



Citizens for Pennsylvania's Future
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April 27, 2015

Rosemary Chiavetta
Secretary of the Commission
Pennsylvania Public Utility Commission
P.O. Box 3265
Harrisburg, PA 17105-3265

Re: PUC Docket No. M-2014-2424864

Dear Chairman Chiavetta:

After reviewing the Commission's recent Tentative Order, a coalition of interested stakeholders including Citizens for Pennsylvania's Future ("PennFuture"), the Clean Air Council, the Sierra Club, the Natural Resources Defense Council and the Environmental Defense Fund, (hereinafter "Joint Commentators") have provided the attached detailed comments on the suggested changes for Phase III as well as a model comprehensive portfolio.

Sincerely,

A handwritten signature in blue ink that reads "Robert C. Altenburg".

Robert Altenburg
Director, Energy Center
Citizens for Pennsylvania's Future

A handwritten signature in blue ink that reads "Logan Welde".

Logan Welde
Staff Attorney
Clean Air Council

A handwritten signature in blue ink that reads "Tom Schuster".

Tom Schuster
Sr. Campaign Representative for PA & NJ
Sierra Club

A handwritten signature in blue ink that reads "Dick Munson".

Dick Munson
Director, Midwest Clean Energy
Environmental Defense Fund



Jackson Morris
Director Eastern Energy
Natural Resources Defense Council

encl: Joint Comments submitted to PUC
Model comprehensive portfolio

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Act 129 Energy Efficiency)	
And Conservation Program)	Docket No. M-2014-2424864
Phase III)	

**COMMENTS OF ENVIRONMENTAL STAKEHOLDERS: PENNFUTURE,
SIERRA CLUB, ENVIRONMENTAL DEFENSE FUND, CLEAN AIR
COUNCIL, AND NATURAL RESOURCES DEFENSE COUNCIL**

1 Introduction

Citizens for Pennsylvania’s Future (PennFuture), Sierra Club, Environmental Defense Fund, Clean Air Council, and Natural Resources Defense Council (hereinafter “Joint Commentators”) appreciate the opportunity to submit these comments in response to the Public Utility Commission’s (Commission) Tentative Implementation Order on Phase III of the Act 129 Energy Efficiency and Conservation Program dated March 11, 2015.¹

PennFuture is a membership based non-profit advocacy organization focused on energy and environmental issues that impact Pennsylvanians. We work to create a just future where nature, communities, and the economy thrive. We enforce environmental laws and advocate for the transformation of public policy, public opinion, and the marketplace to restore and protect the environment, safeguard public health, and reduce the consequences of climate change within Pennsylvania and beyond.

Sierra Club is a non-profit environmental organization whose mission is to explore, enjoy, and protect the wild places of the Earth and to practice and promote the responsible use of the Earth’s resources and ecosystems. The Sierra Club currently has over 24,000 members in Pennsylvania, most of whom receive electricity service from one of the EDCs required to offer efficiency services under Act 129. These members have a strong interest in both the

¹Herinafter “T.O.”

success of energy efficiency programs and in protecting wild places and their ambient environment from the effects of air, water, and other pollution from electrical generation.

Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. With more than 1,000,000 members, we work to solve the most critical environmental problems facing the planet. This has drawn us to areas that span the biosphere: climate & energy, oceans, ecosystems and health. Since these topics are intertwined, our solutions take a multidisciplinary approach.

Clean Air Council is a member-supported environmental organization serving the Mid-Atlantic Region. The Council is dedicated to protecting and defending everyone's right to breathe clean air. The Council works through a broad array of related sustainability and public health initiatives, using public education, community action, government oversight, and enforcement of environmental laws.

The Natural Resources Defense Council (NRDC) is a nonprofit environmental organization with more than 1.4 million members and online activists, including nearly 54,000 in Pennsylvania. Since our founding in 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, its public health, and the environment. NRDC's top institutional priority is curbing global warming emissions and building the clean energy future—a priority that can be advanced by ramping up investments in energy efficiency via strengthened programs such as those administered under Act 129.

We continue to support Act 129 and believe that a well implemented program will protect public health and the environment while promoting economic growth and ensuring affordable electricity is available to our citizens. With that in mind, we respectfully submit the following comments:

2 Evaluation of the EE&C Program and Additional Targets

2.1 Length of Phase III

We support the Commission’s proposal of a five-year term for Phase III and believe this will result in administrative savings.

In our responses to the Commission’s Secretarial Letter² we raised the issue of pending policy changes that are outside the Commission’s control that could affect the viability and appropriateness of Phase III targets. For example, the costs and benefits associated with demand response (DR) could vary widely as a result of court challenges to FERC Order 745. Similarly, decisions on the state and federal level about Clean Power Plan requirements and state plan implementation could fundamentally change market conditions and impact Phase III plans.

While we understand the Commission’s position that they “do not believe [they] can base decisions on uncertain possibilities”³ and while we appreciate the fact that “the Commission can always reconsider its direction at a later date should the uncertainties surrounding the previous issue be resolved,”⁴ We request clarification on the Commission’s statement that “any party has the ability to petition the Commission for a reconsideration of its directives.”⁵

We are concerned that a petition for reconsideration does not provide an adequate solution to the issue as regulations require that “[p]etitions for reconsideration, rehearing, reargument, clarification, supersedeas or others *shall be filed within 15 days* after the Commission order involved is entered or otherwise becomes final,”⁶ and it is unlikely that the outstanding issues will be resolved in that time frame. We recognize that stakeholders have the ability to

²Comments—Joint Commentators at 2 (Dec. 19, 2014) *Hereinafter* “*Joint Comments*”.

³T.O. at 16.

⁴*Id.* at 17.

⁵*Id.* citing 66 Pa.C.S. § 703(g).

⁶52 Pa. Code § 5.572(c) *emphasis added*.

recommend revisions to an EDC’s proposed plan within 30 days of each annual report filing;⁷ however, this only address the issue of plan changes and not situations where the targets are not appropriate. For those reasons we reiterate our request that “the Commission should also outline a process by which stakeholders can petition for a reconsideration of the Phase III targets in the event that one or more of those underlying assumptions turns out to be false.”⁸

2.2 Peak Demand Reduction

2.2.1 Top 100 Hours Methodology

We agree with the Commission that the top 100 hours methodology should be modified.⁹ and we further agree that it is reasonable for a demand response program to call for curtailments where the peak of PJM’s day-ahead forecast is greater than 96 percent of the EDC’s summer peak demand forecast.¹⁰ We note, however, that since the proposed methodology calls for curtailments on no more than six days and each curtailment lasts four hours, this results in reductions occurring over no more than 24 hours per year. Whether or not a 24 hour program is appropriate depends on the ratio cost to benefit for different program lengths. The Commission does not cite a study supporting the choice, so it is not clear the program design is optimal.

2.2.2 Wholesale Market Issues

We agree that “customers participating in PJM’s ELRP program shall not be eligible to participate”¹¹, but we are concerned that money may be spent to encourage customers participating in the ELRP program to switch to an EDC program. This would expend funds without creating any new demand reduction. We recommend the restriction be phrased:

⁷T.O. at 93.

⁸Joint Comments at 3.

⁹T.O. at 32.

¹⁰T.O. at 37.

¹¹T.O. at 38.

