35 of 2007 included an additional reporting requirement at Section 2 F(5).

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[1] See generally 73 P.S. § 1648.1 et seq.

[2] Tier I sources include solar photovoltaic and solar thermal energy, wind power, low-impact hydropower, geothermal energy, biologically derived methane gas, fuel cells, biomass energy (including generation located inside Pennsylvania from by-products of the pulping process and wood manufacturing process including bark, wood chips, sawdust and lignin in spent pulping liquors) and coal mine methane. Tier II sources include waste coal, distributed generation systems, demand-side management, large-scale hydropower, municipal solid waste, generation of electricity outside of Pennsylvania utilizing by-products of the pulping process and wood manufacturing process including bark, wood chips, sawdust and lignin in spent pulping liquors and integrated combined coal gasification technology.

OVERVIEW

For the 2010 reporting year (June 1, 2009 – May 31, 2010) all EDCs and EGSs with an AEPS obligation were in compliance. One EGS that served the Duquesne and PPL service territories did not purchase and/or retire four Tier I and six Tier II AECs and made an alternative compliance payment for the ten credits. All EDCs and EGSs purchased or retired the required number of solar AECs.

There are sufficient Tier I resources available in Pennsylvania through 2013 and Tier II through 2021. There is sufficient solar capacity already built and planned to meet demand through 2015. Pennsylvania EDCs are permitted to obtain AECs from within the entire PJM (regional grid manager) area. If we consider the entire RPS demand and supply from all PJM states rather than just the PA-only market, there is adequate supply for Tier I through 2015 and Tier II until 2014. Solar supply in the PJM market is also adequate through 2013. This is assuming that 25% of the projects in the PJM construction queues are actually built which has historically been the case.

Commission staff recommends the quarterly adjustment be eliminated as an update to the program. The quarterly adjustment requires extensive administrative burden for only an insignificant increase in Tier I non-solar AECS. Eliminating the quarterly adjustment will require a legislative amendment to the AEPS Act.

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SECTION 1 INTRODUCTION

PURPOSE

Act 213 of 2004 was signed into law on November 30, 2004, establishing an alternative energy portfolio standard for Pennsylvania. The law took effect on February 28, 2005, and requires that an annually increasing percentage of electricity sold to retail customers in Pennsylvania by EDCs and EGSs be derived from alternative energy resources.

The PUC is responsible for carrying out and enforcing the provisions of the law. The Department of Environmental Protection has been charged with rendering determinations of resource eligibility and ensuring compliance with all environmental, health and safety laws and standards relevant to the law's implementation. The PUC and DEP are to jointly monitor compliance with the Act, the development of the alternative energy market and the costs of alternative energy, and to conduct an ongoing alternative energy planning assessment. The PUC and DEP are to report their findings and any recommendations for changes to the Act to the General Assembly on a regular basis.

The law establishes a 15-year schedule for complying with its mandates. The percentage of Tier I, Tier II and solar alternative energy resources that must be included in sales to retail customers gradually increases over this period. Compliance is monitored for successive 12-month reporting periods that begin on June 1 and conclude on May 31. The law provides for a true-up period, during which EDCs and EGSs may acquire any additional alternative energy credits needed for compliance, at the conclusion of each reporting period. This three-month true-up period runs from the conclusion of each reporting period until September 1 of the same calendar year. After the conclusion of the true-up period, the PUC will verify compliance and impose Alternative Compliance Payments (ACPs) as appropriate after providing notice and opportunities for hearings to affected parties.

On July 19, 2007, Act 35 of 2007 was signed, which amended Act 213 by changing the compliance schedule related to solar photovoltaic (PV) energy. Act 35 also amended other provisions of the law, including definitions for customer-generator and net metering. As a result, the PUC on September 13, 2007, reopened the public comment period to provide interested parties the opportunity to advise the Commission on how these amendments should be reflected in the

final form rulemaking at Docket No. L-00060180. Comments were due October 11, 2007. The Commission completed its review of the comments and issued a final rulemaking at the Public Meeting on September 25, 2008; the rules became effective when published in the Pennsylvania Bulletin on December 20, 2008.

The final rule, published December 20, 2008, provides a clarification of the solar PV obligation and includes the revised 15-year schedule for solar PV requirements. The clarification for solar PV obligation affirms that the percentage requirement is a percentage of all retail sales and that the solar percentage is a part of the total Tier I obligation. Table 1 provides an overview of the AEPS percentage sales requirements with the revised solar PV schedule.

TABLE 1 – OVERVIEW OF AEPS PERCENTAGE SALES REQUIREMENTS

Year*	Tier I	Tier II	Solar PV
Year 01- 2007	1.50 percent	4.20 percent	0.0013 percent
Year 02- 2008	1.50 percent	4.20 percent	0.0030 percent
Year 03- 2009	2.00 percent	4.20 percent	0.0063 percent
Year 04- 2010	2.50 percent	4.20 percent	0.0120 percent
Year 05- 2011	3.00 percent	6.20 percent	0.0203 percent
Year 06- 2012	3.50 percent	6.20 percent	0.0325 percent
Year 07- 2013	4.00 percent	6.20 percent	0.0510 percent
Year 08- 2014	4.50 percent	6.20 percent	0.0840 percent
Year 09- 2015	5.00 percent	6.20 percent	0.1440 percent
Year 10- 2016	5.50 percent	8.20 percent	0.2500 percent
Year 11- 2017	6.00 percent	8.20 percent	0.2933 percent
Year 12- 2018	6.50 percent	8.20 percent	0.3400 percent
Year 13- 2019	7.00 percent	8.20 percent	0.3900 percent
Year 14- 2020	7.50 percent	8.20 percent	0.4433 percent
Year 15- 2021	8.00 percent	10.00 percent	0.5000 percent

*Years reflect the AEPS year, from June 1 through May 31. For example, Year 1 represents the 12 months of June 1, 2006 through May 31, 2007.

On October 15, 2008, Act 129 of 2008 was signed, which, among other things, included additional energy sources in the definition of Tier 1 alternative energy sources. To accommodate the newly added Tier I alternative energy sources, Act 129 directed the Commission on a quarterly basis to increase the percentage of Tier I requirements for EDCs and EGSs to reflect the amount of generation from the new resources added by the Act. At Public Meeting on May 28, 2009, the Commission approved a Final Order that established procedures to increase the non-solar PV Tier I percentage requirement on a quarterly basis to account for the new resources.

CHRONOLOGY OF EVENTS

Table 2 provides a snapshot of the key chronology of events to date.

TABLE 2 – CHRONOLOGY OF EVENTS: 2004-11

Event	Date
Act 213 of 2004	November 30, 2004
Act 213 of 2004 Effective Date	February 28, 2005
PUC Adopts Implementation Order I (M-00051865)	March 23, 2005
PUC Adopts Implementation Order II (M-00051865)	July 14, 2005
PUC Adopts Order: Standards for DSM Resources (M-00051865)	September 25, 2005
PUC Adopts Order: Designates PJM GATS Registry (M-00051865)	January 27, 2006
Final Net Metering/Interconnection Regulations in PA Bulletin	December 16, 2006
PUC Contracts with Clean Power Markets as Program Administrator	March 28, 2007
Compliance Required for Penn Power & UGI	May 31, 2007

Event	Date
Act 35 of 2007	July 19, 2007
Compliance Required for Citizens, Duquesne, Pike County & Wellsboro	January 1, 2008
PUC Adopts Final Rulemaking Implementation Order (L-00060180)	September 25, 2008
Act 129 of 2008	October 15, 2008
Final Omitted Rulemaking Order (Net Metering) – Published in PA Bulletin (L-00050174)	November 29, 2008
PUC Adopts Act 129 Implementation Order – Relating to AEPS	May 28, 2009
Compliance Required for PPL Electric Utilities	January 1, 2010
PUC Adopts Solar Policy Statement	September 16, 2010
Compliance Required for PECO, Pennsylvania Electric Company, Metropolitan Edison, and West Penn Power	January 1, 2011

SECTION 2 STATUS OF COMPLIANCE

2010 COMPLIANCE SUMMARY

Table 3 provides a summary of compliance for all EDCs and EGSs operating within service territories subject to AEPS compliance requirements during the 2010 reporting period. Included in Table 3 are the MWhs sold, the number of AECs reserved for compliance, the weighted average credit price for each of the tiers, the cost of purchased credits and the number of ACPs made. The solar requirement is a percentage of retail sales and is included in the Tier I requirement. An ACP is required for each AEC for which an EDC and/or EGS was deficient in meeting its compliance obligation.

