



2007 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*





**2007 Annual Report
Alternative Energy Portfolio Standards Act of 2004**

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Executive Summary

The electric distribution companies (EDCs) and electric generation suppliers (EGSs) subject to 2007 compliance standards under the Alternative Energy Portfolio Standards Act (AEPS) of 2004 purchased the requisite number of alternative energy credits (AECs) to meet their obligations for the first reporting period.¹

Pennsylvania Power Company (Penn Power) and UGI Utilities, Inc. - Electric, were required to comply with the law beginning in 2007. In addition, five EGSs that are active in the Penn Power territory recorded sales for this reporting period and therefore had compliance obligations as well. They include Constellation New Energy, Dominion Retail, Sempra, FirstEnergy Solutions and Strategic Energy.

Between Feb. 28, 2007, and May 31, 2007, the companies sold a total of 1,452,807 megawatt hours (MWHs) of electricity and purchased 82,877 AECs to meet their obligations.²

Overall, the AEPS law requires EDCs and EGSs to supply 18.5 percent of electricity using alternative energy resources by 2021. The percentage of Tier I, Tier II and photovoltaic resources that must be included in sales to retail customers gradually increases over this period.³ By Jan. 1, 2008, the renewable resource requirement is estimated to be 1,215,822 MWHs, representing approximately 0.75 percent of the Commonwealth's annual energy demand. By Jan. 1, 2021, AEPS will provide an estimated 36,639,425 MWHs, or 18.5 percent of Pennsylvania's annual electric requirements.

AEPS compliance is verified and tracked through an alternative energy credits program, in which EDCs and EGSs meet their obligations by purchasing individual credits. An alternative energy credit represents one megawatt hour of qualified alternative energy generation, whether self-generated, purchased along with the commodity or separately through a tradable instrument.⁴

During this reporting period, 5.7 percent of electricity sold to Pennsylvania retail customers in the two utility service areas was comprised of electricity generated from alternative energy resources. Of that amount, 1.50 percent was derived from Tier I energy resources, such as wind, low-impact hydro, solar energy and biomass. Solar photovoltaic energy sales represented 0.0018 percent of the total Tier I percentage. The amount generated from Tier II resources, such as waste coal, non-Tier I hydro and demand side management initiatives, was 4.2 percent.

The law established requirements of 1.5 percent and 4.2 percent for Tier I and II resources, respectively, and 0.0013 percent for solar photovoltaic resources by May 31, 2007. For this initial reporting period, the photovoltaic requirement is a component of the Tier I obligation. Act 35 of 2007 subsequently established the photovoltaic percentages as a separate requirement in addition to the Tier I and II obligations. While Act 35 did not increase the overall solar requirement for 2021, it did smooth out the yearly increments needed to obtain the 2021 goal.

¹Gov. Edward Rendell signed Act 213 of 2004 into law on Nov. 30, 2004. It took effect on Feb. 28, 2005. On July 19, 2007, the Governor signed Act 35 of 2007, which amended the AEPS law by further providing for the definitions of "alternative energy credit," "customer-generator," "force majeure," "net metering," and "Tier I alternative energy source," for Alternative Energy Portfolio Standards, for portfolio requirements in other states and for interconnection standards for customer-generator facilities.

²Though compliance is not required until Feb. 28, 2007, the Act expressly provides for a reporting period that runs from June 1 through May 31 of the following year. Feb. 28, 2007, would fall within a June 1, 2006, through May 31, 2007, reporting year. Accordingly, compliance was calculated only for the period from Feb. 28, 2007, through May 31, 2007.

³Tier I sources include solar photovoltaic and solar thermal energy, wind power, low-impact hydropower, geothermal energy, biologically derived methane gas, fuel cells, biomass energy, 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 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.

⁴73 P.S. §1648.3(e)(4)(ii).

AEPS compliance is monitored for successive 12-month reporting periods that begin on June 1 and conclude on May 31. The law provides for a three-month true-up period at the conclusion of each reporting period, during which EDCs and EGSs may acquire additional alternative energy credits needed for compliance. The true-up period runs from June 1 until Sept. 1. At the conclusion of the true-up period, the Public Utility Commission (PUC) verifies compliance and imposes alternative compliance payments as appropriate.

The law also exempts utilities from complying with the schedules for Tier I and Tier II utilization until the companies have fully recovered their competitive or intangible transition charges, or until their generation rate caps have expired, whichever period is longer. The Commission granted Duquesne Light Company an exemption to this general rule until Jan. 1, 2008 because Duquesne was subject to a Commission approved default service plan and rates that existed prior to or within one year of the effective date of the AEPS Act. As a result, only Penn Power and UGI Electric were required to include alternative energy in their power mix beginning Feb. 28, 2007. The compliance periods for the remaining EDCs range from Jan. 1, 2008, to Jan. 1, 2011.

Forecasts by PJM Interconnection⁵ indicate that between 2008 and 2013, renewable resources could represent approximately 34 percent of the planned capacity additions within the Commonwealth. Of the total additions, wind will be responsible for about 27 percent of the additions. At this point, it is estimated that wind capacity could provide more than 5,657 megawatts (MWs) between 2008 and 2013. This is on top of the presently installed 293 MWs of wind resources as of Jan. 1, 2008.

Data from the U.S. Energy Information Administration (EIA) was used to calculate the estimated costs of renewable resources in Pennsylvania for 2007. This data is meant to depict the actual annual costs of ownership on a per kilowatt-hour (kWh) of output basis. The cost of solar photovoltaic energy in 2007 was approximately 41.24 cents per kWh; solar thermal, 27.63 cents; fuel cells, 17.80 cents; wind, 7.46 cents; and biomass, 5.30 cents. By way of reference, the New York Merchantile Exchange (NYMEX) 12-month futures price for November 2007 was \$65.19 per MWh or 6.52 cents per kWh. Comparable costs for conventional coal generation was 5.70 cents per kWh and the cost for nuclear generation was 7.51 cents per kWh in 2007.

Pennsylvania is among the early states which have implemented an alternative/renewable energy portfolio standard. At this early stage, the primary alternative energy sources in the state in terms of production have been waste coal, followed by conventional hydropower, landfill gas, wood and wind. As the marketplace for alternative energy continues to develop, it is expected that more energy will be generated from other Tier I sources, such as fuel cells, and Tier II sources, like coal gasification. At the same time, the growth in energy consumption may decrease on a per capita basis as energy efficiency programs and demand side response programs are expanded and electricity prices increase.

Since passage of the AEPS law in late 2004, the PUC has moved expeditiously to develop the rules and regulations necessary for fostering Pennsylvania's burgeoning alternative energy market. The two electric distribution companies and five electric generation suppliers that had compliance obligations this year have met, and in some instances exceeded, their requirements. Next year should provide a greater snapshot of the alternative energy market as these companies will be subject to a full-year compliance requirement and will be joined by Duquesne Light Company, Citizens Electric Company, Pike County Light and Power and Wellsboro Electric Company, which will have partial year compliance obligations.

⁵PJM Interconnection (www.pjm.com) is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

2007 AEPS Compliance Summary

Table 1 shows the number of megawatt hours sold by EDCs and EGSs operating in the Commonwealth in service territories currently subject to AEPS compliance requirements and the total number of AECs retired. The weighted average credit price is also included. A total of 1,452,807 MWHs were sold for the time period of this report. This required the purchase of 26 solar credits, 21,784 Tier I credits, and 61,037 Tier II credits. The weighted average credit price for solar was \$229.62, Tier I was \$3.90, and Tier II was \$1.37.

Table 1 - 2007 AEPS Compliance Report by Source

Total Energy Sold (MWHs)	Alternative Energy Requirement		Alternative Energy Sales (%)	Number of Credits Retired	Weighted Average Credit Price	Cost of Compliance
	Tier	% of Total Energy Sold				
1,452,807	Solar	0.0013%	0.00179%	26	\$229.62	\$5,970.12
	I	1.4987%	1.49944%	21,784	\$3.90	\$84,957.60
	II	4.2000%	4.20132%	61,037	\$1.37	\$83,620.69
	All	5.7000%	5.70255%	82,847		\$174,548.41

Table 2 presents data on the number of AECs retired in the Penn Power and UGI territories by Tier. The results show that both EDCs and the five EGSs active in Penn Power's service territory are in compliance with the number of AECs that they were required to purchase. Most of the purchases were in the Penn Power service territory, where five electric generation suppliers are actively operating. Because EGS sales information is considered proprietary, their numbers have been combined with Penn Power's numbers. Of the 26 solar AEC credits purchased, 23 were from Penn Power territory. Penn Power and the five EGSs purchased 18,117 Tier I credits and 50,770 Tier II credits.

Table 2 – 2007 AEPS Compliance Report by EDC Service Territory

Distribution Service Territory	Tier	Total Energy Sold (MWHs)	Alternative Energy Requirements (%)	Credits Retired	Compliance Status
Penn Power & Suppliers*	Solar	1,208,374	0.0013%	23	In compliance
UGI**	Solar	244,433	0.0013%	3	In compliance
Penn Power & Suppliers	I	1,208,374	1.4987%	18,117	In compliance
UGI	I	244,433	1.4987%	3,667	In compliance
Penn Power & Suppliers	II	1,208,374	4.2000%	50,770	In compliance
UGI	II	244,433	4.2000%	10,267	In compliance

* EGS information is considered proprietary and therefore is combined with Penn Power.

** No EGS currently serves in the UGI territory.

Future Compliance by Remaining Electric Distribution Companies

The compliance period begins for Citizens' Electric of Lewisburg, Duquesne Light, Pike County Power and Light and Wellsboro Electric Company on Jan. 1, 2008; PPL Electric Utilities, Inc. on Jan. 1, 2010; and Pennsylvania Electric Company (Penelec), Metropolitan Electric Company (Met-Ed), West Penn Power and PECO Energy Company on Jan. 1, 2011. As was the case with Pennsylvania Power and UGI Electric, these companies will initially have partial year reporting requirements.

Table 3 - Overview of EDC Compliance Year Requirements

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

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.⁶ The GATS provides an unbundled, certificates-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. One credit, or certificate, represents one megawatt hour of energy produced. Each certificate is given a unique serial number for tracking purposes. Information in the registry is available to electric distribution companies, electric generation suppliers and state regulators.

The GATS is not an online trading platform where potential buyers can bid for and purchase alternative energy credits. The actual sale of alternative energy and any of its associated attributes, such as the emissions attributes associated with carbon dioxide, nitrogen dioxides and sulfur dioxides, takes place outside the GATS between a buyer and seller. The GATS simply records, after the fact, the ownership transfer of certificates representing certain attributes between two GATS subscribers.

