Act 129 of 2008 Phases I, II & III

Summary: This work plan identifies the carbon emission benefits associated with the megawatt-hour (MWh) reductions of electricity consumption described in Act 129 of 2008 and the ensuing implementation orders from the PA Public Utility Commission (PUC). Note, however, that the imposition of requirements of Act 129 is not inclusive of the modest consumption from electric distribution companies (EDCs) with fewer than 100,000 customers, municipalities that are service providers and the customers of rural electric cooperatives.

Background:

Phase I of Act 129 requires electricity reductions through May 31, 2013. Phase II begins at the point in time where Phase I ends and runs through May 31, 2016. Phase III has not been acted upon or yet decided by the PUC but it is expected that sufficient reduction opportunities exist for continuation of reductions through 2020. As such, a proposed Phase III schedule is included in this work plan analysis.

Following are the electricity reduction requirements for Act 129 Phases I and II and proposed reductions for Phase III:

Phase I

- A reduction in total electricity consumption, by May 31, 2011, of 1% below consumption levels for the period June 1, 2009, through May 31, 2010.
- A reduction in total electricity consumption, by May 31, 2013, of 3% below consumption levels for the period June 1, 2009, through May 31, 2010.

Phase II

- A reduction in total electricity consumption from June 1, 2013 through May 31, 2016 equal to 3,313,246 MWh which, if divided equally amounts to approximately 1,104,415 MWhs per year.

Phase III

- Annual reductions equal to 0.75% of projected electricity consumption for years 2017 through 2020, totaling 4,660,966 MWhs in 2020.

Costs and Greenhouse Gas (GHG) Reductions:

Table 1 depicts the cumulative benefit of Act 129 through the two prescribed phases of implementation plus the addition of what could possibly be considered for implementation of a third phase to extend to 2020. Tables 2 and 3 respectively illustrate the anticipated benefits from Phases I and II combined and for Phase III.

Table 1. Work Plan Cost and GHG Results Summary

Annual Results (2020)			Cumulative Results (2013-2020)		
GHG Reductions ($MMtCO_2e$)	Costs (Million $)	Cost-Effectiveness ($/tCO_2e$)	GHG Reductions ($MMtCO_2e$)	Costs (NPV, Million $)	Cost-Effectiveness ($/tCO_2e$)
8.9	(1,139)	(127)	19.1	(2,033)	(106)

Notes: The cost estimates (columns 2 and 5) are incremental costs of energy-efficient measures including capital, O&M, and labor costs, above baseline measure costs. The cost estimates are calculated as the costs less avoided energy expenditures. Also, 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 net present value (NPV) of the cost savings resulting from implementation of Act 129 from 2013 through 2020 is estimated at approximately $2.0 billion. Some of this will be due to peak load reductions that result in lower wholesale energy and capacity charges, but not less energy used. Peak demand reductions are not quantified in this analysis, as discussed later in this document. There is the assumption that lower wholesale charges will be passed through to customers. Other savings will result through reducing energy consumption.

Table 2. Work Plan Cost and GHG Results Phases I & II

Annual Results (2016)			Cumulative Results (2010-2016)		
GHG Reductions ($MMtCO_2e$)	**Costs (Million $)**	**Cost-Effectiveness ($/tCO_2e$)**	**GHG Reductions ($MMtCO_2e$)**	**Costs (NPV, Million $)**	**Cost-Effectiveness ($/tCO_2e$)**
5.5	(606)	(110)	10.6	(957)	(90)

Table 3. Work Plan Cost and GHG Results Phase III

Annual Results (2020)			Cumulative Results (2017-2020)		
GHG Reductions ($MMtCO_2e$)	**Costs (Million $)**	**Cost-Effectiveness ($/tCO_2e$)**	**GHG Reductions ($MMtCO_2e$)**	**Costs (NPV, Million $)**	**Cost-Effectiveness ($/tCO_2e$)**
3.4	(532)	(155)	8.5	(1,076)	(126)

Quantification Approach and Assumptions:

- The Pennsylvania Public Utility Commission (PUC) has implementation responsibility for Act 129 and has determined the required MWh reductions for years 2011, 2013 and 2016.
- Efficiency investments installed under Act 129 are reasonably expected to have lifetimes as long as or longer than the period of analysis (2020). Efficient equipment is cost-effective to install and it is assumed that it will be replaced at the end of its life.
- A 2009 report prepared by the American Council for an Energy-Efficient Economy (ACEEE) under contract to the DEP and PUC provides the cost and energy supply data for the analysis of this work plan.[1]
- Act 129 does not specify how these reductions are to be achieved. Responses will be market-driven and are better identified in the implementation plans provided by the EDCs to the PUC. Actual savings will likely vary widely throughout the EDC territories, within the various rate classes and economic sectors and also based on socioeconomic factors for residential consumers.