TABLE 3 2010 AEPS COMPLIANCE REPORT BY SOURCE

Reporting Period / MWhs	Alternative Energy Requirement		Number of Credits Reserved	Weighted Average Credit Price*	Cost of Purchased Credits	Alternative Compliance Payments
	Tier	Percent of Total Energy Sold				
2010 / 33,016,464 MWh	Solar	0.0120 percent	3,961	$325	$1,015,379	none
	I	2.5 percent	827,028	$4.77	$2,171,757	4
	II	4.2 percent	1,386,686	$0.32	$245,786	6
	All	6.7 percent	2,217,675	$2.79**	$3,443,241	10

*The Weighted Average Credit Price is calculated using data for credits that have a known cost. Some credits that are retired to meet obligations are self generated or purchased bundled with the electricity and a cost for those credits is not available. Therefore, dividing the Cost of Purchased Credits by the Number of Credits Reserved will not yield the Weighted Average Credit Price reflected in Table 3.

The Weighed Average Credit Price for the ***All* row of Table 3 is the Cost of All Purchased Credits divided by number of credits with a known cost.

Table 4 presents 2010 reporting period data on the number of AECs retired by tier in the territories of EDCs with AEPS obligations. The results show that the EDCs and EGSs are in compliance. One EGS, Energy Plus Holdings serving the Duquesne and PPL service territories did not purchase and/or retire four Tier I and six Tier II credits and made an ACP for the ten credits. All EDCs and EGSs were in compliance for their solar obligations through the purchase and retirement of Solar AECs. Because EGS sales information is considered proprietary, their numbers have been combined and are shown with the appropriate EDC. During this reporting period seven EDCs and thirty-three EGSs had compliance obligations. PPL Electric Utilities and EGSs providing service in the PPL Electric Utilities service area had a partial reporting year AEPS obligation that began January 1, 2010.

TABLE 4 2010 AEPS COMPLIANCE REPORT BY EDC SERVICE TERRITORY

Distribution Service Territory	Total Energy Sold (MWhs)	Alternative Energy Requirement (percent)	Credits Retired	Compliance Status
Citizens' Electric	154,338			
Solar		0.0120 percent	19	In Compliance
Tier I		2.50 percent	3,870	In Compliance
Tier II		4.20 percent	6,482	In Compliance
Duquesne Light & Suppliers	13,329,805			
Solar		0.0120 percent	1600	In Compliance
Tier I		2.50 percent	334,286	In Compliance after ACP paid
Tier II		4.20 percent	559,850	In Compliance after ACP paid
Penn Power & Suppliers	4,300,392			
Solar		0.0120 percent	517	In Compliance
Tier I		2.50 percent	107,831	In Compliance
Tier II		4.20 percent	180,616	In Compliance

Distribution Service Territory	Total Energy Sold (MWhs)	Alternative Energy Requirement (percent)	Credits Retired	Compliance Status
Pike County & Suppliers	73,202			
Solar		0.0120 percent	8	In Compliance
Tier I		2.50 percent	1,836	In Compliance
Tier II		4.20 percent	3,075	In Compliance
PPL & Suppliers	14,093,161			
Solar		0.0120	1689	In Compliance
Tier I		2.50	352,485	In Compliance after ACP paid
Tier II		4.20	591,911	In Compliance after ACP paid
UGI	958,438			
Solar		0.0120 percent	115	In Compliance
Tier I		2.50 percent	24,034	In Compliance
Tier II		4.20 percent	40,254	In Compliance
Wellsboro Electric	107,128			
Solar		0.0120 percent	13	In Compliance
Tier I		2.50 percent	2,686	In Compliance
Tier II		4.20 percent	4,499	In Compliance

FUTURE COMPLIANCE BY REMAINING ELECTRIC DISTRIBUTION COMPANIES

Pennsylvania Electric Company (Penelec), Metropolitan Edison Company (Met-Ed), West Penn Power (formerly Allegheny Power) and PECO Energy Company (PECO) began compliance obligations on Jan. 1, 2011. As was the case with other EDCs, these companies will initially have partial year reporting requirements.

TABLE 5 OVERVIEW OF EDC YEAR REQUIREMENTS

Electric Distribution Companies	
Penn Power	2007
UGI Electric	2007
Duquesne	2008
Citizens'	2008
Pike County	2008
Wellsboro	2008
PPL	2010
West Penn Power (formerly Allegheny Power)	2011
Met-Ed	2011
Penelec	2011
PECO	2011

AEPS GENERATORS CERTIFIED

The Pennsylvania AEPS website (http://paaeps.com/credit/) maintains a summary of qualified generation facilities and qualified energy efficiency and demand-side management (EE/DSM) resources. There were 5,312 qualified generation facilities and 15 EE/DSM resources listed on May 18, 2011. Of the 5,312 qualified generation facilities, 3,894 facilities are located in Pennsylvania and 1,418 facilities are located outside of Pennsylvania.

AEPS CERTIFICATES/CREDITS CREATED

Table 6 shows the number of AECs created in PJM-EIS[3] by tier for calendar years 2005 through 2010 that were eligible for use in Pennsylvania. Since 2005 solar AECs totaled 64,743, Tier I AECs totaled 33,523,589 and Tier II AECs totaled 185,367,852. The data in Table 6 reveals a trend whereby the number of AECs created is increasing each year.

When looking at the number of credits created thus far in relation to the estimated number of credits needed in 2021, Table 6 shows that there were more Tier II credits created in each of the years from 2005 through 2010 than will be needed in 2021. As a result, Tier II credits will continue to be over-subscribed in that there will likely be many more of these credits created in any given year than are needed to meet annual requirements during the 2011-2021 period.

It should be noted that AECs that are eligible for use in Pennsylvania may also be eligible to meet alternative energy requirements in other states. However, provisions are in place to ensure that credits are used only once and are then retired thus preventing reuse for any other purpose.

The data provided in Table 6 is based on information available from PJM-EIS on May 18, 2011, and includes changes to data reported in previous AEPS reports.

TABLE 6 CREDITS ELIGIBLE FOR USE IN PENNSYLVANIA AND ESTIMATED 2021 REQUIREMENTS

	Solar	Tier I	Tier II	Total
2005	60	1,367,566	27,350,981	28,718,607
2006	345	3,030,273	32,695,189	35,725,807
2007	563	3,642,399	31,986,326	35,629,288
2008	2,285	6,264,511	31,542,227	37,809,023
2009	9,113	8,558,637	31,030,106	39,597,856
2010	52,377	10,660,203	30,763,023	41,475,603
2005-10 Total	64,743	33,523,589	185,367,852	218,956,184
Estimated 2021 Requirement	937,931	14,068,959	18,758,612	33,765,502

[3] PJM-EIS database available at http://www.pjm-eis.com.

STATUS OF CUSTOMER-GENERATOR INTERCONNECTIONS

The regulations at 52 §75.34 require EDCs to review interconnection requests using one or more of four review procedures.

Level 1 is used for inverter-based small generator facilities with a nameplate capacity of 10 kW or less. The customer's interconnection equipment is certified.

Level 2 is used for small generation facilities with a nameplate capacity 2 MW or less. The small generator facility uses an inverter for interconnection. The customer's interconnection equipment is certified. The proposed interconnection is to a radial distribution circuit, or a spot network limited to serving one customer. The small generator facility was reviewed under Level 1 review procedures but not approved.

Level 3 is used for evaluating interconnection requests to connect small generation facilities with an electric nameplate capacity of 2 MW or less which do not qualify under Level 1 or Level 2 interconnection review procedures or which have been reviewed under Level 1 or Level 2 review procedures, but have not been approved for interconnection.