⁶www.pjm-eis.com

AEPS Generators Certified

Appendix A contains a list of the renewable generators who have registered with PJM-EIS GATS for Pennsylvania certification. There are 104 AEPS generators certified in Pennsylvania, as well as 147 non-Pennsylvania generators registered as of Dec. 5, 2007. The Pennsylvania generators represent approximately 7,264 megawatts of capacity, and the non-Pennsylvania generators represent approximately 11,178 megawatts of capacity. The generators vary considerably in size, including hydro-pumped storage, waste coal and conventional hydro facilities that have capacities rated in the hundreds or thousands of megawatts to solar photovoltaic generators, whose facilities are rated as fractions of megawatts. The listing of generators in Appendix A is by certification number, fuel source and capacity. Locations of generation facilities are not released for proprietary and security reasons.

AEPS Certificates Created

Table 4 shows the number of alternative energy credits (AECs) created in PJM-EIS from 2005 through 2007 by tier for Pennsylvania. Over this time period, Pennsylvania solar AECs totaled 756, Tier I AECs totaled 8,017,768 and Tier II AECs totaled 89,428,237. The data in Table 4 reveals a trend whereby the number of AECs created are 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 4 shows that there were more Tier II credits created in each of the years from 2005 through 2007 than will be needed in 2021. If this trend continues, Tier II credits will be over subscribed in that there will likely be many more Tier II credits created in any given year than needed to meet requirements in the 2008-2021 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 used to meet compliance requirements in other states are retired and not available to be used to meet Pennsylvania requirements. In addition, credits used for voluntary purchases in Pennsylvania or other states are retired and cannot be used again.

Table 4 – Pennsylvania Eligible Credits and Estimated 2021 Requirements

	2005	2006	2007	2005-07 Total*	Estimated 2021 Requirements**
Solar	60	337	359	756	1,017,282
Tier I	1,359,566	3,093,631	3,564,511	8,017,768	16,276,508
Tier II	27,394,787	30,640,156	31,393,294	89,428,237	20,345,635

* Source - PJM-EIS GATS as of March 6, 2008.

** 2021 estimated requirement based on a projected increase in electricity demand of 1.8% per year through 2021.

AEPS Credit Program Administrator

In April 2007, the PUC entered into a contract with Clean Power Markets, a subsidiary of Enerwise Global Technologies,⁷ to be the Alternative Energy Credit Program Administrator in Pennsylvania. During the five-year contract, Clean Power Markets will verify that electric generation suppliers and electric distribution companies are complying with the minimum requirements of the AEPS Act.

⁷www.cleanpowermarkets.com, www.enerwise.com

Clean Power Markets 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 alternative compliance payment amounts; verifies data from behind the meter and demand side management/energy efficiency resources; 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>.

Net Metering and Interconnection Implementation

In accordance with Section 5 of the AEPS Act,⁸ the PUC has established rules for how customer-generators who use technologies such as solar panels or fuel cells connect to the electric distribution system and how they are compensated by EDCs and EGSs for supplying surplus energy to the electric grid. The interconnection standards work in conjunction with the net metering rules to simplify and regulate the manner in which customer-generators work with utilities.

Section 5 of the Act, 73 P.S. §1648.5⁹, provides as follows:

The Commission shall develop technical and net metering interconnection rules for customer-generators intending to operate renewable onsite generators in parallel with the electric utility grid, consistent with the rules defined in other states within the service region of the regional transmission organization that manages the transmission system in any part of this Commonwealth. The Commission shall convene a stakeholder process to develop Statewide technical and net metering rules for customer-generators. The Commission shall develop these rules within nine months of the effective date of this act.

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 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.¹⁰

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."¹¹ The net metering requirements apply to EGSs and EDCs which have customer-generators intending to pursue net metering opportunities in accordance with the Act.

⁸73 P.S. §1648.5 Interconnection standards for customer-generator facilities.

⁹We include only the pre-Act 35 language as Act 35 did not become effective until after the compliance period covered in this report.

¹⁰See 36 Pa. Bull. 7562, (www.pabulletin.com) and 52 Pa. Code §75 (www.pacode.com)

¹¹73 P.S. § 1648.2

On July 17, 2007, Gov. Rendell signed Act 35 of 2007 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. In order to be eligible for net metering on virtual meter aggregations, properties owned or leased and operated by a customer-generator must be within two miles of the boundaries of the customer-generator's property, and within a single EDC's service territory.

Interconnection Standards

The PUC on Nov. 10, 2005, adopted a proposed rulemaking order establishing interconnection standards for customer-generators. The regulations promote onsite generation by customer-generators using renewable resources 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.¹²

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 review and review criteria 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 application fees were not included in the regulations but are being developed through a stakeholder process. The forms and fees are currently being reviewed by a stakeholder committee and are expected to be adopted by early 2008.

Gov. Rendell signed Act 35 of 2007 into law on July 17, 2007. Act 35 amends 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.

Status of Customer Generator Interconnections

The PUC's regulations for net metering and interconnection provide for annual reports to the PUC 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. The initial data collection period covers the period of March 1, 2007, to May 31, 2007. As of May 31, 2007, Pennsylvania EDCs reported that there were 184 Tier I net metering customer generators interconnected to the distribution system. These customer generators represented approximately 925 kilowatts (kW) of new generation capacity. Solar PV accounted for 88.5 percent of the Tier I customer generators and 64.95 percent of the generation capacity. Generally, the solar PV customer generators had small systems that averaged about 3.7 kW while the other Tier I customer generators had somewhat larger systems that averaged about 15.4 kW in capacity.

Of the 184 customer generators, the EDCs processed 15 of these interconnection requests during the March 1, 2007, to May 31, 2007 period. There was one interconnection denial at Level I.¹³ The average number of days for EDCs to complete a Level I interconnection request/approval was approximately 15 days. The remaining 169 customer generators were processed prior to this three month period.

¹²See 36 Pa. Bull. 7574, (www.pabulletin.com) and 52 Pa. Code §75 (www.pacode.com).

¹³A Level I interconnection involves a small generator with an electric nameplate capacity of 10 kW or less. See 52 Pa. Code §75.34.

Table 5 – Number of Customer Generators Interconnected as of May 31, 2007

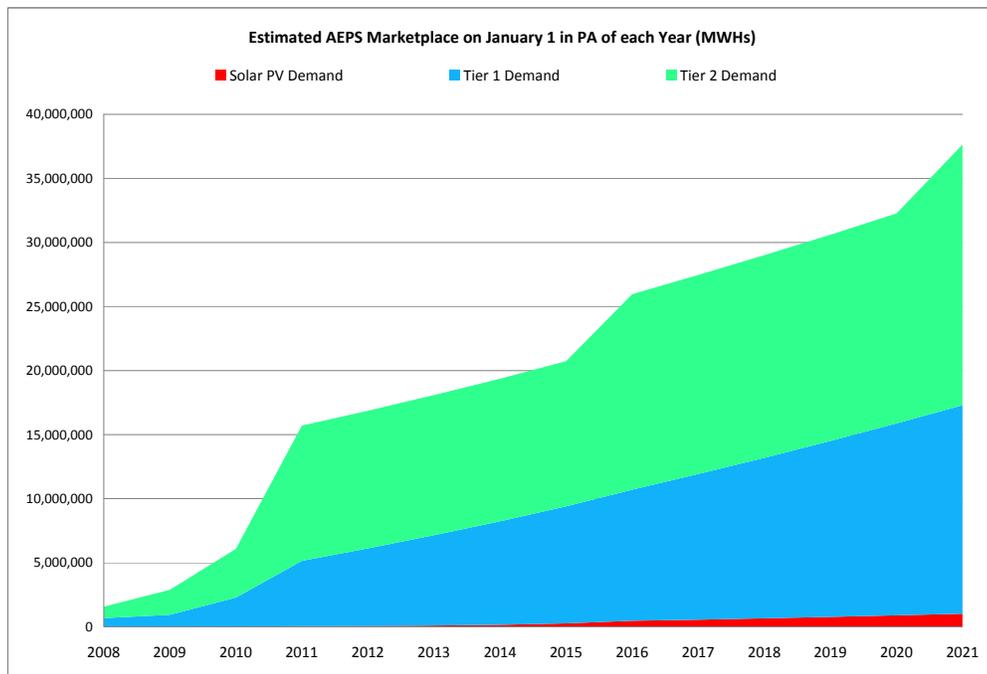
	Tier I	Tier II	Solar PV*	Total
Number of Customer-Generators	21	0	163	184
Estimated Generation Capacity in kW	324.3	0	601.21	925.51

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

Pennsylvania’s Alternative Energy Portfolio Standards Marketplace

For Pennsylvania, the following graph represents the demand for AEPS power on Jan. 1 of each year. As shown, on Jan. 1, 2008, the amount is very small at 1,215,822 MWhs. This represents approximately 0.75% of the Commonwealth’s annual energy demand. However, by Jan. 1, 2016, AEPS will provide 25,960,112 MWhs, or 13.95% of Pennsylvania’s annual electric requirements. At the conclusion of the Act requirements in 2021, renewable resources are estimated to meet 18.5% of Pennsylvania’s total electric energy requirements, or an estimated 36,639,425 MWhs.