“customers who have participated in PJM’s ELRP program and are eligible to continue such participation shall not be eligible to participate in a Phase III DR program.” Such a change would be consistent with the Commission’s stated intent that the “Act 129 DR program is intended to operate independent of and separate from the PJM wholesale markets.”¹²

2.2.3 Budget allocation and DR program cost effectiveness

While we disagree with the Commission’s interpretation of the definition of the Total Resource Cost (TRC) test limiting benefits considered to those of reduced capacity, energy, transmission, and distribution costs, those issues will be addressed in a separate submission.¹³ For the purpose of this docket, we note that the Act does not require DR programs to be evaluated using the TRC test. The statutory language says “the evaluation shall be consistent with a total resource cost test *or a cost-benefit analysis determined by the commission.*”¹⁴ We believe consideration of a more complete set of benefits would provide a more accurate depiction of the role of demand reduction. This includes consideration of O&M benefits such as reduced fossil fuel or water costs.

Peak coincident reductions should be considered

Commission Witmer specifically asks if the determinations proposed by the Commission are “consistent with the policy goals and statutory requirements of Act 129.”¹⁵ For the reasons listed below, we feel they are not.

The program the Commission proposes¹⁶ is a *demand response* program.¹⁷ Demand response typically refers to a specific program design where customers are encouraged to reduce consumption in response to price signals or when needed for reliability¹⁸ or to technologies

¹²T.O. at 33.

¹³See Docket No. M-2015-2568992.

¹⁴66 Pa.C.S. § 2806.1(c) *emphasis added*.

¹⁵Statement of Commissioner Witmer (March 11, 2015).

¹⁶T.O. at 37.

¹⁷See also: T.O. at 5.

¹⁸See: Energy Policy Act of 2005 (Pub.L. 109-58 § 1252(f)).

that “shift electric load from periods of higher demand to periods of lower demand.”¹⁹ While we agree that a demand response program can achieve the goals of the Act, we note that the statutory language calls for a program that creates a “reduction in demand”²⁰ and neither requires “demand response” nor implies that is the only program design permitted.

As we noted in our earlier comments, “setting a target for reducing peak demand does not necessarily imply that program effort be directed to measures or programs that specifically and/or solely reduce peak demand, such as demand response programs. Rather, we note that most EE measures are likely to result in some peak coincident demand reduction. An analysis of available EE measures should, therefore, be able to determine a base level of demand reduction that can be obtained from continued spending on efficiency.”²¹

The proposed program design calls for reductions between 17 and 166 MW on average over each hour for the called event. Since there are a maximum of six events each year, each lasting four hours, no more than 24 hours of curtailment are permitted each year. Given the projected annual program acquisition costs, that is between \$1,734 and \$2,677 per MWh.²² These costs are an order of magnitude higher than energy efficiency program acquisition costs, which average only \$184 per MWh.²³

While we understand that not all energy efficiency programs will provide reductions during the hours of peak summer demand, it is reasonable to assume that less expensive measures or even installation of distributed renewable generation like solar photovoltaic systems, may be available to achieve part or all of the required demand reduction. This is particularly true when we consider that many such measures have a multi-year life span where spending on Demand Response does not. We recommend that the Commission consider the benefits of alternative demand reduction programs such as energy efficiency and distributed generation, which may be capable of cost-effectively reducing both energy consumption and peak

¹⁹53 Pa.Code § 75.1 (xii)(B).

²⁰*See generally*: 66 Pa.C.S. § 2806.1.

²¹Joint Comments at 4.

²²T.O 36 – 38.

²³T.O. at 42.

demand.

Allocation between energy efficiency and demand reduction

The SWE evaluated four separate spending scenarios between energy efficiency and demand reduction before selecting a 90/10 split and finding that “EE programs provide a better return on investment than [demand response].”²⁴ Because of the disparity of costs between demand response and EE, and because of the disparity of available cost effective demand response between customer classes, We are concerned that the methodology selected makes no attempt to select the optimal mix of efficiency and demand reduction and, more significantly, does not guarantee that the allocation of funds under the cap for such programs will fairly reflect the distribution of sales among customer classes.

The Act requires the plans include “a variety of energy efficiency and conservation measures and will provide the measures equitably to all classes of customers.”²⁵ In this case, we do not interpret “equitable” to mean the same percentage of demand reduction must be obtained from each customer class, but instead that spending for each class should be proportional to sales and reflect the relative amounts of cost effective measures within the class.

Under the proposed system it may be true that customers only finance those measures from which they receive benefits²⁶ but there is no guarantee that, for example, relatively expensive demand reductions in the industrial sector will not consume a disproportionate amount of funds under the cap leaving less available for residential customers. In order to ensure an appropriate number and variety of measures can be provided to each class, we propose that in allocating the targets the Commission apportion each EDCs total budget by customer class based on sales and then evaluate the extent to which cost effective demand reduction exists within each customer class. The resulting target can be expressed as a program-wide target, and EDCs will retain flexibility in meeting that target, but such a system will provide

²⁴T.O. at 34.

²⁵66 Pa.C.S. § 2806.1(a)(5).

²⁶§ 2806.1 (a)(11).

added confidence that the targets do not require a non-equitable distribution of benefits.

Peak demand reduction targets

We recommend the Commission reevaluate the proposed demand reduction targets in accordance with the above comments. Once finalized, we recommend that the targets be depicted as annual targets and not annual average targets. As we noted in our Secretarial letter comments, “peak demand reductions are intended to address issues with reliability and high peak power costs that tend to occur as exceptional events. Averaging across years tends to mask such events.”²⁷

2.2.4 DR program design

In accordance with our comments above, we recommend the Commission revise the DR Program Design section to allow for other forms of demand reduction such as peak coincident reductions from energy efficiency and to ensure an equitable distribution of funding across classes. We support the proposed framework for those EDCs that propose demand response programs, but request the Commission extend that framework to allow for other demand reduction programs.

Should the Commission determine, in spite of the forgoing comments, that a particular EDC has no demand reduction target, we support the Commission’s decision that a company without a proposed demand reduction requirement must spend its entire budget on EE programs²⁸ while retaining an option to propose a voluntary DR program provided such a program is cost effective and overall EE targets are still met.²⁹ We further support the decisions that those companies with targets be required to make demand reductions in their respective territories.³⁰

²⁷Joint Comments at 4.

²⁸T.O. at 35.

²⁹T.O. at 39.

³⁰T.O. at 35.

2.3 Energy Efficiency Program

2.3.1 Reduction Targets

To be consistent with the intent of the statute, EDC targets should be set at a level that encourages the maximum lifetime potential reductions that are both cost-effective and available under the statutory spending cap as “every extra kWh of reduction is money which will remain in Pennsylvania’s electric ratepayers’ pockets.”³¹ The Act also specifically requires that these be *additional incremental reductions in consumption*.³²

If roll-over credits are expected from Phase II and are not accounted for in the Phase III targets, the effect may be that no additional incremental reductions are achieved despite the availability of cost-effective reductions under the cap. This is contrary to statutory requirements. To avoid this situation, when roll-over credits are expected from a Phase II, such credits should be accounted for during the target setting procedure as reductions available in Phase III at zero cost thereby lowering average acquisition costs for the Phase. We understand that there will be an additional year left in Phase II after the targets for Phase III are finalized. It may be reasonable to discount the value of expected roll-over credits to some degree to reflect the market uncertainties in that remaining year, but it is not reasonable to proceed as if there will be no rollover credits available.

