Increasing Requirements for the Alternative Energy Portfolio Standard (AEPS) (Act 213 of 2004)

Summary:
While Pennsylvania was one of the first states to have an alternative energy portfolio standard, it has since been passed by other states which now have more robust requirements for the purchase of renewable and/or alternative energy credits. This work plan analyzes the estimated GHG reductions and associated cost impacts of increasing the Tier I requirements.

Background Discussion:
The AEPS currently requires that all electricity consumed within PA by 2021 be comprised of at least 0.5% solar photovoltaic (PV) technology, 7.5% from other renewable (Tier I) sources, and 10% from other alternative energy (Tier II) sources. The AEPS matures in 2021, after which no further increase in renewable and/or alternative generation is required, but the standards from 2021 remain in effect. The PUC and DEP have shared roles in administering the AEPS. Tables 1 and 2 show the annual compliance periods through 2020, and the relative compliance targets that must be met for the AEPS and an AEPS proposal that increases Tier I percentage requirements to 10.5% by May 31, 2020.

Table 1: Current AEPS Implementation Schedule Through May 31, 2020

Period	Tier I Percentage Requirements			Projected Annual AEC Requirement		GHG Reductions (MMtCO2e)
	Total	Solar PV	Non-Solar	Solar PV	Tier I Non-Solar	
June 1, 2012 – May 31, 2013	4.00%	0.0510%	3.95%	75,519	5,847,560	5.68
June 1, 2013 – May 31, 2014	4.50%	0.0840%	4.42%	125,485	6,596,914	6.24
June 1, 2014 – May 31, 2015	5.00%	0.1440%	4.86%	217,277	7,327,053	6.83
June 1, 2015 – May 31, 2016	5.50%	0.2500%	5.25%	380,391	7,988,203	7.94
June 1, 2016 – May 31, 2017	6.00%	0.2933%	5.71%	451,056	8,776,131	8.55
June 1, 2017 – May 31, 2018	6.50%	0.3400%	6.16%	529,255	9,588,852	9.19
June 1, 2018 – May 31, 2019	7.00%	0.3900%	6.61%	614,344	10,412,339	9.85
June 1, 2019 – May 31, 2020	7.50%	0.4433%	7.06%	709,580	11,295,488	10.56

Table 2: Increased AEPS Implementation Schedule Through May 31, 2020

Period	Tier I Percentage Requirements			Projected Annual AEC Requirement		GHG Reductions (MMtCO2e)
	Total	Solar PV	Non-Solar	Solar PV	Tier I Non-Solar	
June 1, 2012 – May 31, 2013	4.00%	0.0510%	3.95%	75,519	5,847,560	5.68
June 1, 2013 – May 31, 2014	4.50%	0.1959%	4.30%	292,648	6,429,750	6.24
June 1, 2014 – May 31, 2015	5.00%	0.3408%	4.66%	514,222	7,030,109	6.83
June 1, 2015 – May 31, 2016	5.50%	0.4857%	5.01%	739,023	7,629,571	7.94
June 1, 2016 – May 31, 2017	6.00%	0.3606%	5.64%	554,554	8,672,632	8.55
June 1, 2017 – May 31, 2018	7.50%	0.7755%	6.72%	1,207,168	10,467,571	10.27
June 1, 2018 – May 31, 2019	9.00%	0.9204%	8.08%	1,449,851	12,727,313	12.02
June 1, 2019 – May 31, 2020	10.50%	1.0653%	9.43%	1,705,200	15,101,895	13.88

Projected GHG Reduction:

Annual GHG reductions, expressed in million metric tons of carbon dioxide equivalents (MMtCO2e) are shown in the far right of Table 2. Because no increases to Tier II requirements are envisioned there are no incremental GHG reductions estimated from this tier.

Hydroelectric—Uprates or upgrades to hydroelectric power generation can come from adding incremental (new) generation at existing plants or simply by improving efficiency; for example, of turbine design or electrical generators. With the enactment of the AEPS, such improvements are being seriously considered by generating companies. Therefore, it is important to note that if these improvements are made or incremental generation is brought on line, the resultant emission reductions that might accrue will be accounted for under Tier I of the AEPS, provided that these hydroelectric plants obtain certification from the Low Impact Hydro Institute (LIHI), as required under the AEPS. Such is the example with PPL's Holtwood Hydro generating station and its soon to be operational 125 MW capacity addition. Any improvements or incremental generation from a hydroelectric plant that does not or cannot obtain LIHI certification will earn Tier II credits under the AEPS, but the emission reductions would not count against our total reductions from the AEPS.

Upgrading older hydropower generating systems is common practice in North America. Through rehabilitation, hydroelectric producers are increasing capacity and efficiency at existing facilities that are several decades old. Rewinding a generator or replacing a turbine runner can result in performance that not only equals, but also surpasses, the capabilities of the equipment when it was new. Rehabilitating existing plants is often a more economical way of adding capacity, when compared to building new facilities.

Work Plan Costs and GHG Reductions:

Table 3 reflects the net costs, cost-effectiveness and GHG reductions for this increased AEPS initiative as compared to the existing AEPS program. The increased AEPS initiative is estimated to yield reductions of 13.9 and 71.4 $MMtCO_2e$, respectively, in 2020 and cumulatively through 2020 with an associated cost-effectiveness of $36 and $15 per ton of CO2e reduced during these time periods.