Level 4 is used for interconnection customers that do not qualify for Level 1 or Level 2 review and do not export power beyond the point of common coupling. These customers may request to be evaluated under Level 4 review procedures which provide for a potentially expedited review process.

The PUC's regulations for net metering and interconnection provide for reports submitted by the EDCs to the PUC annually on July 30 containing the number of customer-generators interconnected to the distribution system as well as the status of interconnection requests processed by the EDCs in the past year. As of May 31, 2011, as illustrated in Table 7, Pennsylvania's EDCs reported that there were 4,435 Tier I and 7 Tier II net metering customer-generators interconnected to the distribution system. The source of this data comes from the EDCs' Annual Net Metering/Interconnection Report, June 1, 2010 to May 31, 2011. These customer-generators represented approximately 83,878 kW of generation capacity. Solar PV accounted for approximately 95% of the Tier I customer-generators and 95% of Tier I generation capacity.

Of the 4,442 customer-generators, the EDCs processed 3,568 of these interconnection requests during the June 1, 2010 to May 31, 2011 period. There were no denials. The average number of days for EDCs to complete a Level I interconnection request/approval was approximately 7 days. Level 2 took an average of 9 days to

complete. There were 14 Level 3 applications taking an average of 20 days to complete. Table 7 below provides a summary of the data.

TABLE 7 NUMBER OF CUSTOMER-GENERATORS INTERCONNECTED: 2007-2010

	Data as of May 31, 2007 (2007 Annual Report)				Data as of May 31, 2010 (2008/2009 Annual Report)				Data as of May 31, 2011 (2010 Annual Report)			
EDC	Tier I	Tier II	Solar PV	Total	Tier I	Tier II	Solar PV	Total	Tier I	Tier II	Solar PV	Total
Number of Customer Generators	21	0	163	184	1,512	3	1,351	1,515	4,435	7	4,201	4,442
Estimated Generation Capacity in kW	324	0	601	926	17,274	465	14,076	17,739	75,397	8,481	71,780	83,878

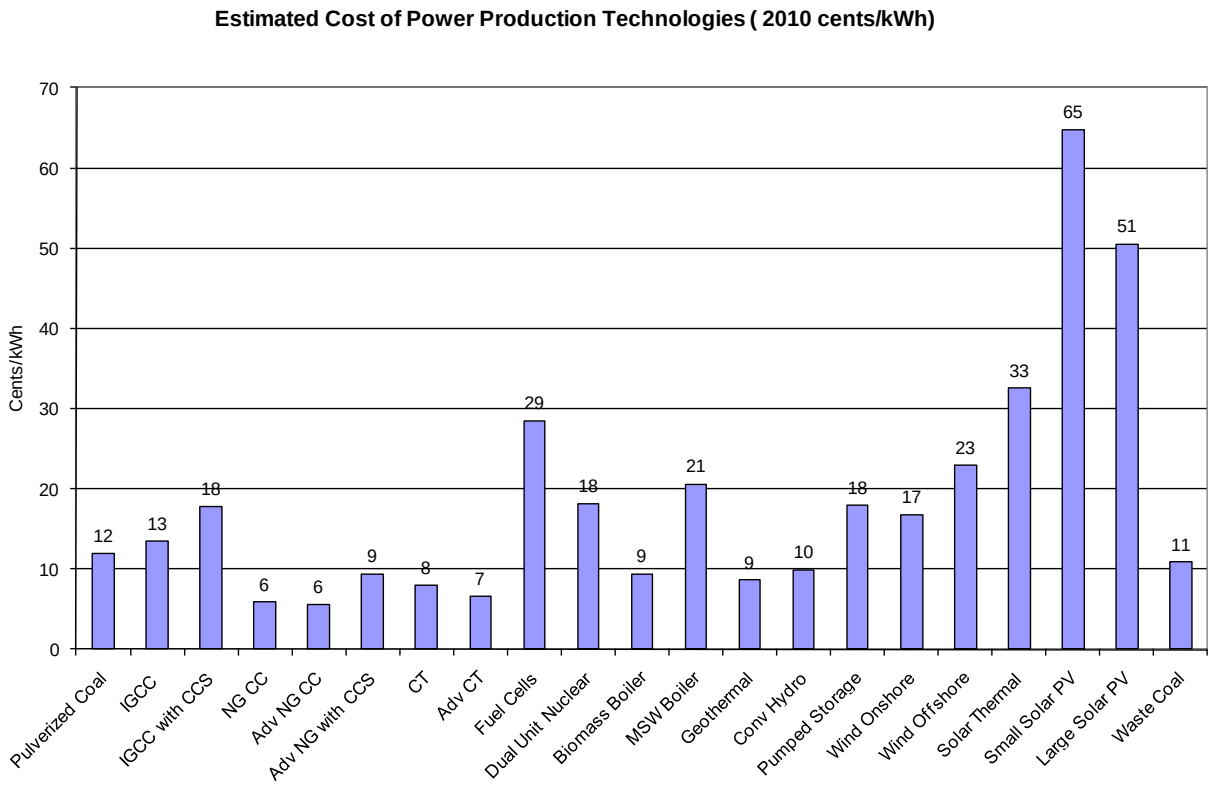
***Solar PV is a Tier I resource. The Solar PV column separately identifies the Solar PV component of Tier I.**

SECTION 3 CURRENT COSTS OF ALTERNATIVE ENERGY GENERATION

The Energy Information Administration (EIA) has provided cost estimate data for the construction and operation of utility scale electric generation plants. Graph 1 allows comparison of annual levelized costs for electric generation plants that would come online if orders had been placed in 2010.[4] These costs include overnight construction costs and annual operating and maintenance costs. Overnight construction cost is an estimate of the cost of construction if the process could be completed in one day, thus avoiding interest payments on the investment to construct. Operating costs include such items as fuel costs, maintenance, insurance and taxes. The annual levelized costs in Graph 1 indicate the competitiveness of different technologies for electricity generation. Levelized cost is the present value of the annual costs which can be variable. These costs are only one tool in the decision of what type of generation is most cost-effective. Fuel costs and future tax benefits can be variable and would impact the choice of generation. The existing resource types and projected plant utilization rates would also impact which type of generation would be suited for a particular load control area.

[4] Energy Information Administration, Annual Energy Outlook 2011, December 2010, DOE/EIA-0383(2010). Waste coal capital cost was estimated from conventional coal as per Hoskins, Bill and Booras, George, "Assessing the cost of new coal-fired power plants," Power, October 2005. Waste coal operating costs from EPA, Waste Coal-Fired Units in the CAIR and CAIR FIP, March 2006, OAR-2004-0076.

GRAPH 1 ESTIMATED LEVELIZED COST OF NEW GENERATION RESOURCES



See Appendix D for a key to the generating technologies.

SECTION 4 COSTS ASSOCIATED WITH THE ALTERNATIVE ENERGY CREDITS PROGRAM

ESTIMATED STATEWIDE AEPS COST OF COMPLIANCE

For analytical purposes, the Commission has provided estimates of the statewide costs of AEPS for the 2013 and 2021 compliance years. These cost projections are presented in 2010 dollars, using a 6% discount rate. Holding projected credit costs flat, the projected total compliance costs will increase each year as the percentage requirements of alternative energy increase. As shown in the charts below, the estimated cost of AEPS compliance is approximately $29.1 million for AEPS year 2013 and $106.7 million for AEPS year 2021. To put these figure in perspective, the average annual statewide expenditures on electric service total $12-15 billion[5]. The cost estimates have been broken down by the types of AECs, namely Solar, Tier I and Tier II. The AEC prices used in this analysis are based on the results of EDC default service solicitations, with preferential weighting given to more recent solicitation results.