Graph 1



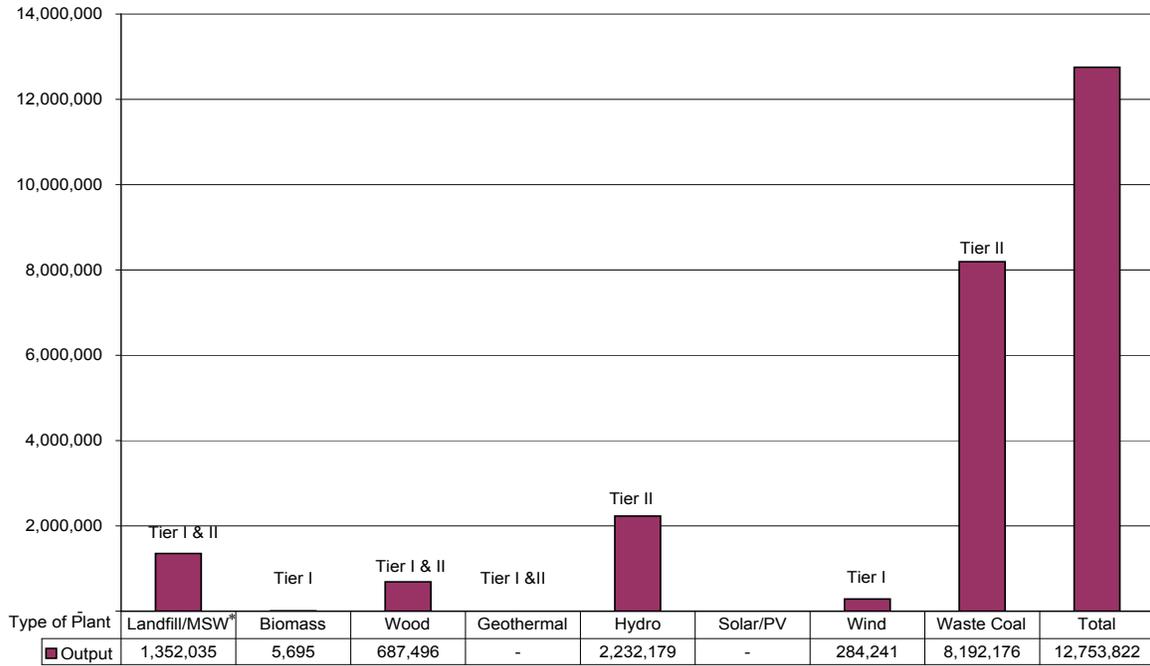
As a result of the Public Utility Regulatory Policies Act of 1978, Pennsylvania has a modest amount of alternative energy capacity. Much of this capacity is in the form of waste coal. In 2006, waste coal generating capacity amounted to 1,449 MWs. In addition, wind contributed about 150 MWs of capacity to the Commonwealth’s total.

Beyond waste coal and wind, according to the US EIA¹⁴, the following generating types provided green energy in 2006.

¹⁴ www.eia.doe.gov

Graph 2

Other Sources of Renewable Power in PA for 2006 (MWh)

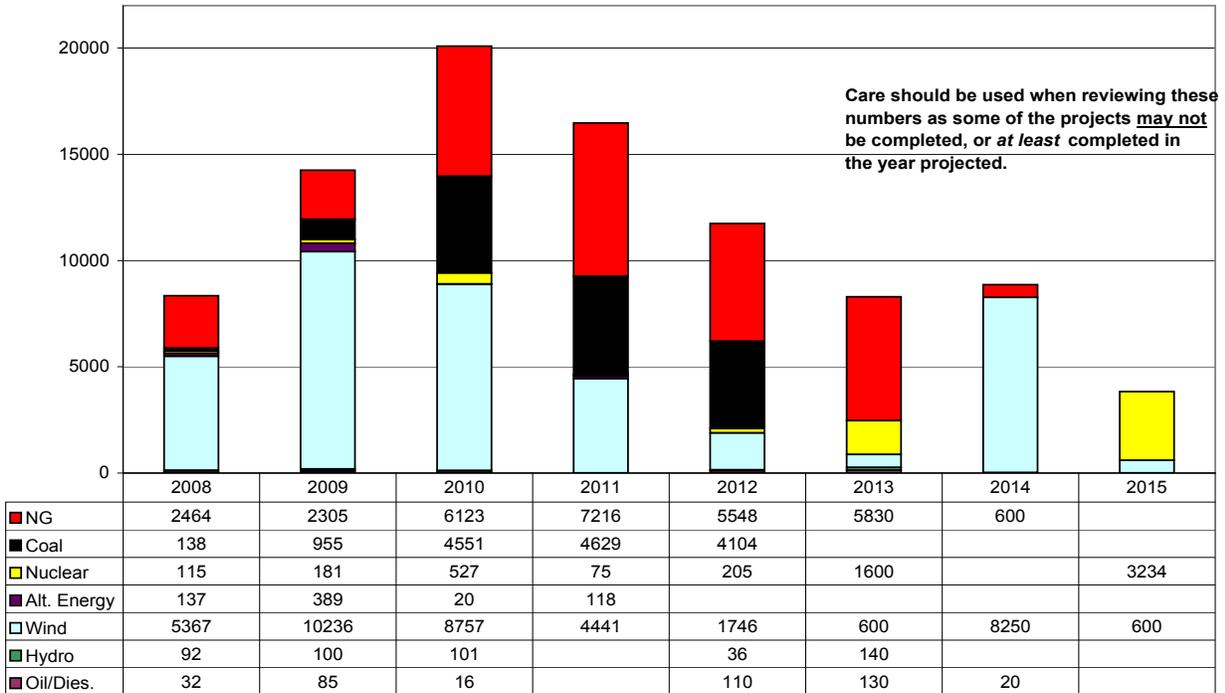


* Municipal solid waste

Looking forward, the PJM maintains planning queues for proposed generating capacity. The following graph shows the planning queue for the entire PJM footprint as of April 2008. The graph shows proposed additions by fuel type by year. This graph represents both renewable and non-renewable resources.

Graph 3

PJM Generation Queue for ALL PJM States as of April 14, 2008 (MWs)

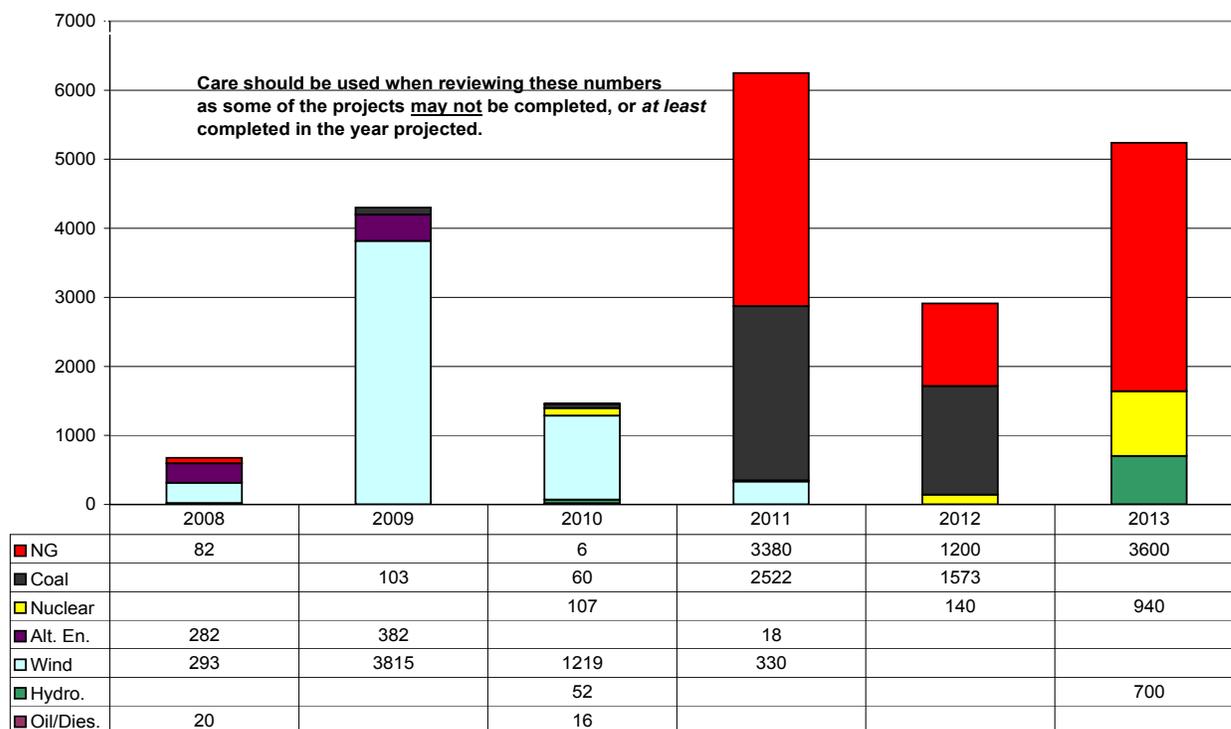


As shown in the previous graph, renewable resources represent just over 44% of the planned capacity additions on the PJM. Of the total additions, wind will be responsible for about 43% of the additions. At this point, it is estimated that wind could provide more than 39,997 MWs between 2008 and 2013.

Although it's true that the Pennsylvania AEPS eligibility rules allow any renewable project within the PJM footprint to qualify for AEPS certification, it is very difficult to do an analysis of Pennsylvania's marketplace with the entire PJM queue as the supply. The reason is marketplaces are where supply and demand meet. In order to use the entire PJM queue, we would need to analyze all renewable energy legislation for each state in the PJM queue. Then, we would have to look at those state's proposed generation queues, subtract out their renewable legislation requirements, and then aggregate across the entire PJM footprint. Such an analysis is under consideration for the 2008 Annual AEPS Report. At this time we note that there are several other PJM states that have renewable portfolio standard requirements that may be met by the renewable resources shown in Graph 3. Those states are New Jersey, Maryland, Delaware, Virginia, Ohio (as of May 1, 2008) and the District of Columbia. As an alternative for this current report, we will use the PJM generation queue, as it reflects the Pennsylvania generation supply market. The following graph looks at the PJM Pennsylvania queue.