Table 3: Net GHG Reductions, Costs and Cost-effectiveness in 2020 and Cumulatively Through 2020

Annual Results (2020)			Cumulative Results (2013-2020)		
GHG Reductions ($MMtCO_2e$)	**Costs (Million $)**	**Cost-Effectiveness ($/tCO2e)**	**GHG Reductions ($MMtCO_2e$)**	**Costs (NPV, Million $)**	**Cost-Effectiveness ($/tCO2e)**
3.3	$266	$80	6.6	$447	$68

Note: The difference between the 2020 cost-effectiveness (column 3) and the cumulative cost-effectiveness (column 6) is due, in part, to the effects of discounting the net cash flows over the analysis period of 2013–2020.

The AEPS is a part of the policies helping to shape Pennsylvania's economy through goods and services related to renewable and alternative energy production and its financial impact is not fully captured in the basic analysis provided in this work plan. According to data from the American Wind Energy Association,[1] in 2011, Pennsylvania's wind energy industry supported 3,000-4,000 direct and indirect jobs. In 2011, there were at least 15 facilities manufacturing components for the wind energy industry. Annual property tax payments made by wind project owners was approximately $1.4 million and annual land lease payments exceeded $2.3 million.

[1] Pennsylvania Wind Energy Factsheets, December 2011 and August 2012

In 2011, Pennsylvania's solar industry supported over 4,700 well-paying jobs averaging $65,000 per year. This ranked Pennsylvania fourth in the nation, down from second place in 2010, with respect to the number of solar jobs.[2] In 2011, approximately 47 percent of solar jobs were in the installation sector, 25 percent in sales, 12 percent in manufacturing, 10 percent in research and development and 6 percent in the other category.[3] According to DEP, the PA Sunshine program has provided approximately $101,694,170 in incentives for the installation of 94.5 MW of solar PV capacity to date. This financial incentive leveraged more than $524,856,583 in private capital, most of which supported Pennsylvania companies engaged in the installation of these systems. Also, in 2011, the Commonwealth Financing Authority (CFA) announced financing totaling nearly $29 million to several projects and project types that are estimated to generate more than 600,000 MWh of electricity per year from qualifying AEPS resources. For these projects the CFA was able to leverage nearly $311 million in private investment; $10.76 in private investment for every $1 in public funding. Project types included biogas, wind, solar PV, combined heat and power and one fuel cell project.

Quantification Approach and Assumptions:

The sole costs included in this analysis are represented by the annual weighted average prices for Alternative Energy Credits (AECs) for Tier I and for the solar PV share that is a specific subset of Tier I, as reported in the annual AEPS compliance reports. One credit represents one MWh of generation from an AEPS certified resource. The weighted average credit price falls far below the actual costs of generation from new alternative energy sources. Because of this fact and the approach that simply considers the compliance costs for the AEPS, it would be inappropriate to consider the otherwise avoided cost of generation from the fossil fuel mix. Several studies indicate that the effect of price suppression would provide an economic benefit by lowering the cost of energy resources that supply power to the electric grid. Price suppression would occur as energy sources bid to supply power to the grid and because renewable energy sources such wind and solar have no fuel costs they effectively supply their energy at $0 per megawatt hour thus forcing downward the total price of electric power supplying the grid. This effect may or may not be being realized but it does not appear to be having a distinguishable impact on electricity rates in PA or within the PJM service territory and is not factored into the costs or cost-effectiveness of this analysis.

GHG emissions reductions are based on a weighted average rate of 0.69 metric tons per MWh which assumes maintaining the current 50/50 split among coal and natural gas as the thermal resources that could be expected to be displaced. As previously mentioned, Tier II costs and any associated GHG reductions are not included in this analysis.

From 2007 through 2012 the average value of a non-solar Tier I AEC is $4.38 with a range of between $3.65 and an estimated high value in 2012 of $5.53. This average value of $4.38 was used in estimating the Tier I-non solar costs for AEPS through 2020. Solar AEC costs are far more difficult to estimate into the future given the extent of price volatility that has largely resulted from an over-supply of photovoltaic capacity, resulting in a precipitous drop in credit values, in advance of the scheduled ramp up. Solar credit values for the 2012 Energy Year were$180.39, down from a high of $325 in 2010 but are expected to be very near $25 to $30 in the years 2013 through 2015 until the over-supply issue begins to rectified itself; however, this may take longer than estimated in this analysis. In the 2015 – 2016 time period of the compliance schedule there exists a significant step increase in the amount of required solar credits that must be acquired by the electric distribution companies. During and after this period solar credit values are forecasted to rebound to a high of $200 in 2019 and $250 in 2020. Table 3 shows the reported and estimated AEC values for solar PV and the non-solar portion of Tier I.

[2] The Solar Foundation."2011 National Solar Census", October 2011
[3] 2011 National Solar Census,

Table 3. AEPS Weighted Average Credit Values, Actual and Estimated (2012)

	2007	2008	2009	2010	2011	2012	Average
Tier One (Non-PV)	$3.90	$4.48	$3.65	$4.77	$3.94	$5.53	$4.38
Solar PV	$229.62	$230.00	$260.19	$325.00	$247.82	$180.39	$245.50

Implementation Steps:
This initiative would require substantial legislative and gubernatorial support.

Potential Overlap:
AEPS