Under the Commission’s proposed structure the consumption reduction targets are enforced at the end of a phase instead of annually using incremental targets.³³ As an alternative to interim targets, the Commission proposes to require that EDC plans are designed to achieve 15% of their target in each year.³⁴ However, these incremental targets are not subject to the enforcement provisions under 66 Pa.C.S. § 2806.1(f). This creates a scenario where EDCs can be penalized if they fail to submit a plan,³⁵ or if they fail to achieve the end-of-phase

³¹Dissenting Statement of Commissioners Gardner and Cawley (August 2, 2012).

³²66 Pa.C.S. 2806.1(c)(3).

³³T.O. at 43.

³⁴T.O. at 45.

³⁵§ 2806.1(f)(1).

targets,³⁶ but no penalty if they fail to follow the approved plan. Such a system could result in plan submission becoming a paper exercise. We request the Commission consider making interim targets enforceable.

At the April 8 stakeholder meeting, there was considerable discussion intended to clarify how progress toward targets would be counted. Staff seemed to say that the 2021 target would be 6,629,460 MWh, which represents the sum of the annual incremental savings as opposed to the annual cumulative savings (the latter accounting for measure decay). Furthermore, EDC progress toward meeting that goal would be accounted for by summing the annual incremental savings at the end of each program year. This accounting methodology was unclear in the Tentative Order, and should be clarified in the final order.

We support the Commission's requirement that any measure with a useful life that expires before the end of the phase be replaced with a measure that replenishes the savings from the expired measure.³⁷

2.3.2 Comprehensive Programs

In response to the request by Commission Witmer,³⁸ we support a more prescriptive program including a balanced portfolio of comprehensive measures over a requirement that “two comprehensive programs be included”. Comprehensiveness comes from the design of the portfolio as a whole, and is determined by how well each program integrates and complements each other, and not by simply having a set number of “comprehensive” programs. Specifically, the EDCs should be encouraged to get as many non-lighting measures as possible, compared to their current offerings, and discouraged from achieving significant savings through mail-out energy savings kits. Appendix A of these comments provides a detailed description of comprehensive programs and a model program design.

³⁶§ 2806.1(f)(2).

³⁷T.O. at 43.

³⁸Statement of Commissioner Witmer (March 11,2015).

Such a program will have a higher cost of acquisition than the Commission’s proposed program and this will result in lower annual savings, but we believe a well designed program will provide higher total lifetime savings and will focus on those measures that have the potential to transform energy efficiency markets and drive technology. Further, the more comprehensive and complicated measures are less likely to happen in the absence of program support. Thus, by moving towards a comprehensive portfolio, the PA EDCs will increase the portion of the benefits directly attributable to the EDC intervention. Increased comprehensiveness will therefore increase confidence that EDC programs are providing real benefits to Pennsylvania consumers, even in the absence of more in-depth evaluations.

2.3.3 Low-income carve out

The Act recognizes the need to provide equitable benefits to reach as many low-income houses as possible. As such, it includes a requirement that the EDCs include a number of measures “proportionate to [the low income] households’ share of the total energy usage in the service territory.”³⁹ We believe that reflecting this target as a low income carve-out is consistent with the intent of Act 129. However, since there was no discussion in the order relating the proposed increase to the low income household energy usage, we cannot form an opinion as to whether the 5.5% value proposed is proportionate as required by the statutory language. Should the Commission retain the proposed increase from 4.5% to 5.5%, we agree that the acquisition costs provided⁴⁰ suggests it is a modest increase.

We support the Commission’s efforts to shift reductions from less comprehensive measures to more whole-house measures, and find it reasonable to achieve this with a separate carve out within the low income sector. This may result in fewer kWh of savings achieved within the sector within any single year, but the longer measure lives in a well designed comprehensive program may allow more houses to be reached over the life of the program. The

³⁹66 Pa.C.S. § 2806.1(b)(1)(i)(G).

⁴⁰Data request from April 8, 2015 Stakeholders Meeting.

Commission’s proposal to limit a portion of the reductions to direct-installed low-income measures⁴¹ can be a surrogate for whole-house measures, but we suggest the Commission evaluate the program we propose for a more comprehensive design and consider requiring measures that are known to be comprehensive.

2.3.4 Government/Education/Nonprofit carve out

The plain language of the Act treats the Government/Education/Nonprofit (G/E/NP) carve out differently from the low income sector. Unlike the low income sector, the Legislature specified achieving a 10% carve-out is a duty of each EDCs⁴² We agree that the Commission has the authority to modify or terminate any part of a plan, including the G/E/NP carve-out, where it “determines that an energy efficiency or conservation measure included in the plan will not achieve the required reductions in consumption in a cost-effective manner.”⁴³

Here the Commission is proposing selecting a 3.5% energy efficiency carve-out for the Government/Education/Nonprofit (G/E/NP). It appears that this number was selected because it was the lowest potential savings calculated for any one EDC.⁴⁴ Since there is no requirement that all EDCs share the same G/E/NP carve out, we believe that individual carve-outs should be set at the potential savings for each EDC up to the mandated 10%. Investing more in the G/E/NP is another way to ensure that the benefits of Act 129 are shared more broadly, as these savings tend to benefit all taxpayers.

2.3.5 Inclusion of multi-family housing

We support the Commission’s proposal to convene a working group to address increased savings for multifamily housing. As we commented earlier we also suggest that savings from

⁴¹T.O. at 56.

⁴²§ 2806.1 (b)(1)(i)(B).

⁴³§ 2806.1(b)(2).

⁴⁴T.O. at 63.

multi-family units be tracked and reported separately to build a record that will inform any future decisions.

2.3.6 Accumulating savings in excess reductions

We support the Commission’s proposal that programs should not be allowed to “go dark” in the event that targets are reached before the end of a phase.⁴⁵ We further support limiting any carryover reductions from Phase II to be used only in Phase III.

We expect, however, that any such carryover should be at a *de minimis* level. Should the Commission’s review of EDC annual reports indicate that a significant carryover is expected, that is an indication that underlying assumptions made by the Commission in setting the targets were incorrect, or there has been a change in circumstances, and the Commission should consider revising the effected EDC’s targets.

3 Plan approval process

We recognize that allowing public hearings on request as opposed to mandatory hearings may allow for a more efficient use of resources, but the statutory language says “The commission *shall conduct a public hearing on each plan* and allow for the submission of recommendations by the Office of Consumer Advocate and the Office of Small Business Advocate and by members of the public...”⁴⁶ As such, we question if the Commission has the authority to omit public hearings.

We also have concerns with the claim that all interested parties are already adequately represented.⁴⁷ As public-interest stakeholders and membership-based organizations we represent a diverse segment of the population, but recent issues such as the potential overlap

⁴⁵T.O. at 70.

⁴⁶66 Pa.C.S. § 2806.1(e) *emphasis added*.

⁴⁷T.O. at 73.

between this plan and the federal clean power plan, may create additional interested parties. Should the Commission not require public hearings as they have proposed, we recommend additional efforts be made to engage potential stakeholders. This could include publication of the notice in a newspaper of general circulation, less formal community meetings, or other appropriate outreach.