Graph 4

PJM Generation Queue for PA Specific Projects for April 17, 2008 to 2013 (MWs)



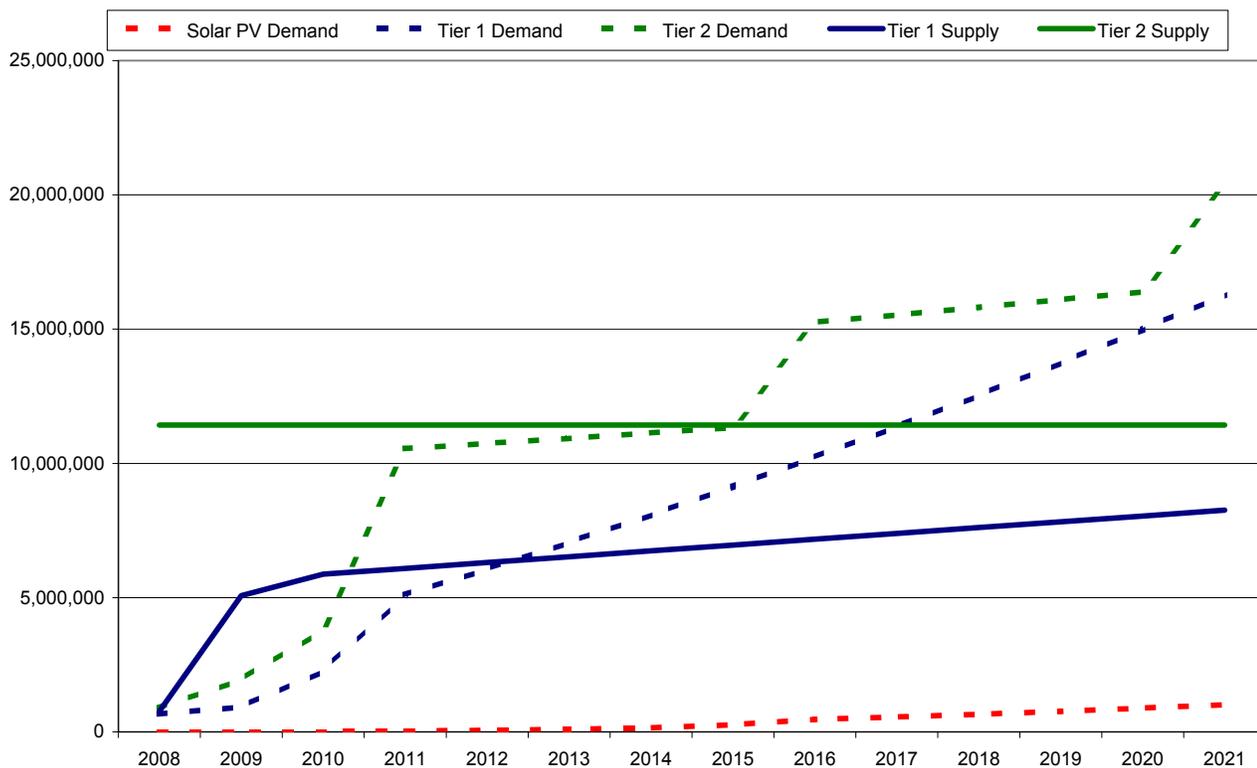
As shown in the foregoing graph, Pennsylvania has 20,840 MWs of proposed generation. Of that, 5,657 MWs is wind; i.e., about 27.1% of the total generation. Including hydro and other forms of alternative energy, Pennsylvania's queue has a total of 7,091 MWs of proposed alternative energy capacity. On a recent past basis, about 25% of what is in the PJM generating queue usually gets built.

Given the foregoing, and assuming that the 1.8% per year electric energy growth rates hold, we see the following. There is presently enough Tier I capacity to meet supply, present and projected, until the year 2012. There is enough Tier II capacity to meet demand until the year 2015. There is an unknown amount of Solar PV which is needed to meet a demand of approximately 0.15 MWs in 2008. This analysis presupposes that all of the wind projects proposed in the PJM planning queue will be built. Historically, this has not been the case; i.e., as mentioned about 25% gets built. An assumption is also made that only 30% of the wind capacity will be available for use. The analysis assumes that only waste coal resources presently installed will be the only Tier II resource available. This will most probably not be the case, as there already exists some landfill/municipal solid waste, hydro and wood Tier II resources in Pennsylvania (Graph 2) as well as potential, new Tier II resources in the PJM generation queue for Pennsylvania specific projects (Graph 4). These additional Tier II resources will likely provide supply in the future, which will extend the period of adequate Tier II resources beyond 2015. The analysis assumes that the historical average energy demand of 1.8% per year will hold. This may not be the case as a recent federal level study¹⁵ showed that energy growth may be cut by a factor of 2 through energy efficiency gains.

All of the foregoing is shown in the following graph.

Graph 5

AEPS Estimated Marketplace (MWhs)
 Based on PA PJM Queue Dated April 17, 2008



If all of the foregoing assumptions hold, there will be enough Tier I capacity to meet demand through 2012. There should be enough Tier II capacity to meet demand through 2015.

¹⁵“Vision for 2025: Developing a Framework for Change,” was prepared by the National Action Plan for Energy Efficiency Leadership Group, November 2007, <http://www.epa.gov/cleanenergy/pdf/vision.pdf>

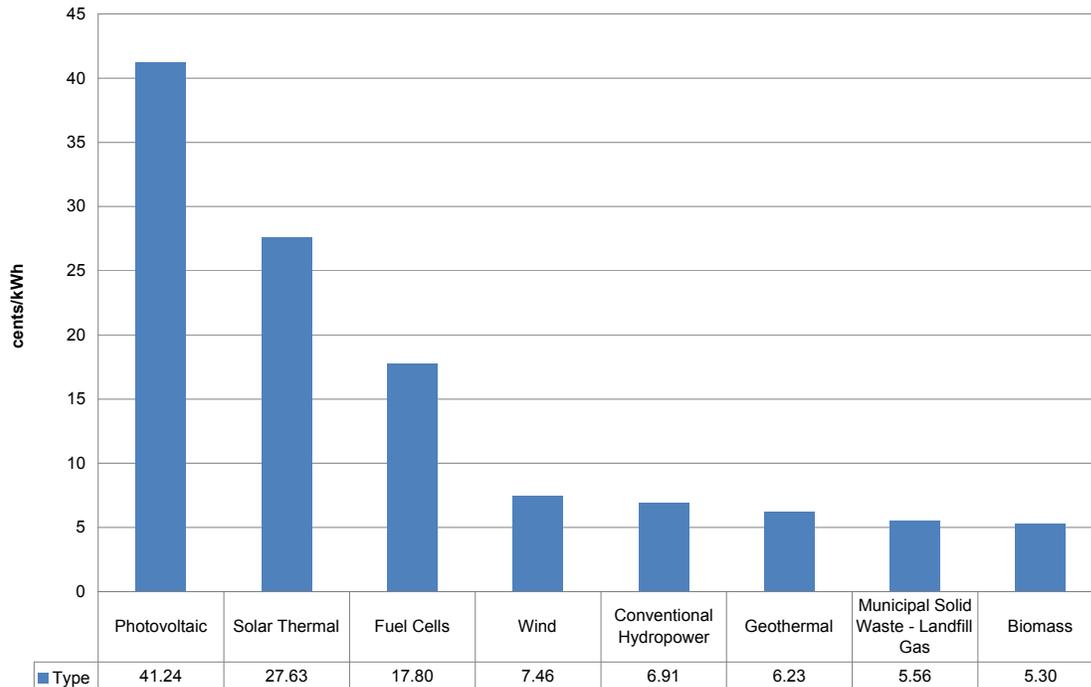
Estimated Costs of Renewable Resources in Pennsylvania

Presently, very limited data is available regarding the costs of renewable resources. Historically, the Electric Power Research Institute (EPRI)¹⁶ provided such data, or the data was made available during rate cases. However, generation has been deregulated. As such, plant construction costs, as well as most distributed generation prices, are considered to be proprietary business information and are not normally made available.

Given the foregoing, related data is available from the Energy Information Administration. This data is related to the generation cost data subset required by EIA to develop its "Annual Energy Outlook 2007." The EIA data was manipulated to produce the following graph showing estimated installed generating costs for Pennsylvania in 2007.

Graph 6

Estimated 2007 Installed Plant Costs for Renewable Resources in PA (cents/kWh)



The graph is meant to depict actual annual costs of ownership per kWh produced. By way of analogy, if we were to use a car, annual costs of ownership would include the following: monthly car payment, registration, gasoline, miscellaneous operation and maintenance (wiper blades, tires), regular operation and maintenance (oil changes, tire rotations), etc. The graph shows all of these expenses on a power plant, including taxes and insurance costs, on a per kWh of output basis.

¹⁶www.epri.com

Generally, the cost estimating methodology started with the available capital and O&M EIA data.¹⁷ Capital costs for these utility scale generating facilities were inflated to 2007 dollars using the U.S. Bureau of Labor Statistics Producer Price Index for Electric Utility Distribution costs.¹⁸ The overnight capital costs were annualized using a fixed charge rate of 15 percent per year.¹⁹ All plant types were assumed to have the same capital structure, cost of debt and equity, and taxes. No benefit was given to any plant for existing, or expected future, tax benefits. Fixed and variable O&M expenses were inflated to 2007 dollars and added to the capital costs. Capacity factors by plant type were either given by EIA, found in the National Renewable Energy Laboratory database²⁰, or came from the "Nuclear Tourist." Fuel prices are based on the New York Mercantile Exchange (NYMEX), one year forward prices for Nov. 21, 2007.²¹ Costs were calculated on a dollar per MWh basis, then converted to cents per kWh. (A more developed discussion of this methodology can be found in Appendix B to this report.)

Recommendations for Program Improvements

Because of the extremely short compliance period and the limited number of EDCs and EGSs having initial compliance obligations, the PUC does not recommend any changes or program improvements at this time. Future reports will address recommendations for program improvements.

The DEP would like to call attention to the overwhelming number of Tier II credits registered as being eligible for compliance in PA. From 2005 through 2007 there were 89,428,237 PA eligible Tier II credits registered in the GATS. Of these, 35,209,027 were from waste coal, for which there exists no other eligibility among other states. The estimated required number of Tier II credits to meet compliance in 2021 is 20,345,635. Credits from waste coal resources in 2007 alone account for 59% of the total Tier II requirement in 2021.

Furthermore, to date, no energy efficiency credits have been registered within the GATS although resources have been certified as eligible to receive credits. The DEP believes that vast over-subscription to Tier II by waste coal and other Tier II resources is proving to be a disincentive for energy efficiency. Therefore, the DEP would like to recommend that the legislature give careful consideration to restructuring energy efficiency such that there exists a dedicated market and further incentive for the resource. Energy efficiency is widely recognized as the most cost effective means of compliance because it reduces the overall need to add new generation and eases constraints on transmission.

The Pennsylvania legislature is currently considering bills that address revisions to existing AEPS laws, but no new legislation has become effective since the passage of Act 35 in July 2007.

¹⁷http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/electricity_tables.pdf

¹⁸<http://data.bls.gov>

¹⁹<http://www.nucleartourist.com/basics.costs.htm>

²⁰www.nrel.gov

²¹<http://www.nymex.com/index.aspx>. The NYMEX price is the average of the JP-PJM Financially Settled Monthly Electric Futures Prices/Off-peak and the JM-PJM Financially Settled Monthly Electric Futures Price/On-peak for December, 2007 through November 2008.

Background

Gov. Rendell signed Act 213 of 2004 into law on Nov. 30, 2004, establishing an alternative energy portfolio standard for Pennsylvania.²² The law took effect on Feb. 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 DEP has been charged with 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 Sept. 1 of the same calendar year. After the conclusion of the true-up period, the PUC will verify compliance and impose alternative compliance payments as appropriate after providing notice and opportunities for hearings to affected parties.