TABLE 8 ESTIMATED STATEWIDE AEPS COST OF COMPLIANCE

Projected 2013 AEPS Year Cost of Compliance in 2010 Dollars

	Solar Credits		Tier I Credits		Tier II Credits	
EDC	Number of Required Credits	Cost with Credits Priced $200.00	Number of Required Credits	Cost with Credits Priced $3.00	Number of Required Credits	Cost with Credits Priced $0.20
Duquesne	7,173	1,204,523	562,591	1,417,086	872,016	146,432
Met Ed	7,150	1,200,688	560,799	1,412,574	869,239	145,966
Penelec	7,281	1,222,573	571,021	1,438,321	885,083	148,627
Penn Power	2,357	395,792	184,861	465,638	286,534	48,116
PECO	21,128	3,547,969	1,657,133	4,174,082	2,568,556	431,322
PPL	19,021	3,194,040	1,491,825	3,757,695	2,312,328	388,295
UGI	495	83,189	38,855	97,870	60,225	10,113
West Penn	10,727	1,801,373	841,358	2,119,262	1,304,105	218,990
Citizens	82	13,781	6,436	16,212	9,976	1,675
Pike	40	6,654	3,108	7,829	4,817	809
Wellsboro	61	10,277	4,800	12,090	7,440	1,249
Aggregate	75,516	**$12,680,859**	5,922,787	**$14,918,659**	9,180,320	**$1,541,594**

[5]U.S. Energy Information Association - http://www.eia.gov/cneaf/electricity/epm/table5_5_a.html

Projected 2021 AEPS Year Cost of Compliance in 2010 Dollars

	Solar Credits		Tier I Credits		Tier II Credits	
EDC	Number of Required Credits	Cost with Credits Priced $200.00	Number of Required Credits	Cost with Credits Priced $3.00	Number of Required Credits	Cost with Credits Priced $0.20
Duquesne	75,166	7,919,335	1,202,661	1,900,640	1,503,326	158,387
Met Ed	76,593	8,069,663	1,225,490	1,936,719	1,531,863	161,393
Penelec	82,717	8,714,836	1,323,469	2,091,561	1,654,336	174,297
Penn Power	24,489	2,580,083	391,821	619,220	489,777	51,602
PECO	224,426	23,644,940	3,590,812	5,674,786	4,488,516	472,889
PPL	199,637	21,033,214	3,194,186	5,047,971	3,992,732	420,664
UGI	5,052	532,239	80,828	127,737	101,035	10,645
West Penn	113,933	12,003,653	1,822,921	2,880,877	2,278,652	240,073
Citizens	842	88,743	13,477	21,298	16,846	1,775
Pike	423	44,551	6,766	10,692	8,457	891
Wellsboro	688	72,446	11,002	17,387	13,752	1,449
Aggregate	803,965	**$84,703,703**	12,863,433	**$20,328,888**	16,079,292	**$1,694,065**

SECTION 5 STATUS OF PA'S ALTERNATIVE ENERGY PORTFOLIO STANDARDS MARKETPLACE

A discussion of the renewable generation capacity both in Pennsylvania and in the area controlled by PJM, the regional grid manager, is presented. The amount of renewable generation available and that which will be needed to meet the AEPS requirements are compared.

RENEWABLE GENERATION CAPACITY IN PENNSYLVANIA AND PJM

Table 9 provides a summary of the existing installed capacity by fuel type in Pennsylvania as of December 31, 2010 and solar capacity as of May 2011.[6]

TABLE 9 EXISTING CAPACITY IN PENNSYLVANIA

Fuel Type	MW
Coal (non-waste)	13,964
Waste Coal	1,419
Nuclear	9,451
Natural Gas	9,384
Hydro	3,240
Diesel	1,702
Oil	2,881
Municipal-Solid Waste	280
Wind	749
Solar	73
Total	43,143

PJM manages grid interconnection requests in construction queues. Not all of the projects submitted to PJM for interconnection actually get built. Approximately 25 percent of the interconnection requests from 2005 to 2009 led to projects that were actually built.[7] The renewable generation in the queue (up to and including queue W4) for Pennsylvania as of January 31, 2011 is summarized in Table 10. Withdrawn projects have not been included.

[6] PJM 2010 Regional Transmission Expansion Plan, Monitoring Analytics 2010 State of the Market Report and Solar MW info from DEP, OETD.

[7] PJM 2009 Regional Transmission Expansion Plan.

TABLE 10 RENEWABLE GENERATION IN THE PJM CONSTRUCTION QUEUE FOR PENNSYLVANIA ONLY

Fuel Type	Name Plate MW
Wind	3,302
Solar	948
Biomass	31
Hydro	149
Landfill Gas	67
Total	4,497

AWS Truewind estimates that Pennsylvania has 661.4 km^2 of windy land area or land with a potential gross capacity factor of 30% and greater at 80-m height. Using this available land, Pennsylvania has a potential of 3,307 MW of installed wind capacity with annual generation of 9,673 GWh, assuming 5 MW/km^2 of installed nameplate capacity.[8] This does not include offshore generation potential in Lake Erie.

AEPS allows Pennsylvania EDCs and EGSs to purchase AECs from the entire PJM region and not just those generated in Pennsylvania. PJM has substantial existing and proposed renewable generation capacity as detailed in Table 11.

TABLE 11 INSTALLED AND PROPOSED RENEWABLE CAPACITY IN PJM

Fuel Type	Installed Capacity Name Plate MW[9]	Proposed Capacity Name Plate MW[10]
Wind	4,899	64,513
Solar	366	4,927
Hydro	9,900	2,962
Landfill Gas	777	727
Total	15,942	73,129

Each of the states in PJM has different renewable portfolio standards (RPS) and obligations. Some states limit the use of AECs to only those generated within their states.

[8] Estimates of Windy Land Area and Wind Energy Potential by State for Areas >= 30% Capacity Factor at 80m, NREL February 4, 2010. www.windpoweringamerica.gov/docs/wind_potential_80m_30percent.xls · XLS file

[9] 2010 State of the Market Report for PJM, Energy Market, Part 2, Monitoring Analytics, LLC., 2011.

[10] PJM 2010 Regional Transmission Expansion Plan, 2011.

PJM states with renewable portfolio standards include Pennsylvania, Michigan, Ohio, Virginia, North Carolina, Illinois, Delaware, District of Columbia, Maryland, West Virginia, and New Jersey. Tennessee, Kentucky and Indiana do not yet have a final RPS. The RPS requirements in those states with RPS range from 12.5 percent of retail sales of electricity in North Carolina to 25 percent in Ohio by 2025.

PJM has estimated the new nameplate MW capacity that will be needed due to RPS standards for PJM –based Tier I resources, assuming a 30% capacity factor (where a unit generates only 30% of its rated capacity) as 11,802 MW by 2015 and 28,947 by 2020.[11] PJM has formed a stakeholder group - the Regional Planning Process Task Force - to determine how to best plan transmission to meet this need. PJM does not plan or build generation, but will have to coordinate transmission construction to accommodate new generation, including that built to meet RPS.