4 Cost-benefit analysis approval process

Comments relative to the total resource cost test will be filed separately in docket M-2015-2468992.

Regarding the proposed net-to-gross adjustment, our preference is to use net verified savings for compliance with goals. We disagree with the Commission’s interpretation “that there is no requirement in Act 129 that mandates savings be determined on a net basis”⁴⁸ On the contrary, the plain-language definition of *energy efficiency and conservation measures* found in the Act implies such an adjustment. The language specifies that the measures are the “technologies, management practices or other measures employed by retail customers that reduce electricity consumption,” and are further restricted to those measures installed after the effective date of the act and with a cost of acquisition or installation “directly incurred in whole or in part by the electric distribution company.”⁴⁹ Improvements in efficiency that are obtained from sources that do not meet this definition are not energy efficiency and conservation measures under the Act and should not be considered in determining compliance.

⁴⁸T.O. at 89.

⁴⁹66 Pa.C.S. § 2806.1(m).

5 Standards to ensure measures are applied equitably

We support the Commission's decision view that "EDCs should develop plans to achieve the most energy savings per expenditure."⁵⁰ Provided that adequate consideration is given for the net savings over the life of the measures, we believe this will drive more comprehensive measures over short-term programs.

In our discussion regarding determining the relative contribution of demand reduction and energy efficiency, we raised the issue that the significant disparity in cost between those measures could create a situation where a disproportionate amount of spending was incurred in one customer class to the detriment of another class. Because the overall cap and issues of cost recovery are separate from the allocation of spending we do not agree with the Commission that "the overall limitation on cost recovery and the specific limitation tying costs to a benefited class...will ensure that offerings will not be skewed toward or away from any particular class."⁵¹

One obvious solution is a requirement that EDCs ensure a proportional distribution of spending between customer classes, but we are concerned that the added administrative costs and loss of flexibility on the part of the EDCs could divert resources from additional efficiency measures. Our position, therefore, is that the Commission should consider the proportional distribution of spending while establishing targets so as not to require disproportionate allocation of resources.

6 EDC Cost Recovery

As noted above, we support extending the program to five years because such an extension should allow for administrative efficiencies that reduce costs and allow more funds to be

⁵⁰T.O. at 92.

⁵¹emphId.

spent on program measures. These cost savings could be significant and include, as PECO cites, not only the additional “costs involved with more frequent plan filings” but also the “significant administrative burdens on EDCs” in preparing and litigating plans.⁵² We are concerned, however, with the statement the First Energy Companies filed in their comments that, while agreeing there will be increased administrative efficiencies, that “the longer term will allow for more time and attention to [among other things] the administration of the approved programs.”⁵³ We request that the Commission, in determining if costs are prudent and reasonable, ensure proposals fully account for administrative efficiencies and are not simply increasing administrative costs in proportion to the increased program time.

We strongly support the Commission proposal that the two percent limitation in the Act expresses an annual limit and not the allowed spending for the entire five-year period. We also agree that that this should be based on the EDCs “total annual revenue” and not distribution revenues.⁵⁴ Any other interpretation would be contrary to the plain language of the Act and intent stated in the preamble that “it is in the public interest to adopt energy efficiency and conservation measures.”⁵⁵ Likewise, we support the Commission proposal to fund the SWE as was done in Phase III.⁵⁶

6.0.7 Application of excess phase II budget

We disagree with the Commission’s statement that it is not “sound policy to continue spending Phase II budgets in Phase III when those monies should be refunded back to the appropriate rate classes.”⁵⁷ The SWE has reported a TRC ratio for the program potential scenario of 1.88 demonstrating that it is more beneficial to expend the money on more energy efficiency than to provide the proposed payments.⁵⁸ Not only is it more beneficial to

⁵²Comments of PECO at 3 (Dec. 16, 2014).

⁵³Comments of Met Ed, Penelec, Penn Power & West Penn Power at 3 (Dec. 19, 2014).

⁵⁴T.O. at 107.

⁵⁵Act 129 of 2008, preamble.

⁵⁶T.O. at 108.

⁵⁷T.O. at 110.

⁵⁸Energy Efficiency Potential Study for Pennsylvania, 7 (February, 2015).

spend excess budgets on efficiency measures, the process of returning excess money would incur further administrative costs with no added benefits. Since the Commission is allowing the EDCs to use savings in excess of Phase II compliance targets for Phase III compliance, the EDCs could end up doing less in Phase III than they did in Phase II and have an even higher excess budget. Such a system frustrates the purpose of the Act.

The plain language of the Act does not set the Commission-determined target as a ceiling on reductions, and the intent of the Legislature is clearly to maximize reductions under the cap. In addition to providing for incremental reductions upon review,⁵⁹ the Act establishes the duty of the EDC is to submit a plan that includes “specific proposals to implement energy efficiency and conservation measures to *achieve or exceed* the required reductions in consumption.”⁶⁰ Similarly, the Act requires the Commission to analyze “how the program and individual plans will enable each electric distribution company to achieve or exceed the requirements for reduction in consumption.”⁶¹ This is inconsistent with a policy decision to offer rebates of unused funds.

Documentation of program expenditures is an item that must be reported to the Commission annually.⁶² If this reporting indicates that excess budgets are accruing, this indicates that underlying assumptions made by the Commission in setting the targets were incorrect. Since “The Commission can always reconsider its directions at a later date,”⁶³ we ask the Commission use its authority to ensure excess budgets are minimized.

Should the Commission decide not to adjust the targets, we recognize that EDCs can revise their plans to increase spending and fund more comprehensive programs that will generate additional credits. These credits can be rolled over towards the compliance obligation of the next phase in accordance with the Commission’s order. If funds are not used within a phase, it is reasonable to require EDCs to continue spending this money on Phase II programs to

⁵⁹66 Pa.C.S. § 2806.1(c)(3).

⁶⁰66 Pa.C.S. § 2806.1(b)(1)(A) *emphasis added*.

⁶¹§(a)(4).

⁶²§ 2806.1(i)(1)(i).

⁶³T.O. at 16.

benefit customers and to balance any discrepancies in those benefits that exist after the end of a phase. However, since there would be no issue with continuity of programs that justified allowing EDCs to roll over reductions, any reductions actually achieved after the end of the phase should not be rolled over and spending should not be counted towards the annual cap of the new phase. Such a policy would be a further incentive for EDCs to maximize reductions.

**A Model Portfolio for Pennsylvania Energy Efficiency
Programs under Act 129 Phase III**

Prepared for



by



3 April 2015

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EXECUTIVE SUMMARY

This paper presents a model portfolio that can be used as a guide for how Pennsylvania's efficiency programs can evolve going forward. Note that this model is meant as a general guideline of the path forward, and not as a set of specific goals or prescriptions for future programs. Although acquisition costs are higher for this portfolio than what is being currently achieved, we believe that this is a worthwhile tradeoff for deeper and more comprehensive programs. This is especially true since the costs in the model portfolio are similar to the budgeted cost per kWh in PY 5 – the PAs were significantly under budget, so the actual costs are lower than the budgeted costs. Further, if Pennsylvania EDCs reported lifetime savings, we would likely see a much smaller difference in cost, because the model portfolio promotes a higher proportion of longer-lived measures. Finally, although this portfolio is based on analysis of actual program data and other information, it is presented for illustrative purposes. Further analyses and conversations with the EDCs are needed to develop actual spending and savings targets.