On July 19, 2007, the Governor signed Act 35 of 2007,²³ which amended the Alternative Energy Portfolio Standards Act by changing the compliance schedule related to solar photovoltaic energy. Act 35 also amended other provisions of the original law, including definitions for customer-generator and net metering. As a result, the PUC on Sept. 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 Oct. 11, 2007, and are available for review on the PUC's Web site.²⁴

The new compliance schedule appears in Table 6.

²²73 P.S. §§1648.1-1648.8

²³An Act amending the act of Nov. 30, 2004 (P.L.1672, No.213), known as the Alternative Energy Portfolio Standards Act, further providing for the definitions of "alternative energy credit," "customer-generator," "force majeure," "net metering," and "Tier I alternative energy source," for alternative energy portfolio standards, for portfolio requirements in other states and for interconnection standards for customer-generator facilities.

²⁴http://www.puc.state.pa.us/electric_alt_energy.aspx

Table 6 – Overview of AEPS Percentage Sales Requirements

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

* 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.

Chronology of Events

Table 7 provides a snapshot of the key chronology of events to date.

Table 7 - Chronology of Events: 2004-07

Event	Public Meeting Date
Governor Rendell Signs Act 213 of 2004	Nov. 30, 2004
Act 213 of 2004 Effective Date	Feb. 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)	Sept. 25, 2005
PUC Adopts Order: Designates PJM GATS Registry (M-00051865)	Jan. 27, 2006
Final Net Metering/Interconnection Regs in PA Bulletin	Dec. 16, 2006
PUC Contracts with CPM as Program Administrator	March 28, 2007
Compliance Required for PennPower & UGI	May 31, 2007
Governor Rendell Signs Act 35 of 2007	July 19, 2007

Appendix A

Alternative Energy Portfolio Standards Generators Registered for PA Certification

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
PA	PA-39078-OG-II, PA-39077-BFG-II, PA-39092-EE-II, PA-39093-DSR-II,	BFG	OG	52.500
PA	PA-39001-BLQ-II	BLQ	BIT	60.000
PA	PA-39094-EE-II	EE		31.000
PA	PA-39084-EE-II	EE		Varies**
PA	PA-39085-EE-II	EE		Varies**
PA	PA-39089-HPS-II	HPS		469.000
PA	PA-39002-HPS- II	HPS		800.000
PA	PA-39003-LFG-I	LFG	NG	23.200
PA	PA-39004-LFG-I PA-39005-LFG-I	LFG	NG	60.000
PA	PA-39096-LFG-I	LFG		6.000
PA	PA-39097-LFG-I	LFG		6.000
PA	PA-39100-LFG-I	LFG		0.840
PA	PA-39101-LFG-I	LFG		0.820
PA	PA-39103-LFG-I	LFG		3.200
PA	PA-39070-LFG-I	LFG		9.900
PA	PA-39074-LFG-I	LFG		1.200
PA	PA-39006-LFG-I	LFG		5.600
PA	PA-39008-LFG-I, PA-39007-LFG-I	LFG		6.000
PA	PA-39009-LFG-I	LFG		6.000
PA	PA-39010-LFG-I	LFG		3.100
PA	PA-39016-MSW-II	MSW	DFO	36.500
PA	PA-39011-MSW-II	MSW		0.000
PA	PA-39012-MSW-II	MSW		24.400

* Multiple certification numbers indicates that the owner has multiple generation plants.

**Varies - Certification number issued to aggregator

Abbreviation List

BIT	Bituminious Coal	FC	Fuel Cell	RFO	Residual Fuel Oil
BL	Black Liquor	HPS	Hydro Pump Storage	SOL	Solar Photovoltaic
BLQ	Black Liquor	LFG	Landfill Gas	WAT	Conventional Hydro
BFG	Blast Furnace Gas	MSW	Municipal Solid Waste	WC	Waste Coal/Other Coal
CMM	Coal Mine Methane	NG	Natural Gas	WDS	Wood/Wood Waste Solids
CMG	Coal Mine Methane/Gas	OBG	Other Biomass Gas	WH	Waste Heat
DSR	Demand Side Response	OG	Other Gas	WND	Wind
DFO	Distillate Fuel	PC	Petroleum Coke		
EE	Energy Efficiency	PG	Propane Gas		

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
PA	PA-39013-MSW-II	MSW		36.000
PA	PA-39014-MSW-II	MSW		32.220
PA	PA-39090-LFG-I	NG	LFG	1440.000
PA	PA-39104-LFG-I	NG	LFG	1338.000
PA	PA-39075-OBG-I	OBG		0.800
PA	PA-39079-OG-II, PA-39095-DSR-II, PA-39094-EE-II	EE, OG	NG	31.000
PA	PA-39071-SOL-I	SOL		0.054
PA	PA-39072-SOL-I	SOL		0.031
PA	PA-39082-SUN-I	SOL		0.000
PA	PA-39088-SUN-I	SOL		0.002
PA	PA-39091-SUN-I	SOL		0.003
PA	PA-39102-SUN-I	SOL		Varies*
PA	PA-39080-WAT-II	WAT		51.200
PA	PA-39083-WAT-I	WAT		0.200
PA	PA-39017-WAT-II	WAT		9.200
PA	PA-39018-WAT-II	WAT		9.200
PA	PA-39019-WAT-II	WAT		1.200
PA	PA-39020-WAT-II	WAT		16.500
PA	PA-39028-WAT-II, PA-39021-WAT-II, PA-39026-WAT-II, PA-39029-WAT-II, PA-39030-WAT-II, PA-39025-WAT-II, PA-39027-WAT-II, PA-39023-WAT-II, PA-39024-WAT-II, PA-39022-WAT-II	WAT		107.200
PA	PA-39031-WAT-II	WAT		51.200
PA	PA-39032-WAT-II	WAT		9.600
PA	PA-39033-WAT-II	WAT		21.700

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
PA	PA-39045-WAT-II, PA-39043-WAT-II, PA-39042-WAT-II, PA-39034-WAT-II, PA-39037-WAT-II, PA-39035-WAT-II, PA-39038-WAT-II, PA-39044-WAT-II, PA-39040-WAT-II, PA-39041-WAT-II, PA-39039-WAT-II, PA-39036-WAT-II	WAT		415.500
PA	PA-39046-WAT-II	WAT		5.200
PA	PA-39047-WAT-II	WAT		20.000
PA	PA-39048-WAT-II	WAT		19.600
PA	PA-39049-WAT-II	WAT		11.000
PA	PA-39060-WC-II	WC	BIT	94.700
PA	PA-39059-WC-II	WC	DF0	36.200
PA	PA-39063-WC-II	WC	DF0	36.000
PA	PA-39099-WC-II	WC	NG,PG	43.000
PA	PA-39081-WC-II	WC	PC	67.000
PA	PA-39056-WC-II	WC	PC	134.000
PA	PA-39076-WC-II	WC		585.000
PA	PA-39050-WC-II	WC		90.000
PA	PA-39051-WC-II	WC		102.000
PA	PA-39052-WC-II	WC		55.000
PA	PA-39053-WC-II	WC		46.000
PA	PA-39054-WC-II	WC		79.000
PA	PA-39055-WC-II	WC		50.000
PA	PA-39057-WC-II	WC		67.300
PA	PA-39058-WC-II	WC		93.000

* Multiple certification numbers indicates that the owner has multiple generation plants.

Abbreviation List

BIT	Bituminous Coal	FC	Fuel Cell	RFO	Residual Fuel Oil
BL	Black Liquor	HPS	Hydro Pump Storage	SOL	Solar Photovoltaic
BLQ	Black Liquor	LFG	Landfill Gas	WAT	Conventional Hydro
BFG	Blast Furnace Gas	MSW	Municipal Solid Waste	WC	Waste Coal/Other Coal
CMM	Coal Mine Methane	NG	Natural Gas	WDS	Wood/Wood Waste Solids
CMG	Coal Mine Methane/Gas	OBG	Other Biomass Gas	WH	Waste Heat
DSR	Demand Side Response	OG	Other Gas	WND	Wind
DF0	Distillate Fuel	PC	Petroleum Coke		
EE	Energy Efficiency	PG	Propane Gas		

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
PA	PA-39061-WC-II	WC		117.000
PA	PA-39062-WC-II	WC		43.000
PA	PA-39064-WDS-II	WDS		12.500
PA	PA-39065-WDS-I	WDS		18.000
PA	PA-39086-WND-I	WND		24.000
PA	PA-39087-WND-I	WND		0.010
PA	PA-39092-WND-I	WND		26.000
PA	PA-39098-WND-I	WND		80.000
PA	PA-39073-WND-I	WND		10.400
PA	PA-39066-WND-I	WND		9.000
PA	PA-39067-WND-I	WND		33.000
PA	PA-39068-WND-I	WND		15.000
PA	PA-39069-WND-I	WND		65.000
Outside PA	PA-16007-BFG-II	BFG	NG	152.000
Outside PA	PA-21007-BFG-II	BFG	NG	120.000
Outside PA	PA-16003-BFG-II, PA-16004-OG-II,	BFG	OG	81.900
Outside PA	PA-16005-BFG-II, PA-16006-OG-II	BFG	OG	161.000
Outside PA	PA-50013-WDS-I	BIT	NG	213.200
Outside PA	PA-46038-WDS-II	BIT	WDS	63.000
Outside PA	PA-50014-WDS-I	BIT	WDS	278.200
Outside PA	PA-36004-BLQ-II, PA-36005-WDS-II	BLQ	BIT	92.800
Outside PA	PA-46034-DSR-II	BLQ	BIT, WDS	96.500
Outside PA	PA-46031-WDS-II, PA-46034-DSR-II, PA-46030-BLQ-II	BLQ	BIT, WDS	96.500
Outside PA	PA-46045-WDS-I, PA-46044-BLQ-II	BLQ	WDS	101.000
Outside PA	PA-46028-BLQ-II, PA-46029-WDS-II	BLQ	WDS	47.600
Outside PA	PA-23007-WDS-II, PA-23006-BLQ-II	BLQ, BIT, NG	RF0, WDS	103.300
Outside PA	PA-21006-BLQ-II,	COAL	BL	65.000
Outside PA	PA-32001-HPS-II, PA-32003-HPS-II, PA-32002-HPS-II	HPS		453.000
Outside PA	PA-46001-HPS-II, PA-46002-HPS-II	HPS		2100.600