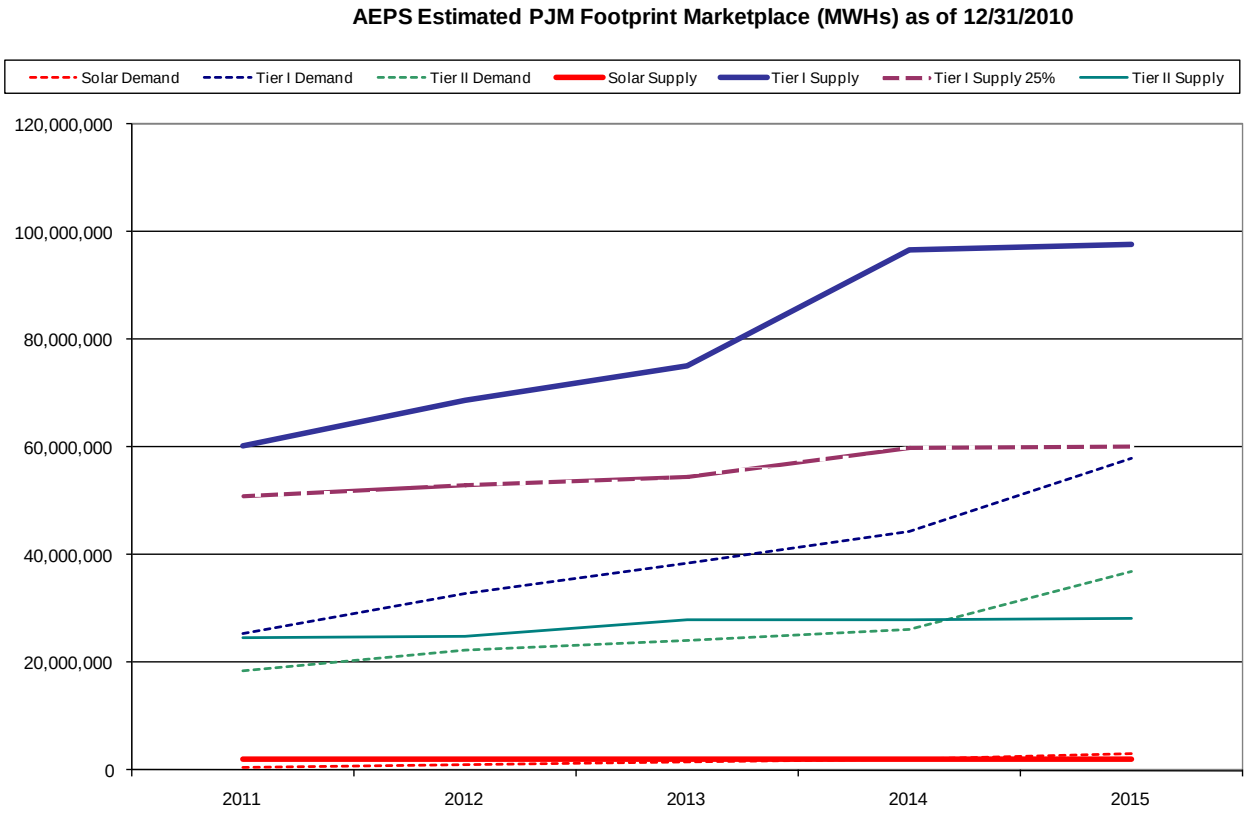
Much of the new generation constructed would be wind. Within the PJM service territory there are several good locations for wind power development such as the Appalachian Mountains, throughout the Midwest and within and along the shorelines of the Great Lakes and Atlantic Ocean. PJM estimates that a 20% renewable energy requirement in PJM would require approximately 70 GW of wind.[12] PJM is commissioning a renewable power integration study to determine operational, planning and technical issues related to large scale integration of wind power into PJM.

The overall adequacy of the marketplace for renewables in PJM can be estimated using sales data from EIA and the summary of RPS for each state in PJM. As we can see from Graph 2, there is adequate Tier I supply through 2015 and Tier II supply until 2014. Not all states in the PJM service area currently have renewable requirements, so this excess capacity may be diminished if more PJM member states adopt renewable requirements, however, the adoption of new state-specific RPS policies would reasonably be expected to spur the increased development of qualifying renewable/alternative resources within and around those states entering the RPS marketplace.

[11] 2010 RTEP Sensitivity Studies Presentation at the IRWG by Paul McGlynn of PJM, July 8, 2010.

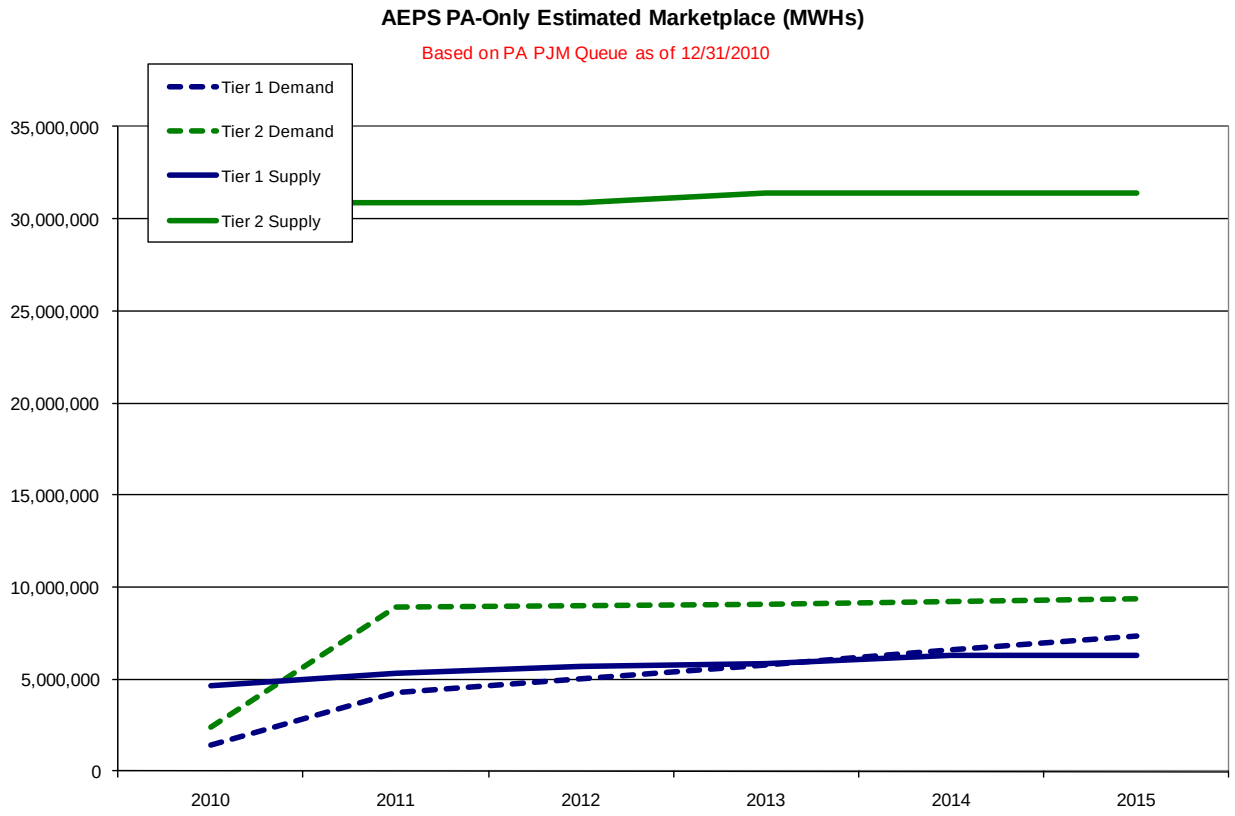
[12] PJM Wind Power Integration Study: Scope of Work, draft, October 18, 2010.

GRAPH 2 – AEPS ESTIMATED PJM MARKETPLACE



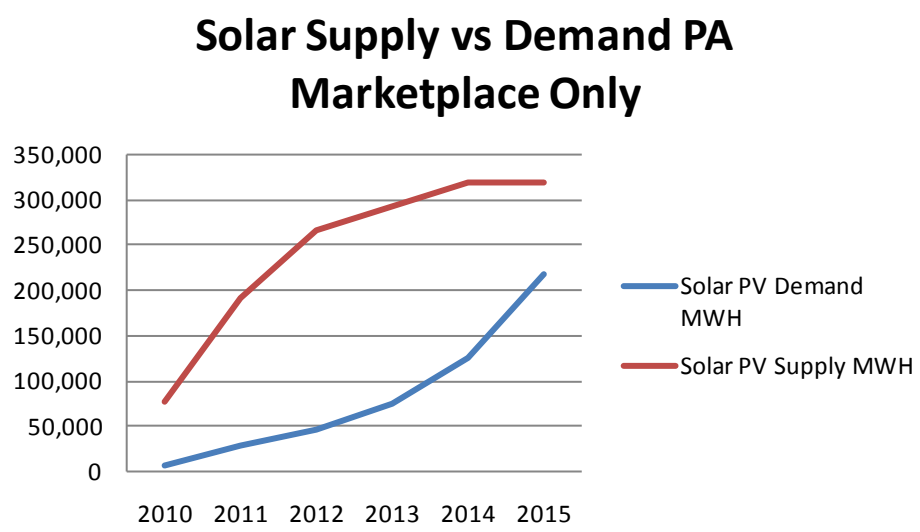
The AEPS Marketplace for Pennsylvania is quite complex. To meet the RPS requirements, Pennsylvania EDCs and EGSs can purchase AECs from sources outside of Pennsylvania but within the PJM region. PJM will need to do planning to incorporate the new generation required to meet the RPS program requirements and to ensure grid reliability with the new renewable resources. From Graph 3, there appears to be adequate Tier I supply in the Pennsylvania-only market area through 2013 and Tier II supply through 2015. If we consider the period beyond 2015 for Tier II resources using current Tier II resource availability, Tier II demand is met thru 2021. Total Tier II demand for Pennsylvania is estimated at 18,758,612 MWhs for 2021. There is already an existing supply of 30,901,294 MWhs in Pennsylvania as of 12/31/2010.