The table below summarizes the model portfolio with the Pennsylvania Program Year 5 results and the targets from the commission order. Note that "C&I" in the table refers to both the Commercial and the Industrial sector combined. As seen, there are a several differences between the portfolios:

- The cost per kWh in the model portfolio is higher than either the PY 5 results or the commission order
- As a result, the model portfolio achieves lower annual savings than the other two scenarios, given the budget constraint.
- The tradeoff for lower annual savings is a much higher portion of savings coming from more comprehensive measures. As seen, many of the existing EDCs get their savings almost entirely from lighting measures, which is not ideal for creating sustainable efficiency programs.
- For the model portfolio we present estimated lifetime energy savings. A comparable value for the PY5 portfolio or the commission order are not available. However, we do estimate the approximate lifetime savings from the current PY 05 portfolio. Note that even though the PY5 portfolio produces more annual savings, it gets lower savings on a lifetime basis. However, this is a high level estimate, and actual lifetime savings from the PY5 portfolio could vary. To reduce this uncertainty, we recommend that this important metric should be reported going forward. Reporting lifetime savings would give a more holistic view of the portfolio, and help create a portfolio that better correlates with economic benefits.
- The lifetime for some programs in the model portfolio is lower than typical, due to the requirement in Pennsylvania that no measure have a lifetime of greater than 15 years. Without this requirement, the lifetime savings would be even higher.

- The model portfolio has a much higher portion of savings coming from the commercial & industrial (C&I) sectors than the other two scenarios. Costs are typically lower for C&I, in part because a very high portion of the usage tends to be concentrated at a small number of facilities. Further, C&I customers tend to use proportionally more electricity than residential customers. According to the EIA, the C&I sector accounted for about 63% of total statewide electric use in 2013.¹ However, due to lower prices in the C&I sector, this translates into about 51% of electricity expenditures.² To the extent that Pennsylvania has regulations requiring sector equity, the distribution of savings in the model portfolio may have to be revisited. Note that an increase in savings in the residential or low income sectors would increase total acquisition costs.
- Note that, although the portfolio needs to offer more than lighting and behavioral programs, these are still very important elements of the portfolio. There is evidence, for example, that behavioral programs may actually have a longer than one year measure life, and that they increase participation in other programs. This is seen in the portfolio, where 11% of total savings is achieved through behavioral programs, more than currently achieved by some EDCs.

	Comparison	PA PY 05	Model Portfolio	Commission Order
Percent of total savings	Residential	60%	40%	59%
	Low Income	4%	3%	6%
	C&I	35%	57%	35%
\$ /annual kWh	Residential	\$ 0.12	\$ 0.27	n/a
	Low Income	\$ 0.42	\$ 0.41	n/a
	C&I	\$ 0.15	\$ 0.20	n/a
	Total	\$ 0.14	\$ 0.24	\$ 0.184
Total Annual Savings (MWh)	Residential	569,264	355,389	721,543
	Low Income	43,704	26,654	67,362
	C&I	390,132	506,429	435,863
	Total	1,003,100	888,472	1,224,768
Total Lifetime Savings (MWh)	Residential	3,761,850	2,740,321	n/a
	Low Income	453,524	257,189	n/a
	C&I	4,069,869	6,204,133	n/a
	Total	8,285,243	9,201,643	n/a

¹ http://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_use_es.pdf

² http://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_pr_es.pdf

Percent of prescriptive program from lighting (PPL)	Residential	97%	59%	36% ³
	C&I	97%	56%	40% ⁴

INTRODUCTION

For the past five years, the Pennsylvania Electric Distribution Companies (EDCs) have been running successful efficiency programs that have exceeded initial savings goals. However, as the 2% cap on spending acts as a limiting factor, the EDCs will need to decide which opportunities to pursue, and how to balance their limited set of financial resources in order to achieve the most benefit for a wide range of market segments. Further, each EDC currently offers a different set of efficiency programs, resulting in uneven access for Pennsylvania residents, potential confusion in the marketplace, likely administrative inefficiencies, and difficulty in comparing results from one utility to the next. This white paper describes some of the existing programs in Pennsylvania, and then goes on to look at the efficiency portfolios in leading jurisdictions. Finally, using the lessons from these jurisdictions, a potential portfolio for Pennsylvania is proposed. It is the hope that this portfolio will expand the energy savings and comprehensiveness achieved by the EDCs into sectors and end uses not currently seeing many savings, and provide a foundation on which to build a sustainable and successful efficiency program.

EXISTING PENNSYLVANIA PROGRAMS

The seven electric distribution companies (EDCs) in Pennsylvania currently have a fair amount of variation in program offerings. While the four EDCs owned by First Energy offer a standard set of nine programs, these vary significantly from each of the other three EDCs. This paper will take a deeper look at the First Energy and PECO programs. However, the general lessons can also be applied to the other two EDCs.

First Energy EDCs

The programs offered by the First Energy Companies (Met-Ed, Penelec, Penn Power, and West Penn Power) are as follows.

Residential Efficient Products Program

This program offers standard prescriptive incentives for new energy efficient appliances, HVAC equipment, and water heaters. It also contains an upstream lighting program and

³ From potential study, savings by end use. An additional 13.9% of savings comes from behavioral programs, some of which will come from lighting.

⁴ PA Potential Study, Figure 4-4. Commercial only, Lighting is 14.3% of Industrial savings.

consumer electronics component that incents retailers for energy efficient lighting or electronics sold directly to end users.

Residential Home Performance Program

This program contains multiple components aimed at the residential sector. First, the program has a direct-install component, where a customer will receive an initial home audit including installation of low cost measures as well as recommendations for more cost intensive measures. The PY 5 evaluations found that relatively few customers follow up with these recommendations to install attic insulation, air sealing, or HVAC replacement, and that the vast majority of savings for this component were for the low-cost measures installed during the audit.

The second program component is the home energy reports, in which electricity usage reports are mailed to residential customers. These reports have been found to result in significant savings on an aggregate basis, but with a one year measure life – you need to send the same report to each customer each year in order to maintain a steady level of savings.

In a third component to the program, energy savings kits are mailed to the customer. These kits consist of CFLs, LED night lights, a furnace whistle, a smart power strip, and, if the customer has electric hot water, faucet aerators and low-flow showerheads. For Program Year 5, the program also started providing kits to school children, in conjunction with an energy efficiency educational course with take home work to engage their parents.

Finally, the program contains a new construction component, where the EDCs provide incentives for residential new construction with lower savings than code based on REMRate modeling, or that choose to install efficient shell measures, HVAC systems, lighting, or other features. According to the PY5 evaluation report, this component consisted of a small portion of total program savings.

Residential Appliance Turn-in

In this program, residential customers are incented to recycle old, but working refrigerators and room AC units. Each participant is eligible to receive free pick up and a cash incentive for recycling up to two refrigerators or freezers and two room air conditioners.

Residential Low-Income Program

The low-income program contains multiple components. A direct install component consists of the WARM plus, WARM Extra Measures, and WARM multifamily programs. The differences between these programs are unclear, but they all provide direct install of measures such as CFLs, smart strips, furnace whistles, faucet aerators, LED nightlights, heat pump water heaters, refrigerators, programmable thermostats, and more. A “giveaway” component, gives away CFLs and other low cost measures at community events. Finally, a third program component directly mails energy savings kits to low-income customers.