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
Outside PA	PA-46004-HPS-II, PA-46003-HPS-II, PA-46005-HPS-II, PA-46025-WAT-II, PA-46026-WAT-II	HPS, WAT		547.500
Outside PA	PA-10003-LFG-I	LFG		3.200
Outside PA	PA-10004-LFG-I	LFG		4.200
Outside PA	PA-15003-LFG-I	LFG		3.500
Outside PA	PA-15004-LFG-I	LFG		3.500
Outside PA	PA-15005-LFG-I	LFG		2.140
Outside PA	PA-15006-LFG-I	LFG		3.300
Outside PA	PA-15007-LFG-I	LFG		3.300
Outside PA	PA-15008-LFG-I	LFG		8.400
Outside PA	PA-15009-LFG-I	LFG		5.500
Outside PA	PA-15010-LFG-I	LFG		4.400
Outside PA	PA-15011-LFG-I	LFG		4.200
Outside PA	PA-15012-LFG-I	LFG		1.100
Outside PA	PA-15013-LFG-I	LFG		4.400
Outside PA	PA-15014-LFG-I	LFG		1.100
Outside PA	PA-15015-LFG-I	LFG		3.300
Outside PA	PA-15016-LFG-I	LFG		5.456
Outside PA	PA-15017-LFG-I	LFG		1.600
Outside PA	PA-15018-LFG-I	LFG		9.900
Outside PA	PA-15019-LFG-I	LFG		6.000
Outside PA	PA-15020-LFG-I	LFG		9.000
Outside PA	PA-15021-LFG-I	LFG		1.600
Outside PA	PA-15022-LFG-I	LFG		6.000
Outside PA	PA-15024-LFG-I	LFG		2.000
Outside PA	PA-15025-LFG-I	LFG		1.600
Outside PA	PA-16009-LFG-I	LFG		3.200
Outside PA	PA-32014-LFG-I	LFG		20.000

*Multiple certification numbers indicates that the owner has multiple generation plants.

**Varies - Certification number issued to aggregator

Abbreviation List

BIT	Bituminous Coal	FC	Fuel Cell	RFO	Residual Fuel Oil
BL	Black Liquor	HPS	Hydro Pump Storage	SOL	Solar Photovoltaic
BLQ	Black Liquor	LFG	Landfill Gas	WAT	Conventional Hydro
BFG	Blast Furnace Gas	MSW	Municipal Solid Waste	WC	Waste Coal/Other Coal
CMM	Coal Mine Methane	NG	Natural Gas	WDS	Wood/Wood Waste Solids
CMG	Coal Mine Methane/Gas	OBG	Other Biomass Gas	WH	Waste Heat
DSR	Demand Side Response	OG	Other Gas	WND	Wind
DFO	Distillate Fuel	PC	Petroleum Coke		
EE	Energy Efficiency	PG	Propane Gas		

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
Outside PA	PA-32020-LFG-I	LFG		1.200
Outside PA	PA-36006-LFG-I	LFG		2.728
Outside PA	PA-46036-LFG-I	LFG		3.200
Outside PA	PA-46037-LFG-I	LFG		3.200
Outside PA	PA-46040-LFG-I	LFG		1.900
Outside PA	PA-46041-LFG-I	LFG		3.200
Outside PA	PA-46042-LFG-I	LFG		3.000
Outside PA	PA-46043-LFG-I	LFG		4.800
Outside PA	PA-21001-LFG-I	LFG		2.800
Outside PA	PA-32004-LFG-II	LFG		7.000
Outside PA	PA-32005-LFG-II	LFG		9.500
Outside PA	PA-32006-LFG-II	LFG		5.000
Outside PA	PA-32007-LFG-II	LFG		1.000
Outside PA	PA-46006-LFG-I	LFG		16.000
Outside PA	PA-46007-LFG-I	LFG		3.000
Outside PA	PA-46008-LFG-I	LFG		2.000
Outside PA	PA-46009-LFG-I	LFG		4.000
Outside PA	PA-46010-LFG-I	LFG		7.000
Outside PA	PA-46011-LFG-I	LFG		16.000
Outside PA	PA-46012-LFG-I	LFG		16.000
Outside PA	PA-46013-LFG-I	LFG		12.000
Outside PA	PA-15023-LFG-I	LFG, OG (N/A)	DF0	25.000
Outside PA	PA-32012-MSW-II	MSW	DF0	13.000
Outside PA	PA-32008-MSW-II	MSW	DF0	70.000
Outside PA	PA-21008-MSW-II	MSW	NG	78.000
Outside PA	PA-21002-MSW-II	MSW	NG	67.800
Outside PA	PA-32011-MSW-II	MSW	NG	45.000
Outside PA	PA-21003-MSW-II	MSW		60.240
Outside PA	PA-32009-MSW-II	MSW		35.000
Outside PA	PA-32010-MSW-II	MSW		10.000
Outside PA	PA-39015-MSW-II	MSW		53.300
Outside PA	PA-46014-MSW-II	MSW		63.000
Outside PA	PA-46033-CMG-I	NG	CMM	88.000
Outside PA	PA-36003-WDS-II	NG	WDS	16.500
Outside PA	PA-32016-FC-I	NG		0.000
Outside PA	PA-32017-FC-I	NG		0.000
Outside PA	PA-10002-OBG-I, PA-10001-LFG-I	No. 6 Oil, COAL	LFG	698.000
Outside PA	PA-32018-OBG-I	OBG	NG	0.270
Outside PA	PA-32019-OBG-I	OBG	NG	0.990
Outside PA	PA-46035-WAT-II	WAT		Varies**
Outside PA	PA-50015-WAT-II	WAT		2.800

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
Outside PA	PA-50015-WAT-II	WAT		1.600
Outside PA	PA-50015-WAT-II	WAT		1.400
Outside PA	PA-50015-WAT-II	WAT		0.900
Outside PA	PA-50015-WAT-II	WAT		0.800
Outside PA	PA-50015-WAT-II	WAT		1.900
Outside PA	PA-50015-WAT-II	WAT		1.000
Outside PA	PA-50016-WAT-II	WAT		80.000
Outside PA	PA-16001-WAT-II	WAT		1.400
Outside PA	PA-16002-WAT-II	WAT		4.800
Outside PA	PA-21004-WAT-II	WAT		474.000
Outside PA	PA-21005-WAT-II	WAT		9.600
Outside PA	PA-23001-WAT-II	WAT		7.200
Outside PA	PA-23002-WAT-II	WAT		0.400
Outside PA	PA-46018-WAT-II, PA-46017-WAT-II, PA- 46016-WAT-II	WAT		56.100
Outside PA	PA-23003-WAT-II	WAT		18.700
Outside PA	PA-23004-WAT-II	WAT		1.200
Outside PA	PA-23005-WAT-II	WAT		0.400
Outside PA	PA-28001-WAT-II	WAT		177.600
Outside PA	PA-28002-WAT-II	WAT		100.000
Outside PA	PA-32013-WAT-II	WAT		10.800
Outside PA	PA-36001-WAT-II	WAT		42.000
Outside PA	PA-36002-WAT-II	WAT		23.700
Outside PA	PA-46015-WAT-II	WAT		8.400
Outside PA	PA-46019-WAT-II	WAT		7.500
Outside PA	PA-46020-WAT-II	WAT		204.000
Outside PA	PA-46021-WAT-II	WAT		20.000
Outside PA	PA-46022-WAT-II	WAT		2.400
Outside PA	PA-46023-WAT-II	WAT		15.000

*Multiple certification numbers indicates that the owner has multiple generation plants.

Abbreviation List

BIT	Bituminious Coal	FC	Fuel Cell	RFO	Residual Fuel Oil
BL	Black Liquor	HPS	Hydro Pump Storage	SOL	Solar Photovoltaic
BLQ	Black Liquor	LFG	Landfill Gas	WAT	Conventional Hydro
BFG	Blast Furnace Gas	MSW	Municipal Solid Waste	WC	Waste Coal/Other Coal
CMM	Coal Mine Methane	NG	Natural Gas	WDS	Wood/Wood Waste Solids
CMG	Coal Mine Methane/Gas	OBG	Other Biomass Gas	WH	Waste Heat
DSR	Demand Side Response	OG	Other Gas	WND	Wind
DFO	Distillate Fuel	PC	Petroleum Coke		
EE	Energy Efficiency	PG	Propane Gas		

Location	Certification Numbers*	Primary Fuel	Secondary Fuel	MW Capacity
Outside PA	PA-46024-WAT-II	WAT		12.500
Outside PA	PA-50001-WAT-II	WAT		80.000
Outside PA	PA-50002-WAT-II	WAT		17.400
Outside PA	PA-50003-WAT-II	WAT		4.400
Outside PA	PA-50004-WAT-II	WAT		4.800
Outside PA	PA-50005-WAT-II	WAT		14.700
Outside PA	PA-50007-WC-II	WC	BIT	80.000
Outside PA	PA-50012-WC-II	WC	NG	95.700
Outside PA	PA-50006-WC-II	WC		95.700
Outside PA	PA-50011-WC-II	WC		137.800
Outside PA	PA-23008-WDS-I	WDS	NG	44.000
Outside PA	PA-46039-WDS-II	WDS		83.000
Outside PA	PA-46027-WDS-II	WDS		79.600
Outside PA	PA-16008-WH-II	WH		94.600
Outside PA	PA-50009-WND-I	WND		50.000
Outside PA	PA-15026-WND-I	WND		198.000
Outside PA	PA-15027-WND-I	WND		80.000
Outside PA	PA-32015-WND-I	WND		0.000
Outside PA	PA-15001-WND-I	WND		50.000
Outside PA	PA-15002-WND-I	WND		45.000
Outside PA	PA-50008-WND-I	WND		66.000
Outside PA	PA-50010-WND-I	WND		125.000
Total for PA				7262.980
Total				16340.404