GRAPH 3 PA ONLY AEPS MARKETPLACE



Graph 4 indicates that there is likely to be sufficient solar PV supply for Pennsylvania within the Pennsylvania-only marketplace through 2015. This includes the existing 73 MWs of solar PV and the solar PV in the PJM construction queues. Here again, the data is based on the assumption that 25% of what is in the PJM queues actually gets built.

GRAPH 4 SOLAR MARKETPLACE IN PA ONLY



Note: Solar PV supply in Graph 4 includes existing supply and 25% of the new capacity in the PJM construction queues.

Solar demand for Pennsylvania is summarized below in Table 12.

TABLE 12 SOLAR DEMAND FOR PENNSYLVANIA

Year	Generation Requirement (MWh)	Estimated Needed Capacity (MW)	Estimated Generation*
2010	6,823	6.49	76,738
2011	29,551	28.11	191,187
2012	47,547	45.23	266,874
2013	75,516	71.84	293,154
2014	126,330	120.18	319434
2015	219,903	209.19	319775
2016	286,049	272.12	319775
2017	455,375	433.20	319775
2018	532,907	506.95	319775
2019	616,144	586.13	319775
2020	709,164	674.62	319775
2021	803,965	764.81	319775

*Note- Estimated generation includes that from existing solar capacity and 25% of the solar MWs to be built in the PJM construction queues. Capacity factor used is 12%. There are no solar projects in the PJM queue scheduled for construction in Pennsylvania with startup after 2015.

RENEWABLE ECONOMY BENEFITS - JOBS, EXPORTS, WAGES

The AEPS is a part of the policies shaping Pennsylvania's "green" economy - goods and services related to renewable and alternative energy production. The Pennsylvania Department of Labor and Industry estimated in a *2010 Green Jobs Survey Report* the total green jobs in Pennsylvania as 183,029 and forecasts green jobs to increase to 206,261 in 2012. This is an annual growth rate of 6.2%. The report defined green jobs as those producing or offering products or services that: promote energy efficiency, contribute to the sustainable use of resources or renewable energy, prevent pollution, clean up the environment, promote the reduction of harmful emissions and provide green education/training, awareness or compliance. More than half of these jobs occur in three sectors - construction, manufacturing and professional, scientific and technical services. The report was based on surveys completed by Pennsylvania employers.[13]

As noted in a *Pittsburgh Business Times* article from October 18, 2010, Pennsylvania ranks second in the nation in the number of solar jobs deployed.[14] The data in the article is based upon the *Solar Foundation's National Solar Jobs Census* report which has estimated the number of solar jobs in the Keystone State at 6,700.[15] The report identifies that these are well-paying jobs averaging about $65,000 per year and further indicates that losses in the fossil fuel electric power sector between 2010 and 2011 have been more than offset by gains in the solar industry. Data from DEP, which administers the Pennsylvania Sunshine rebate program (Sunshine program), indicates that thus far nearly $98 million has been awarded to Pennsylvania home owners and businesses for the installation of solar electric and solar hot water systems. This investment of public funds has leveraged more than $530 million in private sector funding, greater than sixty percent of which went to Pennsylvania installation companies. Pennsylvania is also home to several solar component manufacturing firms that have either recently expanded operations or have established operations in the Commonwealth and which collectively employ several hundred people. In fact, in the last few years Pennsylvania has attracted the attention of several foreign companies who have established manufacturing operations in the Commonwealth and which

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[13] Pennsylvania Department of Labor & Industry, "The Pennsylvania Green Jobs Survey Report", December 2010.

[14] Litvak, Anya, Pa. No. 2 on Solar Job Creation List, Pittsburgh Business Times, October 18, 2010.

[15] National Solar Jobs Census 2010, A Review of the U.S. Solar Workforce http://www.thesolarfoundation.org/sites/thesolarfoundation.org/files/Final%20TSF%20National%20Solar%20Jobs%20Census%202010%20Web%20Version.pdf

support activities related to the AEPS. Companies from countries such as Canada, the United Kingdom, Germany, Switzerland, France and Spain have created new manufacturing opportunities in Pennsylvania that have resulted in the creation of approximately 1,700 new jobs for Pennsylvanians.[16]

The Brookings Institute (BI) provided additional information on green jobs in their *Sizing the Clean Economy Assessment* released in July 2011. BI developed a database of green service providers from economic data and research on each provider. BI estimates that Pennsylvania has 118,686 clean jobs, ranking Pennsylvania as 4th among the 50 states and the District of Columbia in total clean jobs. BI estimates that the clean jobs sector in Pennsylvania has grown by 19,352 jobs from 2003 to 2010 for an annual growth rate of 2.6 percent. These jobs were predominantly in manufacturing and provided an average of $15,709 in exports per job. Clean jobs provided well-paid jobs even for those with modest education levels at an average annual wage of $39,266. The average wage for all jobs in Pennsylvania is $36,048.[17]

BI defines the clean or green economy more narrowly than the Pennsylvania Dept. of Labor and Industry did in their report. BI defines "clean" or "green" economy as the sector of the economy that produces goods and services with an environmental benefit. This likely explains the differences with the Labor and Industry report.

The Federal Bureau of Labor Statistics (BLS) has initiated a Green Jobs Initiative to develop information on (1) the number of and trend over time in green jobs, (2) the industrial, occupational, and geographic distribution of the jobs, and (3) the wages of the workers in these jobs. BLS will begin data collection in July 2011 and plans to publish their data in Summer 2012.[18]

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[16] Email from Amy Zecha, DCED August 4, 2011.

[17] Brookings Institution with Batelle Technology Partnership Practice, “Sizing the Lean Economy – A National and Regional Green Jobs Assessment,” July 2011.

[18] http://www.bls.gov/green/

SECTION 6 RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS

ELIMINATION OF THE QUARTERLY ADJUSTMENT

The Commission recommends that the quarterly adjustment applied to non-solar Tier I AEC obligations be eliminated. Act 129 of 2008 amended the AEPS by adding additional resources to Tier I. The added resources included black liquor from paper manufacturers located in Pennsylvania and existing small, municipal and rural electric cooperative-owned low-impact hydropower projects.[19]

In conjunction with the addition of these resources, Act 129 required that the Tier I obligation be increased on a percentage basis to reflect the increase of Tier I resources. The Commission, accordingly adopted regulations at a public meeting on May 28, 2009 directing the EDCs and the EGSs to provide additional information on a quarterly basis to the AEPS Program Administrator (Clean Power Markets). The quarterly data reported by the EDCs and EGSs is to be used by Clean Power Markets to determine the increase of non-solar Tier I resources.

The quarterly adjustment has become an onerous administrative burden on the EDCs, the EGSs, and Clean Power Markets while the resultant impact of the requirement is a comparatively insignificant increase in Tier I non-solar AECS requirements. Fulfilling requirements of the quarterly adjustment requires the EDCs and EGSs to expend staff time collecting, analyzing and reporting data four times each year instead of once per year as would be needed absent the adjustment. In addition, Clean Power Markets expends substantial time each quarter reviewing and analyzing the data submitted from each EDC and EGS.