C&I Small Energy Efficient Equipment Program

This program provides prescriptive and custom incentives for lighting, HVAC, motors and drives, and specialty equipment. It also contains a program providing CFLs and smart strips to

master metered multi-family programs, and an appliance recycling component similar to the Residential Appliance Turn-in Program.

C&I Small Energy Efficient Buildings Program

This program has two components. In the first component, energy conservation kits are directly delivered by mail to commercial customers. The second component incents custom whole building projects such as new construction, retro-commissioning, and building envelope improvements.

C&I Large Energy Efficient Equipment Program

This program is the same as the C&I Small Energy Efficient Equipment Program, but aimed at larger facilities.

C&I Large Energy Efficient Buildings Program

This program is the same as the C&I Small Energy Efficient Buildings Programs, but without the energy conservation kits. This program has not yet had any participants.

Government and Institutional Program

This program works specially with government and non-profits to develop projects through the other program offerings, though it is unclear if there are additional incentive dollars available. Almost all savings in PY5 were from 11 lighting participants (there were two HVAC/DHW projects with negligible savings).

First Energy Program EDC program quantitative review

The table below shows the program cost per kWh by program of the four First Energy EDCs.

Program	Met-Ed	Penelec	Penn Power	West Penn Power
Appliance Turn-In	\$ 0.24	\$ 0.25	\$ 0.21	\$ 0.19
Efficient Products	\$ 0.10	\$ 0.09	\$ 0.09	\$ 0.10
Home Performance	\$ 0.14	\$ 0.16	\$ 0.17	\$ 0.12
Low Income	\$ 0.52	\$ 0.51	\$ 0.70	\$ 1.06
Small Equipment	\$ 0.15	\$ 0.13	\$ 0.18	\$ 0.20
Small EE Buildings	\$ 0.61	\$ 0.40	\$ 0.56	\$ 0.39
Large Equipment	\$ 0.08	\$ 0.09	\$ 0.08	\$ 0.09
Large EE Buildings		\$ 2.68		
Gov't/Institutional	\$ 0.73	\$ 0.51	\$ 2.57	\$ 0.93
Total	\$ 0.14	\$ 0.16	\$ 0.16	\$ 0.14

As seen, with the exception of a couple of outliers in small programs, costs are largely consist among the four companies. Further, the cost per kWh for the overall portfolio is relatively low compared to some of the programs with higher costs, such as the Energy Efficient buildings program and the low income program. This indicates that savings are driven by the less expensive programs such as Efficient Products, Home Performance and Large Equipment. This is verified by looking at the next table, showing the percent of total savings from each program.

Program	Met-Ed	Penelec	Penn Power	West Penn Power
Appliance Turn-In	3%	4%	5%	5%
Efficient Products	27%	28%	36%	29%
Home Performance	42%	39%	36%	40%
Low Income	3%	4%	3%	1%
Small Equipment	10%	13%	10%	10%
Small EE Buildings	1%	1%	1%	1%
Large Equipment	15%	10%	10%	13%
Large EE Buildings	0%	0%	0%	0%
Gov't/Institutional	0%	0%	0%	0%
Total	100%	100%	100%	100%

The four companies are also remarkably consistent on the distribution of savings among each program. Further, about 70% of total portfolio savings come from the Efficient Products and the Home Performance Programs, with most of the rest coming from the C&I Equipment Programs. This is noteworthy because it is typically less expensive to achieve more savings from the larger customers, as these customers yield vastly more savings per visit. In Massachusetts, for example, almost 60% of total annual 2014 savings and nearly 70% of lifetime

savings came from the C&I sector, with the largest customers making up the majority of those savings. This is an odd contrast with PA, where the largest electric consumers only achieved 10-15% of total savings, and indicates a likely opportunity to achieve better penetration in this important customer segment. The model portfolio below proposes achieving a higher portion of the savings from the C&I sector. We will also recommend several methods of achieving deeper C&I savings, such as using account managers for the largest customers.

Further, the significant amount of low-cost savings achieved in the residential sector indicate that the companies are likely achieving a large portion of the total savings through retail lighting and the direct mailed energy savings kits. A deeper look at the PY5 evaluation reports shows that this is indeed likely the case. For Met-Ed, for example, upstream lighting made up 87% of savings in the efficient products program, and energy conservation kits and low-cost DI measures made up 50% of the Home Performance Program, with another 49% from behavioral changes resulting from the home energy reports. On the C&I side, 95% of the small commercial equipment program savings and 96% of the large commercial equipment program savings came from lighting projects.

PECO Portfolio

PECO Energy ran a total of 19 programs in Program Year 5. This large number of programs partly reflects more disaggregation than the FirstEnergy Companies, with separate “programs” for what are considered program components by FirstEnergy. PECO’s programs are:

Smart Appliance Recycling

This is similar to the First Energy EDCs’ Residential Appliance Turn-in Program, except that it does not seem to give rebates to room ACs – only refrigerators and freezers.

Smart Home Rebates

This program is similar to the FirstEnergy Residential Efficient Products program, with traditional prescriptive rebates for efficient appliances, HVAC equipment, consumer electronics, and fuel-switching measures, as well as upstream incentives for CFL and LED measures.

Smart House Call

This program provides a home audit and direct installation of low-cost measures, as well as follow-up recommendations for more expensive HVAC, building envelope, and water heating measures. It appears very similar to the direct install component of FirstEnergy’s Residential Home Performance Program, except with no direct mail energy kits, and significantly more penetration of non-lighting measures.

Smart Builder Rebates

This program gives rebates to contractors who build ENERGY STAR rated homes. A base rebate of \$450 per home is offered, along with \$0.1 per kWh saved over a baseline home. This program corresponds to the New Construction component of FirstEnergy’s Residential Home Performance Program.

Low-Income Energy Efficiency Program

This program is similar to FirstEnergy's low-income program, but without the direct mail of energy conservation kits. It provides free audits as well as the direct installation of low-cost measures. If more expensive equipment, such as refrigerators, need upgrades, this will also be done. However, shell/weatherization opportunities are limited as most PECO LI customers have gas heat. CFLs represent 88% of the savings from the program.

Smart Energy Saver

This program develops a school curriculum designed to teach school children about energy efficiency, and includes a take home energy conservation kit. It is similar to the education component in FirstEnergy's Residential Home Performance Program.

Smart Usage Profile

This behavioral program uses OPower to send out energy usage reports to residential customers. It is similar to the Home Energy Reports component of FirstEnergy's Home Performance Program.

Smart AC Saver

This is a demand response program, where PECO is able to cycle or shut down a customers' central AC unit on short notice during times of peak demand. This program is mostly about reducing peak demand, and has minimal energy savings.

Smart Multi-Family Solutions - Residential

This program is aimed at both residents and tenants at existing commercial, residential, governmental, institutional, and nonprofit multifamily buildings with four or more living units. The program offers prescriptive incentives to building owners for installing measures such as heat pump water heaters, efficient lighting, and HVAC equipment. A second component, aimed towards residents, offers direct install of CFLs, low-flow showerheads, and faucet aerators. FirstEnergy does not seem to have a direct counterpart to this program.