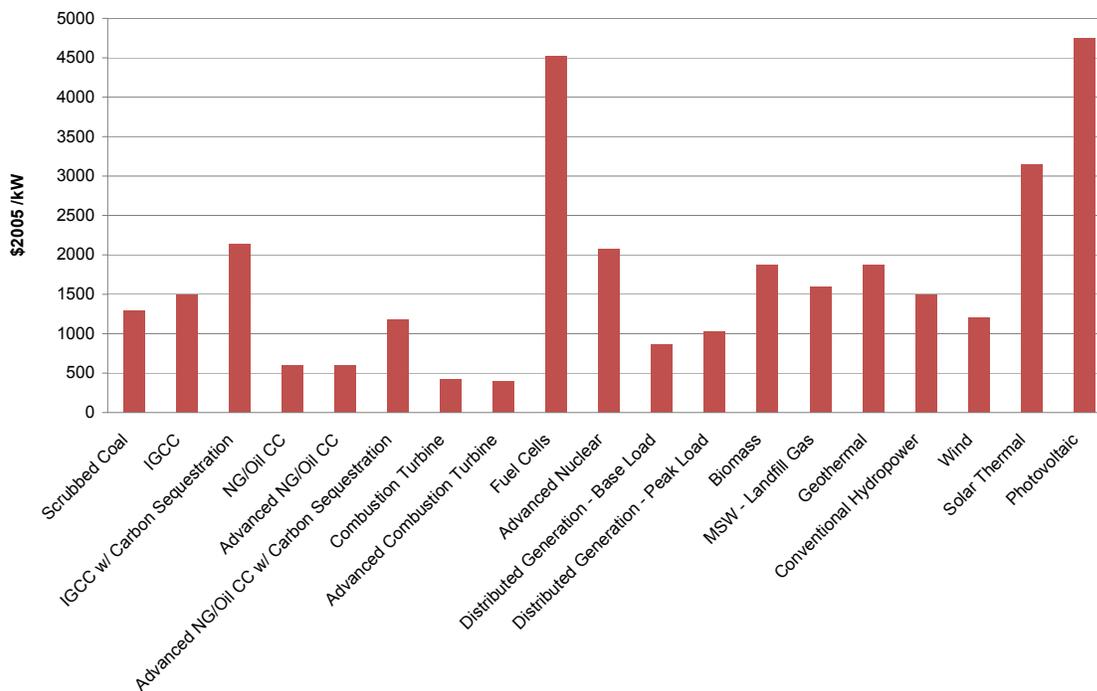
Appendix B - Discussion of Estimating Costs of Renewable Resources Methodology

Graph 5 on page 14 shows the estimated 2007 installed plant costs for renewable resources in cents per kWh. The graph is meant to depict actual annual costs of ownership per kWh produced. This appendix provides a more detailed discussion of the methodology.

Capital costs associated with various generating units can be found in the U.S. EIA's Table 39, Assumptions to the Annual Energy Outlook 2007.²⁵ The costs as shown in the following graph were updated from 2005 dollars to 2007 dollars using the U.S. Bureau of Labor and Statistics (BLS) Producer Price Index (PPI) for Electric Utility Distribution costs.²⁶ The 2005 capital costs were inflated by 4.5 percent for 2006, and then by 7.5 percent for 2007.

Graph 7

UE EIA Overnight Construction Costs in 2005 Dollars



The term overnight construction costs is meant to represent the idea that there was no interest accumulated on funds used during construction. No consideration in this report was given to the length of construction duration, nor to the degree of construction difficulty.

The third major issue was that of the annualization of capital costs. This is necessary so that we can compare different technologies to one another. For the purposes of this report, we used a fixed-charge rate. For simplicity, we assumed a fixed-charge rate of 15 percent per year. We kept this the same for all plant types, regardless of the level of risk involved in each technology. We assumed that this was levelized, at least over the study horizon. The fixed charge rate is composed of the capital costs, debt and equity, taxes, and insurance. No benefit was given to any plant-type for existing or expected future tax benefits.

²⁵http://www.eia.doe.gov/oi/af/aeo/assumption/pdf/electricity_tables.pdf

²⁶<http://data.bls.gov>

The concept of fixed-charge rates²⁷ is widely used in the utility industry. "Fixed-charge rate" is defined as the annual owning costs of an investment as a percent of the investment. A typical value might be 20 percent per year. When an investment in utility plant is made and placed into service, the owning cost to the utility includes the following:

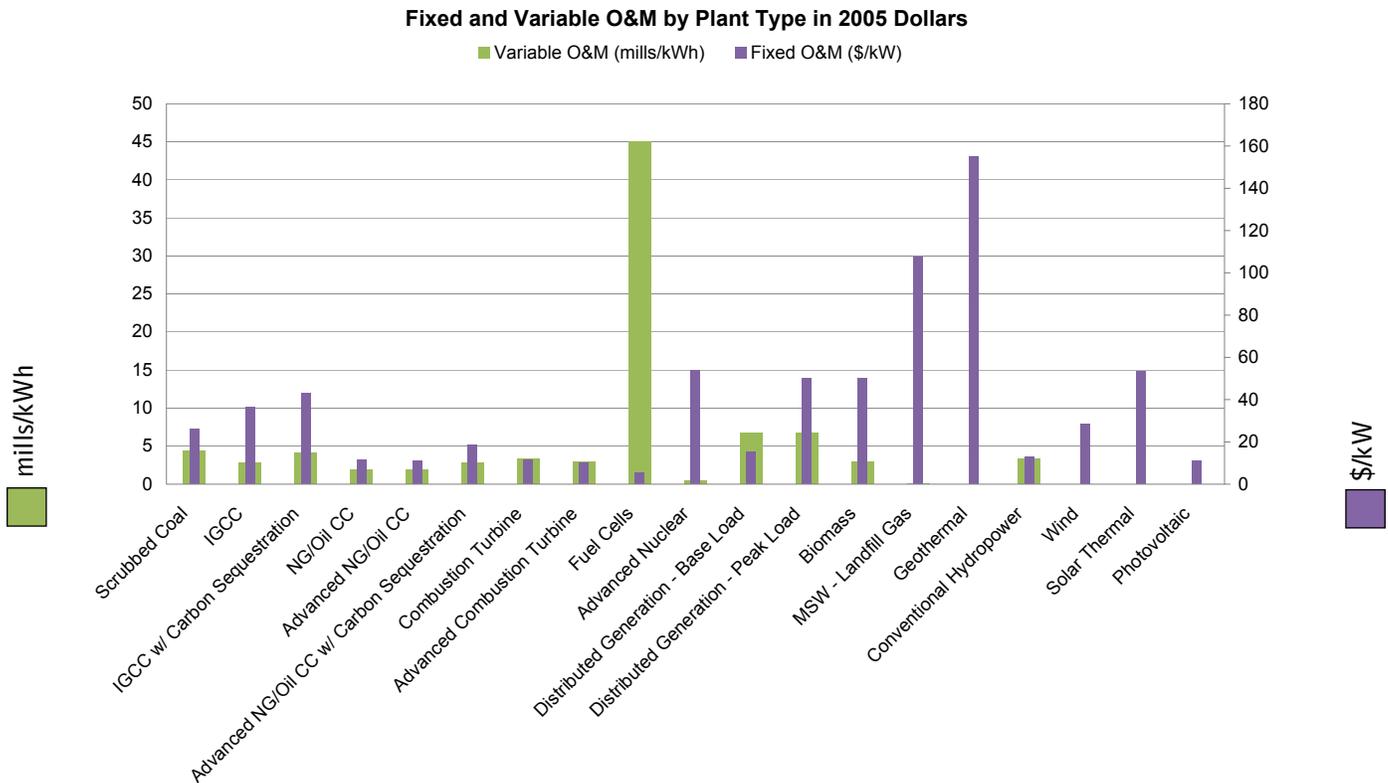
- Interest on bonds used to partially finance the project;
- Equity return requirements of the stockholders who helped to finance the project;
- Income taxes to be paid to state and local government;
- Ad valorem (property) taxes and insurances to be paid; and
- Depreciation charge on this investment.

The fixed-charge rate has a yearly variation. The fixed-charge rate might begin at a value of 28 percent per year and decrease to a value of 14 percent per year at age 30 years. Levelized or average value over the 30- or 40-year plant life is also used. This can range from 18 percent to 22 percent on a levelized basis for a typical investor-owned utility, depending on the specific utility. For purposes of simplicity, we have assumed a fixed-charge rate of 15 percent per year for all plant types, regardless of ownership. Then, fixed and variable operation and maintenance (O&M) expenses were added in. Most of these O&M numbers were based on the U.S. EIA data. The O&M data was for 2005, and like the capital costs, had to be inflated to 2007 dollars. The same PPI inflators were used. The data is shown in the following graph.

²⁷Harry G. Stoll, "Least Cost Electric Utility Planning," Wiley-Interscience, NY: NY, June 12, 1989.

Graph 8

Fixed and Variable O&M by Plant Type in 2005 Dollars



Capacity factors were either given by the EIA, or came from the following sources: base load facilities were assumed at 80 percent, renewable capacity factors came from the National Renewable Energy Laboratory (NREL), fuel cell capacity factors came from U.S. Army research and distributed generation came from the EIA.²⁸

Fuel prices are based on NYMEX forward prices for Nov. 21, 2007.²⁹ Nuclear fuel costs were obtained at the "Nuclear Tourist."³⁰

All costs were calculated in \$/MWh and then converted to cents/kWh. All calculations follow.

²⁸NREL http://www.nrel.gov/analysis/power_databook/docs/excel/12_3.xls
 CF Fuel Cell http://dodfuelcell.cecer.army.mil/res/site_summary.php4?location_id=14
 Distributed Generation CF http://www.eia.doe.gov/oiaf/speeches/dist_generation.html

²⁹NYMEX <http://www.nymex.com/index.aspx>

³⁰Nuclear Fuel Price (cents/kWh) <http://www.nucleartourist.com/basics/costs.htm>

Summary of Cost and Performance Characteristics of New Central Station Technologies

(Following after: US EIA, Table 39, Assumptions to the Annual Energy Outlook 2007
http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/electricity_tables.pdf)

Plant Type	Size (MW)	Total Overnight Construction Costs	Variable O&M	Fixed O&M	Early/Poor Heat Rates
		(\$2005/kW)	(\$2005 - mills/kWh)	(\$2005/kW)	(BTU/kWh)
Scrubbed Coal	600	1290	4.32	25.91	8644
IGCC	550	1491	2.75	36.38	8309
IGCC w/ Carbon Sequestration	380	2134	4.18	42.82	9713
NG/Oil CC	250	603	1.94	11.75	7163
Advanced NG/Oil CC	400	594	1.88	11.01	6717
Advanced NG/Oil CC w/ Carbon Sequestration	400	1185	2.77	18.72	8547
Combustion Turbine	160	420	3.36	11.4	10607
Advanced Combustion Turbine	230	398	2.98	9.91	9166
Fuel Cells	10	4520	45.09	5.32	7873
Advanced Nuclear	1350	2081	0.47	53.88	10400
Distributed Generation - Base Load	2	859	6.7	15.08	9500
Distributed Generation - Peak Load	1	1032	6.7	50.18	10634
Biomass	80	1869	2.96	50.18	8911
MSW - Landfill Gas	30	1595	0.01	107.5	13548
Geothermal	50	1880	0	154.92	36025
Conventional Hydropower	500	1500	3.3	13.14	10107
Wind	50	1206	0	28.51	10280
Solar Thermal	100	3149	0	53.43	10280
Photovoltaic	5	4751	0	10.99	10280

