Alternative Energy Portfolio Standard (AEPS) (Act 213 of 2004)

Summary: Identifies GHG reductions associated with the existing AEPS Tier I requirement at 8%.

Existing Measure: The AEPS 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. Table 1 shows the annual compliance periods, through 2020, and the relative compliance targets that must be met.

Table 1: AEPS Implementation Schedule

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 ~~4.09~~
June 1, 2013 – May 31, 2014	4.50%	0.0840%	4.42%	125,485	6,596,914	6.24 ~~4.64~~
June 1, 2014 – May 31, 2015	5.00%	0.1440%	4.86%	217,277	7,327,053	6.83 ~~5.21~~
June 1, 2015 – May 31, 2016	5.50%	0.2500%	5.25%	380,391	7,988,203	7.94 ~~5.78~~
June 1, 2016 – May 31, 2017	6.00%	0.2933%	5.71%	451,056	8,776,131	8.55 ~~6.37~~
June 1, 2017 – May 31, 2018	6.50%	0.3400%	6.16%	529,255	9,588,852	9.19 ~~6.99~~
June 1, 2018 – May 31, 2019	7.00%	0.3900%	6.61%	614,344	10,412,339	9.85 ~~7.62~~
June 1, 2019 – May 31, 2020	7.50%	0.4433%	7.06%	709,580	11,295,488	10.56 ~~8.29~~

Projected GHG Reduction:
Annual GHG reductions, expressed in million metric tons of carbon dioxide equivalents (MMtCO2e) are shown in the far right of Table 1. Tier II resources are not expected to appreciably attribute any incremental GHG reductions because most of these qualifying AEPS resources are pre-existing and therefore part of the background/baseline.

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 2: 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)
8.3	$ 23~~462~~	$ ~~322~~	~~49.0~~64.84	$ ~~785~~684	$ 10~~6~~

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.

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 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 in 2012 are estimated at about $~~190~~180, down from a high of $325 in 2010 but are expected to be very near $25 to $30 in the years 2013 through ~~and~~ 2015~~4~~ until the over-supply issue begins to ~~is~~ 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 $~~300~~ 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.

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	$~~191.28~~ 180.39	$245.50~~247.32~~

Implementation Steps:
This is an existing initiative already being implemented.

Potential Overlap:
None