Smart Equipment Incentives – Commercial and Industrial

This program provides incentives for efficient equipment in the C&I program. In PY5, the program had 329 participants, and 82% of the total savings came from lighting projects. PECO has a stated goal in Phase II of pursuing non-lighting projects. It is similar to First Energy's small and large efficient equipment programs.

Smart Equipment Incentives – Governmental, Nonprofit, and Institutional

This is the same as the above, but for governmental and nonprofit customers. It had 101 participants in PY5, with 82% of the savings from lighting measures.

Smart Business Solutions

This program provides small non-residential customers with the direct installation of lighting, refrigeration, and water heating measures.

Smart Multi-Family Solutions - Nonresidential

This program is the same as the residential multifamily program. It seems that the difference is if the buildings pay a commercial rate they are counted in this program.

Smart Construction Incentives

The exact nature of this program is unclear based on the program description in the evaluation report. One component is a new construction program that includes some new whole building projects that used building modeling. The other component less clear, but seems like a prescriptive new construction tract.

Smart On-Site

This program provides incentives for CHP installations. Two projects were installed in 2015, for a total capacity of 7.4 MW.

Smart AC Saver- Commercial

This is an AC cycling demand response program for the commercial sector. It is similar to the Smart AC Saver program for the residential sector.

PECO Program discussion

The table below shows the cost per annual kWh saved for each of PECO's programs, as well as the amount of savings it contributed, as a percent of the total portfolio savings.

	\$/kWh	% of savings
Smart Appliance Recycling	\$ 0.14	2%
Smart Home Rebates	\$ 0.09	44%
Smart House Call	\$ 2.03	0%
Smart Builder Rebates	\$ 40.00	0%
Smart Energy Saver	\$ 0.22	1%
Smart Usage Profile	\$ 0.20	1%
Smart Multi-Family Solutions - Residential	\$ 0.42	1%
Low-Income Energy Efficiency	\$ 0.36	6%
Smart Equipment Incentives	\$ 0.25	15%
Smart Construction Incentives	\$ 0.27	2%
Smart Business Solutions	\$ 0.18	4%
Smart On-Site	\$ 0.09	22%
Smart Multi-Family Solutions - Commercial	\$ 0.30	1%
Total	\$ 0.15	100%

Looking at this table, a few things jump out:

- The cost to achieve of \$0.15 per kWh is quite cheap compared to the cost per annual kWh in other jurisdictions, and in line with the other EDCs

- The two CHP projects produced a very large amount of savings, contributing 22% to the portfolio savings.
- This CHP program was very inexpensive, contributing significantly to the low overall portfolio costs
- Excluding CHP, the commercial sector only achieved 28% of total portfolio savings. This is in line with the FirstEnergy EDCs, but low compared to other jurisdictions.
- Savings from the Smart Usage Profile for PECO are much lower than they are for the FirstEnergy EDCs, where they were about 50% of the savings from the Home Performance Program, which in turn was 40% of the total portfolio savings. This equates to about 20% of total portfolio savings from Home Energy Reports for First Energy, compared to 1% for PECO. This is most likely a function of lower participation rates for PECO.
- PECO seems to have one a somewhat better job pursuing non-lighting projects than the FirstEnergy EDCs.

ELEMENTS OF A COMPREHENSIVE PORTFOLIO

This section examines the essential elements of a good efficiency portfolio, as informed through an investigation of portfolios of leading jurisdictions in Rhode Island, Massachusetts, California, and Vermont.

Good Balance Between Sectors

A well constructed portfolio has programs targeting opportunities in all market sectors, and specifically pursues important but hard-to-reach market segments such as low-income households and small businesses. The table below shows annual savings sector as a percent of total portfolio savings in California, Massachusetts, Vermont, and Rhode Island. The California distribution is shown both with and without the significant contribution from codes and standards.⁵

	MA	RI	VT	PGE	PGE no codes and standards
Residential and Low-income	43%	37%	41%	20%	31%
Commercial and Industrial	57%	63%	59%	44%	69%
Codes and Standards				36%	

⁵ PG&E monthly report, January 2015. Savings from agriculture are included under industrial. Savings from separate lighting program are distributed between C&I and res.

As seen, most jurisdictions are getting around 40% of savings from the Residential sector and 60% from the Commercial sector. PG&E gets a slightly higher portion of its savings from C&I, though this is mainly do to significant agricultural savings. This table shows annual savings – if you look at lifetime numbers, the savings skew even more toward commercial, due to a large amount of short lived residential behavioral savings, as well as a preponderance of lighting fixture replacements in C&I compared to screw-in bulbs in residential.

Pennsylvania gets a significantly larger portion of its savings from residential programs. The table below shows savings by sector by state. As seen, Pennsylvania gets about 65% of its savings from residential (including low income), and the other 35% from C&I. This is inconsistent with the savings distribution from many other utilities, as well as the distribution of electric sales in PA, which consist of about 63% C&I and 37% residential. This skew suggests there is likely opportunity in Pennsylvania for higher savings in the commercial and industrial sector. However, as mentioned earlier, due to lower costs in the C&I sector, the percentage of utility revenue coming from residential versus C&I is roughly even. State specific requirements for sector equity may limit the

	Res	Low Income	C&I
Duquesne Light	45%	11%	43%
Met-Ed	72%	3%	25%
Penelec	71%	4%	25%
Penn Power	76%	3%	20%
West Penn Power	74%	1%	24%
PECO	51%	6%	43%
PPL	55%	1%	43%
Statewide	60%	4%	35%

Greater Focus on Lifetime Savings

It is important for energy efficiency programs to go beyond the simple and low cost measures such as lighting and behavioral measures. When the very attractive measures are cherry picked and done on their own, it may create lost opportunities where the more complex measures are less likely to be implemented. By contrast, if a program takes a holistic approach at energy savings for a customer, the less expensive measures help make the whole project look more financially attractive. Further, many times the more complex and expensive measures have a longer measure life than the low cost measures. This means that even though they look expensive on a \$/annual kWh, they will look much more attractive on a \$/lifetime kWh basis.

Residential behavioral programs provide a good illustration of this effect as noted in the table. Notice that on an annual basis, the behavioral program at \$0.07/kwh looks like the cheapest program in Massachusetts’s 2014 portfolio. However, on a lifetime basis, it becomes more expensive than any other non low-income program with the exception of Home Energy Services, although this is explained in part because the program supports significant oil savings. Note that, although Massachusetts and most other states use a one year measure life for

behavioral programs, there is recent evaluation data that indicates that savings may actually persist for multiple years, which would make behavior programs more cost effective when compared on a lifetime basis. For example, a 2014 report by Cadmus finds annual savings decay after the behavioral program is stopped of 20%⁶. This means savings from behavioral programs are likely to have a multiple year measure life, however it also means that the incremental annual savings from multiple years of behavioral programs will decline. To address these findings, we recommend that Pennsylvania strongly consider updating the custom measure protocol for behavior programs to account for longer measure life. Further, there is some good evidence that participation in behavioral programs raises general awareness of efficiency and thus increases participation in other programs with longer measure lives.

Despite the above caveats, this illustrates at the importance of considering lifetime savings in addition to annual savings – the lifetime savings tend to give a more complete picture of the benefits of the portfolio, and an emphasis on lifetime savings encourages more complex measures to be implemented.