During the 2010 reporting year, the total number of Tier I credits to be retired (including those mandated by the quarterly adjustment) for all of the EDC and EGS obligations combined was 827,032. If the Quarterly Adjustment had not been imposed, the combined EDC and EGS obligations would have been 821,550 credits. This is a difference of 5,482 AECs, a value that equals roughly 0.67% of the AECs retired. Furthermore, once all EDCs and EGSs are subject to a full AEPS compliance year (reporting period 2012), the total obligation will more than double. However, the number of AECs to be procured for the quarterly adjustment should only be subject to minor fluctuations. Thus, if the quarterly adjustment would increase to around 6,000 AECs and the total EDC and EGS

[19] *See 66 P.S. § 2814.*

obligation roughly doubled to 1,654,064 AECs, the resulting quarterly adjustment would be approximately 0.36% of the AECs retired.

It is evident that the expenditure of time and resources by both the EDCs/EGSs and Clean Power Markets to result in an additional 5,482 AECs (or 0.67%) is not an efficient use of resources, for which the costs are then recovered via EDC and EGS rates. Therefore, in consideration of the administrative burden caused by the quarterly adjustment compared to the relative insignificance of the adjustment, removal of the quarterly adjustment requirement is recommended.

APPENDIX A BACKGROUND

ALTERNATIVE ENERGY CREDIT

One alternative energy credit represents one megawatt hour of qualified alternative electric generation from within the PJM footprint, whether self-generated, purchased along with the electric commodity, or purchased separately through a tradable instrument. The Alternative Energy Credit does not represent the purchase of renewable energy, only the confirmation of the generation of renewable energy. The generators are permitted to use generation on site or sell the energy by contract or participate in net metering if the facility is a customer-generator.

Generation output is confirmed by the PJM market settlement process or by metering of the generation system except for some small solar PV (<15 kW). Alternative Energy Credits for solar PV systems that are not based on meter recordings of the generation output will be calculated via the use of the National Renewable Energy Laboratory's (NREL's) PVWatts™ software to determine the energy production from the system. The PVWatts™ calculator works by creating hour-by-hour performance simulations that provide estimated monthly and annual energy production in kilowatt hours and energy value. Users can select a location and choose to use default values or their own system parameters for size, electric cost, array type, tilt angle and azimuth angle. In addition, the PVWatts™ calculator can provide hourly performance data for the selected location. There are two versions of PVWatts™ available. Pennsylvania uses Version 1 for the purposes of calculating estimates for solar generators participating in the PA AEPS program.

ALTERNATIVE ENERGY CREDITS REGISTRY

On Jan. 27, 2006, the PUC designated PJM Environmental Information Services Inc.'s (PJM-EIS) Generation Attribute Tracking System (GATS) as the alternative energy credits registry.[20] GATS provides an unbundled, certificate-based tracking system for use by electricity suppliers and other energy market participants to comply with state policies and regulatory programs. The GATS database contains information about each megawatt hour of electricity generated, including megawatt hours produced, emissions data, fuel source, location, state program qualification and ownership of attributes. Each certificate is given a unique serial number for tracking purposes. Varying levels of information in the registry are available to EDCs, EGSs, state regulators and the public.

GATS is not an online trading platform where potential buyers can bid for and purchase alternative energy credits. The actual sale of alternative energy certificates or credits, and any of its associated attributes, such as the emissions' attributes associated with carbon dioxide, nitrogen oxides and sulfur dioxides, takes place outside of GATS between a buyer and seller.

[20] www.pjm-eis.com

GATS simply records, after the fact, the ownership transfer of certificates representing certain attributes between two GATS subscribers.

In April 2007, the PUC entered into a contract with Clean Power Markets (CPM), a subsidiary of Enerwise Global Technologies,[21] to be the Alternative Energy Credit Program Administrator in Pennsylvania. During the three-year contract, CPM has verified and will continue to verify EGS and EDC compliance with requirements of the AEPS Act.

CPM works with the Department of Environmental Protection (DEP) to administer the process of reviewing and qualifying alternative energy systems. CPM also tracks alternative energy credit prices; calculates ACP amounts; verifies data from behind–the-meter and energy efficiency/demand-side management; and confirms that the same alternative energy is not being claimed for compliance with another state's portfolio requirements. The company provides regular reports to the PUC and maintains a public Internet site at http://paaeps.com.

On Feb. 9, 2010, the Commission issued a new request for proposal for the services of an Alternative Energy Credits Program Administrator. At Public Meeting on June 3, 2010, the Commission approved CPM to continue as the Alternative Energy Credits Administrator and entered into a new contract until Dec. 31, 2013, with the option for two one-year contract extensions.

NET METERING

The PUC formally commenced its rulemaking process to establish regulations governing net metering for customer-generators by issuing a proposed rulemaking order entered on Nov. 16, 2005. The PUC finalized the rulemaking on June 22, 2006, and the new regulations became effective when they were published on Dec. 16, 2006, in the Pennsylvania Bulletin.[22]

Net metering is defined as "the means of measuring the difference between the electricity supplied by an electric utility and the electricity generated by a customer-generator when any portion of the electricity generated by the alternative energy generating system is used to offset part or all of the customer-generator's requirements for electricity."[23] The net metering requirements apply to EDCs which have customer-generators intending to pursue net metering opportunities in accordance with the AEPS Act. EGSs may offer net metering to customer-generators under terms established in agreements between the EGS and the customer-generator taking service from the EGS.[24]

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[21] www.cleanpowermarkets.com, www.enerwise.com

[22] See 36 Pa. Bull. 7562 (www.pabulletin.com) and 52 Pa. Code Ch. 75 (www.pacode.com)

[23] 73 P.S. §1648.2

[24] 52 Pa. Code § 75.13

On July 17, 2007, Act 35 of 2007 was signed into law. Act 35 became effective immediately and amended a number of provisions of the AEPS Act, including revising the definition of net metering to include a restriction on virtual meter aggregation.

VIRTUAL METER AGGREGATION

Virtual meter aggregation involves the combination of readings and billings for all meters, regardless of rate class, on properties owned or leased and operated by a single customer-generator, by means of the EDC's billing process, rather than through physical rewiring of the customer-generator's property for a physical, single point of contact. Virtual meter aggregation on properties owned or leased, and operated by a customer-generator, shall be allowed for purposes of net metering. Virtual meter aggregation shall be limited to meters located within 2 miles of the customer-generator's property and within a single EDCs territory.

INTERCONNECTION STANDARDS

On Nov. 10, 2005, the Commission adopted a proposed rulemaking order establishing interconnection standards for customer-generators. The regulations promote onsite generation by customer-generators using alternative energy systems and eliminate barriers which may have previously existed regarding interconnection. The PUC finalized the rulemaking on Aug. 17, 2006, and the new regulations became effective when they were published on Dec. 16, 2006 in the *Pennsylvania Bulletin*.[25]

The interconnection regulations govern the process by which a customer-generator may interconnect onsite generation equipment to an electric utility's distribution lines. The regulations set forth specific levels of, and criteria for, review depending on the rated generation capacity of the generation equipment. The regulations also provide for a dispute resolution process to manage disputes which may arise during the interconnection process. The application forms and associated fees were not included in the regulations, but were developed through a stakeholder process. The Commission's Interconnection Standards Working Group developed a set of standard application forms for use by customer-generators that wish to interconnect to an EDC's distribution network pursuant to 52 Pa. Code Sections 75.21-75.5. The application forms cover Level 1 through Level 4 projects. The forms were adopted by Commission order on Feb. 26, 2009. The associated application fees were adopted by Policy Statement on Feb. 26, 2009.[26]

The Policy Statement establishes various fees by type of project. Simple Level 1 application reviews require a flat fee of $100 per application. Level 2 applications establish a base fee of $250 plus $1.00 per kW of nameplate capacity rating of the customer-generator's facility, plus other review costs that may not exceed $100 per hour. Level 3 applications specify a base fee of $350 plus $2.00 per kW of the nameplate capacity rating of the customer-generator's facility,

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[25] See 36 Pa. Bull. 7574, (www.pabulletin.com) and 52 Pa. Code Ch. 75 (www.pacode.com)

[26] See 52 Pa. Code §§69.2101-69.2104.

plus other review costs that may not exceed $100 per hour. For a Level 4 application, when the Level 4 application is processed using the Level 1, Level 2 or Level 3 review process, the fees set forth for those particular review levels should apply. No fee shall be assessed for an area network impact study conducted under Section 75.40. A Level 4 application reviewed under Section 75.40(d) is subject to a base fee of $350 plus $2.00 per KW of nameplate capacity rating of the customer-generator's facility.