[1] Source: ACEEE et al. (2009). Energy Efficiency, Demand Response, and Onsite Solar Energy Potential in Pennsylvania. http://www.aceee.org/pubs/e093.htm

- Greenhouse gas (GHG) reductions and costs from the peak demand reduction component of Act 129 are not quantified for the following reasons.
    - The costs and GHG reduction compliance pathways are deemed too uncertain for quantification. For instance, peak demand reductions could be met with peak shifting from peak periods where the marginal resource might be diesel-fired generators or natural gas turbines, to off-peak periods where the baseload resource is at least 50% coal, which has a higher carbon dioxide (CO_2) emissions intensity (metric tons per megawatt-hour [t/MWh]).
    - Other peak reductions might arise from the energy efficiency deployment obtained under the other components of Act 129. The costs of compliance equipment, such as smart meters and associated communications equipment that might also be used to meet the peak demand reduction, are also deemed too uncertain to quantify.
- The efficiency percentage targets are applied to residential, commercial, and industrial loads but this assessment does not try to identify the specific percentage of load reductions that will be met by each EDC for each of the three sectors. Instead, this assessment applies a weighted average cost ($27.61/MWh) for energy efficiency measures, which does not vary through out the period of analysis. This value is determined by the sector costs as identified in the ACEEE study. Cost savings from avoided electricity purchases was calculated based on the retail electricity rates, by sector, multiplied by the average annual rate of growth in the retail rate from 2007 through 2011. The weighted average values used in this assessment range from $114/MWh in 2013 to $150/MWh in 2020.
- Energy efficiency costs are expressed as levelized costs over the life of the energy efficiency options over the planning period. The incremental costs (typically incurred in the first year of program implementation) are spread over all future years of the life of the energy efficiency measures.
- The cost of the work plan is calculated by estimating the annual costs of energy efficiency less avoided electricity expenditures. These cash flows are then discounted at a real rate of 5%. The net present value (NPV) of cash flows is calculated beginning in 2013 through 2020.
- All prices are expressed in 2010 dollars ($2010)
- The sum of capital and fixed program costs are assumed to be part of each measure's capital cost. These include administrative, marketing, and evaluation costs of 5%.
- The cost of energy efficiency measures includes program and participant costs as is typically used in a Total Resource Cost test.
- The costs to implement Act 129 are recoverable by utilities, so customers will be funding the efficiency deployment but consumers will realize long-term cost savings. In a recent analytical assessment of the first two years of Act 129, Optimal Energy noted that every dollar spent created $8 dollars in ratepayer savings over the lifetime of those installed measures.[2]
- Electricity transmission and distribution (T&D) losses are assumed to be 6.6% over the analysis period.
- To estimate GHG emission reductions that are expected to displace conventional grid-supplied electricity (i.e., energy efficiency and conservation), a simple, straightforward approach is used. We assume that these policy recommendations would displace generation

[2] Optimal Energy, Inc., *Pennsylvania 2013 – 2018 Energy Efficiency Goals*, 2011.

from an "average thermal" mix of fuel-based electricity sources of coal and natural gas. This mix is based on 50% natural gas and 50% coal from 2013 through 2020 and reflects the latest trend in Pennsylvania shifting towards a greater percentage of natural gas and less coal. The average thermal approach is preferred over alternatives because sources without significant fuel costs would not be displaced—e.g., hydro, nuclear, or renewable energy generation. Given the generation fleet's coal and gas combustion efficiencies, this equates to a CO_2 intensity of approximately 0.69 metric tons (t)/MWh.

- This approach provides a transparent way to estimate emission reductions and to avoid double counting (by ensuring that the same MWh from a fossil fuel source are not "avoided" more than once). The approach can be considered a "first-order" approach. That is, it does not attempt to capture a number of factors, such as the distinction between peak, intermediate, and baseload generation; issues in system dispatch and control; impacts of non-dispatchable and intermittent sources, such as wind and solar; or the dynamics of regional electricity markets. These relationships are complex and could mean that policy recommendations affect generation and emissions (as well as costs) in a manner somewhat different from that estimated here. Nonetheless, this approach provides reasonable first-order approximations of emission impacts and offers the advantages of simplicity and transparency that are important for stakeholder processes.
- Note that some renewable resources, like co-firing biomass with coal or dedicated biomass gasification have substantial fuel costs. However, because these resources are negligible in the reference case electricity supply forecast, they are not able to be "backed down" in the analysis.

Implementation Steps:

Act 129 was signed into law on October 15, 2008. On January 16, 2009, the PUC established an energy efficiency and conservation program implementation order that required each EDC to develop and implement cost-effective energy efficiency and conservation plans to reduce consumption and peak load within their service territories. On August 2, 2012, The PUC issued its Phase II implementation order.

Act 129 requires the PUC to submit a 5-year plan by November 30, 2013 assessing the potential of further energy efficiency requirements that are deemed cost-effective according to a Total Resource Cost Test that also considers the annual EDC budgets for these reductions not exceeding two percent of annual revenues. The Act further stipulates that the PUC must continue this planning process every 5 years thereafter.

Subcommittee/Committee Comments:

Moving forward the PUC should consider mechanisms the following:

- Develop new strategies to deepen the energy and emissions savings that can be cost effectively achieved by Act 129, such as: on-bill financing, joint implementation of programs by multiple EDCs (to leverage administrative investments and achieve economies of scale), rate decoupling to reduce EDC disincentives in to EE&C investments, and more.
- Eliminate the 2% revenue spending cap.
- Allow for over-compliance and banking of excess credits for subsequent year compliance.