Plant Type	FCR (%)	Fuel Price (\$/MM BTU,Ton)	Capacity Factor (%)	Annualized Capital Costs 2007 Dollars	Annual Cost	Average Annual Cost
					\$ 2007 Dollars	(\$2007/MWH)
Scrubbed Coal	15%	52.13	80.0%	130,423,838	239,504,878	56.96
IGCC	15%	52.13	80.0%	138,183,550	241,388,706	62.63
IGCC w/ Carbon Sequestration	15%	52.13	80.0%	136,645,088	220,124,153	82.66
NG/Oil CC	15%	7.77	80.0%	25,402,317	126,212,439	72.04
Advanced NG/Oil CC	15%	7.77	80.0%	40,037,085	191,286,494	68.24
Advanced NG/Oil CC w/ Carbon Sequestration	15%	7.77	80.0%	79,871,963	274,444,842	97.90
Combustion Turbine	15%	7.77	80.0%	11,323,620	105,784,510	94.34
Advanced Combustion Turbine	15%	7.77	80.0%	15,425,062	132,780,529	82.38
Fuel Cells	15%	7.77	75.0%	7,616,483	11,695,377	178.01
Advanced Nuclear	15%	0.5	80.0%	473,393,033	710,298,592	75.08
Distributed Generation - Base Load	15%	7.77	5.0%	289,494	388,044	442.97
Distributed Generation - Peak Load	15%	7.77	5.0%	173,898	266,467	608.37
Biomass	15%	0	80.0%	25,195,055	29,704,734	52.98
MSW - Landfill Gas	15%	0	80.0%	8,063,024	11,685,908	55.58
Geothermal	15%	0	90.0%	15,839,588	24,541,250	62.26
Conventional Hydropower	15%	0	44.2%	126,379,688	133,760,265	69.09
Wind	15%	0	36.0%	10,160,927	11,762,298	74.60
Solar Thermal	15%	0	24.4%	53,062,618	59,064,811	276.33
Photovoltaic	15%	0	22.5%	4,002,866	4,064,595	412.44

Notes: Coal price based on US EIA, NYMEX Near Month Price for December 2007 Central Appalachian
 NG Price based on NYMEX 12 Month Strip for 11/21/2007 = \$7.77/MM BTUS
 Nuclear Fuel Price (cents/kWh) <http://www.nucleartourist.com/basics/costs.htm>
 Base Load capacity factors = 80%
 Renewable capacity factors from NREL http://www.nrel.gov/analysis/power_databook/docs/excel/12_3.xls
 CF Fuel Cell http://dodfuelcell.cecer.army.mil/res/site_summary.php4?location_id=14
 Distributed Generation CF http://www.eia.doe.gov/oiaf/speeches/dist_generation.html

Plant Type	2005 to 2007	Total 2007	Expected Annual	Adjusted F & V	Expected Annual	Total Annual	Average Annual
	Adjusted Plant Price Change	Plant Cost 2007 Dollars	Plant Output MWH	O & M 2007 Dollars	Fuel Cost 2007 Dollars	Costs 2007 Dollars	Costs (\$2007/ MWH)
Scrubbed Coal	1449	869,492,250	4,204,800	17,463,993	91,617,048	239,504,878	56.96
IGCC	1675	921,223,669	3,854,400	22,477,613	80,727,543	241,388,706	62.63
IGCC w/ Carbon Sequestration	2397	910,967,255	2,663,040	18,279,113	65,199,951	220,124,153	82.66
NG/Oil CC	677	169,348,781	1,752,000	3,299,916	97,510,206	126,212,439	72.04
Advanced NG/Oil CC	667	266,913,900	2,803,200	4,947,346	146,302,063	191,286,494	68.24
Advanced NG/Oil CC w/ Carbon Sequestration	1331	532,479,750	2,803,200	8,411,835	186,161,045	274,444,842	97.90
Combustion Turbine	472	75,490,800	1,121,280	2,049,040	92,411,850	105,784,510	94.34
Advanced Combustion Turbine	447	102,833,748	1,611,840	2,560,512	114,794,955	132,780,529	82.38
Fuel Cells	5078	50,776,550	65,700	59,814	4,019,080	11,695,377	178.01
Advanced Nuclear	2338	3,155,953,556	9,460,800	81,712,051	155,193,508	710,298,592	75.08
Distributed Generation - Base Load	965	1,929,958	876	33,889	64,662	388,044	442.97
Distributed Generation - Peak Load	1159	1,159,323	438	56,378	36,190	266,467	608.37
Biomass	2100	167,967,030	560,640	4,509,680	0	29,704,734	52.98
MSW - Landfill Gas	1792	53,753,494	210,240	3,622,884	0	11,685,908	55.58
Geothermal	2112	105,597,250	394,200	8,701,663	0	24,541,250	62.26
Conventional Hydropower	1685	842,531,250	1,935,960	7,380,577	0	133,760,265	69.09
Wind	1355	67,739,513	157,680	1,601,371	0	11,762,298	74.60
Solar Thermal	3538	353,750,788	213,744	6,002,193	0	59,064,811	276.33
Photovoltaic	5337	26,685,773	9,855	61,729	0	4,064,595	412.44

Notes: Installed Plant costs increased by 4.5% for 2005 and 7.5% for 2006 based on PPI - Electric Utility Distribution Plant increase after US BLS <http://data.bls.gov/PDQ/servlet/SurveyOutputServlet>

* Please see column one on page 29 for the MW size of the generation unit.

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 March 23, 2005

Implementation of the Alternative Energy Portfolio Standards Act of 2004 (Implementation Order II), PUC Docket No. M-00051865, PUC public meeting July 14, 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 Sept. 29, 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 Jan. 27, 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 June 22, 2006

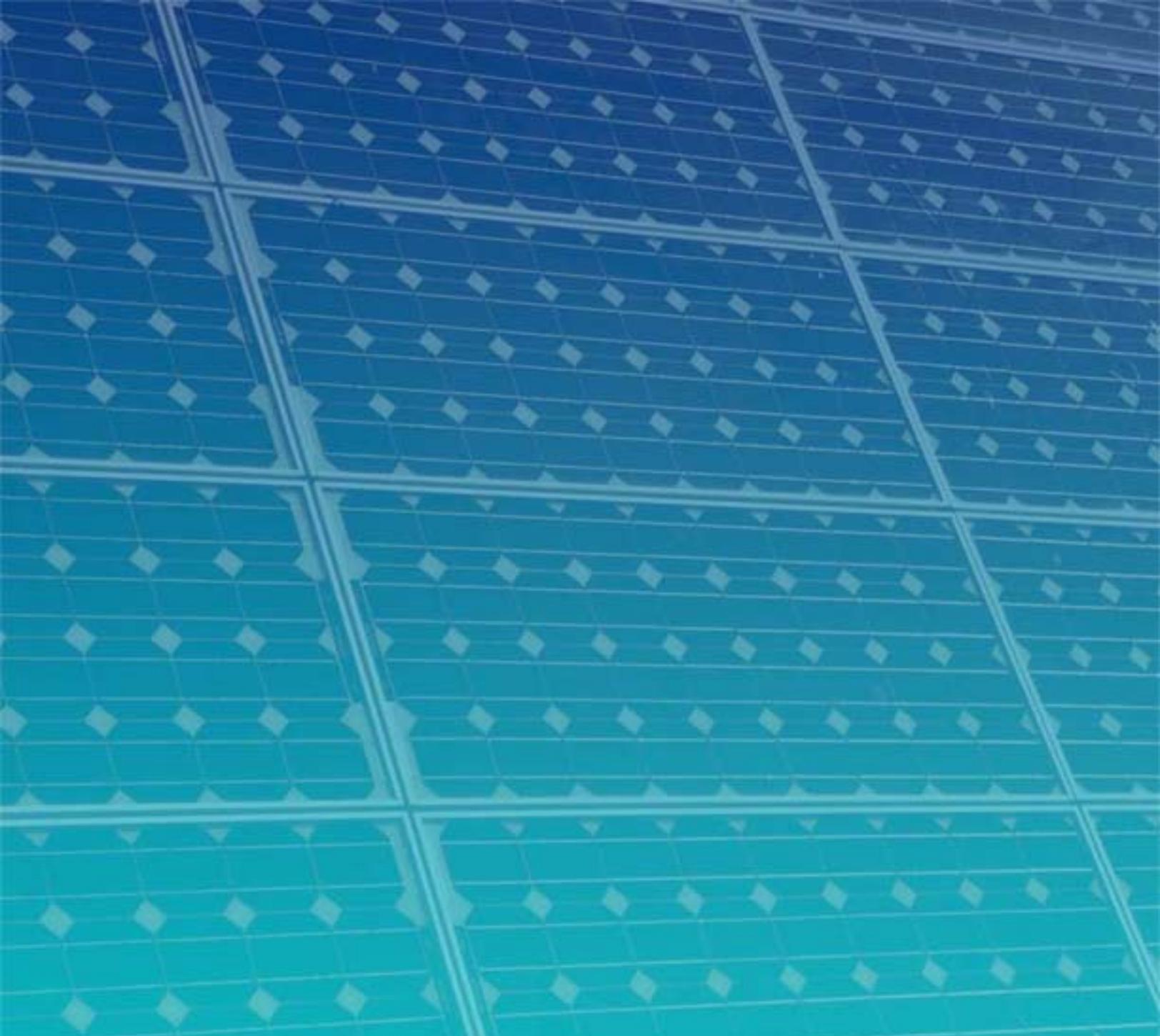
Implementation of the Alternative Energy Portfolio Standards Act of 2004, Docket No. L-00060180, PUC public meeting July 20, 2006

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 Sept. 15, 2006

Implementation of the Alternative Energy Portfolio Standards Act of 2004, Docket No. M-00051865, PUC public meeting Nov. 30, 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 Dec. 21, 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, Petition for Reconsideration of Viking Energy of Northumberland, Docket No. P-00052149, PUC public meeting May 30, 2007



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