Act 35 amended a number of provisions of the AEPS Act, including revising the definition of "customer-generator" to increase the capacity limit on non-residential projects from 1 to 3 megawatts and from 2 to 5 megawatts for those projects that operate in parallel with the grid.

APPENDIX B AEPS REGISTERED GENERATORS

Alternative Energy Portfolio Standards Generators Registered for Pennsylvania Certification Summary Information as of May 18, 2011:

- 5,312 certified generators
- 3,894 certified generators located in Pennsylvania
- 1,418 certified generators located outside of Pennsylvania
- 3,800 certified solar facilities in Pennsylvania with a capacity of 71 MW
- 1,262 certified solar facilities outside of Pennsylvania with a capacity of 24 MW

Table 13 summarizes the Alternative Energy Resources by type and the capacity of each type in and outside of Pennsylvania. Though the table does not include biomass as an alternative energy resource type, generator facilities using biomass are included within the Tier I Wood/Wood Wastes Solids resource type.

TABLE 13 – AEPS RESOURCE SUMMARY

AEPS Tier	Alternative Energy Resource Types (s)	Nameplate Capacity of Facilities in PA (MWs)	Nameplate Capacity of Facilities Outside of PA (MWs)	Total Nameplate Capacity (MWs)
I	Black Liquor	54	0	54
I	Coal Mine Methane	1	88	89
I	Hydro	42	0	42
I	Landfill Gas	1,511	989	2,500
I	Other Biomass Gas	1.6	1.8	3.4
I	Solar	71	24	95
I	Wind	717	3,040	3,757
I	Wood/Wood Waste Solids	18	729	747
I	Wood/Wood Waste Solids & Black Liquor	110	0	110

AEPS Tier	Alternative Energy Resource Types (s)	Nameplate Capacity of Facilities in PA (MWs)	Nameplate Capacity of Facilities Outside of PA (MWs)	Total Nameplate Capacity (MWs)
II	Black Liquor	0	65	65
II	Blast Furnace Gas	0	557	557
II	Blast Furnace & Other Gases	53	486	539
II	Hydro	2,183	4,294	6,477
II	Municipal Solid Waste	252	464	716
II	Other Gases	31	0	31
II	Waste Coal	1,614	245	1,859
II	Waste Heat	0	95	95
II	Wood/Wood Waste Solids	13	63	76
II	Wood/Wood Waste Solids & Black Liquor*	0	646	646

* Several facilities have the capability of generating electricity utilizing multiple fuel sources that include both Tier I and Tier II resource types, those facilities are accounted for as Tier II Wood/Wood Waste Solids & Black Liquor.

APPENDIX C PUC ORDERS

Orders are available on the PUC Web site at www.puc.state.pa.us under the tab Electricity, Alternative Energy. Information is also available at http://paaeps.com.

Implementation of the Alternative Energy Portfolio Standards Act of 2004 (Implementation Order I), PUC Docket No. M-00051865, PUC Public Meeting on March 23, 2005, entered March 25, 2005

Implementation of the Alternative Energy Portfolio Standards Act of 2004 (Implementation Order II), PUC Docket No. M-00051865, PUC Public Meeting on July 14, 2005, entered July 18, 2005

Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources, PUC Docket No. M-00051865, PUC Public Meeting on September 29, 2005, entered October 3, 2005.

Implementation of the Alternative Energy Portfolio Standards Act of 2004: Designation of the Alternative Energy Credits Registry, PUC Docket No. M-00051865, PUC Public Meeting on January 27, 2006, entered January 31, 2006.

Final Rulemaking Re: Net Metering for Customer-generators pursuant to Section 5 of the Alternative Energy Portfolio Standards Act, 73 P.S. §1648.5, Docket No. L-00050174, and Implementation of the Alternative Energy Portfolio Standards Act of 2004: Net Metering, Docket No. L-00050175, PUC Public Meeting on June 22, 2006, entered June 23, 2006.

Implementation of the Alternative Energy Portfolio Standards Act of 2004, Docket No. L-00060180, PUC Public Meeting on July 20, 2006, entered July 25, 2006.

Final Rulemaking Re: Interconnection Standards for Customer-generators pursuant to Section 5 of the Alternative Energy Portfolio Standards Act, 73 P.S. §1648.5, Docket No. L-00050175, and Implementation of the Alternative Energy Portfolio Standards Act of 2004: Interconnection Standards, Docket No. M-00051865, PUC Public Meeting on September 15, 2006, entered September 19, 2006.

Implementation of the Alternative Energy Portfolio Standards Act of 2004, Docket No. M-00051865, PUC Public Meeting on November 30, 2006, entered December 5, 2006.

Petition for Declaratory Order Regarding Ownership of Alternative Energy Credits Associated with Non-Utility Generating Facilities Under Contract to Pennsylvania Electric Company and Metropolitan Edison Company, Docket No. P-00052149, PUC Public Meeting on December 21, 2006, entered February 12, 2007.

Petition for Declaratory Order Regarding Ownership of Alternative Energy Credits Associated with Non-Utility Generating Facilities Under Contract to Pennsylvania Electric Company and Metropolitan Edison Company, Petition for Reconsideration of Viking Energy of

Northumberland, Docket No. P-00052149, PUC Public Meeting on May 30, 2007, entered May 31, 2007.

Implementation of Act 35 of 2007; Net Metering and Interconnection, Docket No. L-00050174, PUC Public Meeting on May 22, 2008, entered July 2, 2008.

Implementation of the Alternative Energy Portfolio Standards Act of 2004, Docket No. L-00060180, PUC Public Meeting on September 25, 2008, entered September 29, 2008.

Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standard Interconnection Application Forms, Docket No. M-00051865, PUC Public Meeting on February 26, 2009, entered February 27, 2009.

Implementation of Act 129 of 2008 Phase 4 – Relating to the Alternative Energy Portfolio Standards Act, Docket No. M-2009-2093383, PUC Public Meeting on May 28, 2009, entered on May 28, 2009.

Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update, Docket No. M-00051865, PUC Public Meeting on May 28, 2009, entered on June 1, 2009.

Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update, Docket No. M-00051865, PUC Public Meeting on June 3, 2010, entered on June 8, 2010.

Policy Statement in Support of Pennsylvania Solar Projects, Docket No. M-2009-2140263, entered September 16, 2010.

APPENDIX D KEY TO GENERATING TYPES AS USED IN GRAPH 1

Generating Type	Description of Plant Used to Estimate Costs as in Graph 1
Advanced Pulverized Coal	650 MW, supercritical with advanced pollution control
IGCC – Integrated Gasification Combined Cycle	600 MW – coal to syngas
IGCC with Carbon Capture and Sequestration (CCS)	520 MW – coal to syngas
NGCC – Natural Gas Combined Cycle	540 MW, F Class turbine
Advanced NGCC	400 MW, H Class turbine
Advanced NGCC with CCS	340 MW, H Class turbine
CT – Combustion Turbine	85 MW
Advanced CT	210 MW
Fuel Cells	10 MW
Dual Unit Nuclear	2200 MW
Biomass Boiler – Wood Fuel	50 MW Fluidized Bed
MSW Boiler – Municipal Solid Waste	50 MW
Geothermal	50 MW
Conventional Hydro	500 MW
Pumped Storage	250 MW

Generating Type	Description of Plant Used to Estimate Costs as in Graph 1
Wind Farm Onshore	100 MW
Wind Farm Offshore	400 MW
Solar Thermal	100 MW
Small Solar PV	7 MW
Large Solar PV	150 MW
Waste Coal	650 MW Fluidized Bed with Pollution Control

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