	\$/annual kWh	\$/lifetime kWh	Implied Measure Life
Total	\$0.36	\$0.04	9
Residential	\$0.36	\$0.05	7
Residential Consumer Products	\$0.57	\$0.07	8
Residential Cooling & Heating			
Equipment	\$0.96	\$0.07	14
Residential Lighting	\$0.15	\$0.02	8
Residential Behavior/Feedback	\$0.08	\$0.08	1
Residential Home Energy			
Services	\$1.06	\$0.12	9
Residential Multi-Family			
Retrofit	\$0.87	\$0.08	11
Residential New Construction	\$0.64	\$0.06	11
Low-Income	\$1.29	\$0.13	10
Low-Income Multi-Family			
Retrofit	\$1.03	\$0.10	10
Low-Income New Construction	\$1.99	\$0.19	10
Low-Income Single Family			
Retrofit	\$1.79	\$0.19	9
Commercial & Industrial	\$0.31	\$0.03	10
C&I New Construction	\$0.22	\$0.02	11
C&I Direct Install	\$0.73	\$0.06	12
C&I Retrofit	\$0.29	\$0.02	15

⁶ Khawaja, M. Sami and Stewart, James. *Long Run Savings and Cost-Effectiveness of Home Energy Report Programs*. Winter 2014/2015.

Variety of End-Uses

Newer efficiency programs typically get the vast majority of their savings from lighting measures. As they mature, programs tend to expand more into other end uses, in order to ensure sustainably high levels of savings and to avoid creating lost opportunities. The table below shows the portion of savings attributable to lighting in Vermont, California, and NStar⁷ (Massachusetts).

	Vermont	California ⁸	NStar (MA)
% lighting	61%	43%	56%

This 40% - 60% range is about what can be expected from established highly performed programs. Some other jurisdictions see a much higher percentage of projects from lighting. Met Ed, for example, got 71% of annual savings from lighting, with another 21% from residential behavioral programs. This leaves only 8% for larger more in-depth projects.

Combined Heat and Power

Combined Heat and Power (CHP) is an on-site installation electric generator whose waste heat can be used to satisfy thermal load. Because these units integrate the production of electric and thermal energy, they are significantly more efficient than producing each separately. CHP systems are most effective in industrial or large commercial applications with a year round thermal load to take maximum advantage of the waste heat produced by the CHP system. Many top performing utilities have significant contribution from CHP systems – 10% of NStar MA’s 2013 savings, for example, came from CHP. Some Pennsylvania EDCs already have thriving CHP programs – PECO achieved 22% of total program savings from CHP - and there is opportunity to carry this success to the other EDCs in the state.

Codes and Standards

Recently, more energy efficiency program administrators have begun including a codes and standards programs as part of their portfolio. As discussed earlier, Pacific Gas and Electric achieved 36% of its 2013-2014 savings from its codes and standards program, and RI is planning on ramping up a program to achieve 6% of the commercial goal and 2% of the residential goal. Getting codes and standards savings at the level of California requires that the state actively pursue state standards and codes upgrades. Rhode Island’s savings are much lower than those in CA, because it is focusing its programs around increasing code compliance.

There are three main ways in which codes and standards programs can capture savings. These are:

⁷ Now part of Eversource

⁸ Not including Codes and Standards

- Provide training and funding for code compliance officials and builders to improve the rates of code compliance in the jurisdiction
- Work with local governments to adopt stretch codes that are more stringent than the statewide energy code
- Work with code setting and/or appliance standards entities to directly influence appliance standards and/or building codes.

It is probably easiest for new programs to focus on improving code compliance, as it possible to show that utility efforts have had a direct impact on compliance rates via studies. For example, a baseline study in Rhode Island found that commercial buildings completed in 2008-2011 were only 70% compliant with existing code. In other words, the buildings were using 30% more energy than they would if they fully complied with state code. Increasing code compliance thus offers significant opportunity for increased energy savings, and Rhode Island is implementing four strategies to do so:

- **Trainings:** Rhode Island will develop a curriculum of on-site, classroom, and web-based trainings for appropriate third party vendors. Separate raining sessions will target the building envelope, HVAC, and electrical sections of the code, as well as code compliance software.
- **Technical Assistance.** Rhode Island will hire energy code and efficient design consultants, known as circuit riders, to act as an intermediary between design/builders and energy code officials. The circuit riders will clarify any misunderstandings or confusion that market actors may have about existing energy code, and support their efforts to build code compliant buildings.
- **Support for Third Party Inspections:** Rhode Island law allows for voluntary third-party inspections of the building energy code for residential and commercial new construction. As part of this provision, the Rhode Island program administrator will develop trainings for technical and administrative topics for any vendor who wants to become a third-party
- **Documentation Tools:** Rhode Island will develop a consistent set of documentation tools such as builder manuals, software tools, checklists, and code check protocols. This set of tools will reduce the significant confusion in the construction industry regarding the acceptable level and formatting of documentation is support of code compliance.

The Rhode Island program started slowly in 2013, with the program getting 0.7% of the commercial savings and 0.2% of the 2013 residential goal. However, they are planning to continue ramping up program efforts until reaching a target of 90% compliance by 2016. At this time, 40% of the savings from the increase in compliance will be attributed to the program. This equates to about 6% of the commercial goal and 2% of the residential goal.

Small Business Direct Install

Small businesses face particularly strong market barriers preventing investment in energy efficiency. In the face of these barriers, efficiency programs have found that, in order to secure significant participation, it is necessary to give higher incentives and minimize the time commitment needed from small business owners or employees. To this end, small business direct install programs have become popular. These programs provide up to 75% of the full installed cost of the direct installation of lighting, hot water, and other relatively easy to install measures. The program also covers the initial cost of the audit at the commercial facility.

Although some Pennsylvania EDCs, such as PECO, already offer a small business direct install program, it is not consistently offered throughout the state. We believe that it would be highly beneficial for Pennsylvania small businesses served by every EDC to have access so a small business direct install program.

MODEL PORTFOLIO

Portfolio

A good portfolio reaches all customer segments with comprehensive programs that encourage customers to go beyond the simplest measures. The next two tables below show a model ideal portfolio for Pennsylvania, drawn from the experiences described above in Massachusetts, Vermont, Rhode Island, California, and other jurisdictions with nation leading efficiency portfolios. There are a few important things to note in the tables:

- The cost per annual kWh of the portfolio is \$0.24. This is higher than the statewide cost per kWh achieved in Phase II PY 5 of \$0.14 and the acquisition cost in the commission order of \$0.184. This is a result of the proposed portfolio containing a more balanced mix of measures and higher contribution from the commercial sector, with less cherry picking of low cost measures, and higher lifetime savings. However, it is important that, if Pennsylvania were to adopt the proposed portfolio below, significant effort be taken to diversify beyond lighting and behavioral efforts.
- Note that, although the portfolio needs to offer more than lighting and behavioral programs, these are still very important elements of the portfolio. There is evidence, for example, that behavioral programs may actually have a longer than one year measure life, and that they increase participation in other programs. This is seen in the portfolio, where 11% of total savings is achieved through behavioral programs, more than currently achieved by some EDCs.
- The cost per kWh is based on actual Pennsylvania performance, rather than the potential study. This is so we can ensure that the EDCs can realistically achieve the savings with the desired mix of programs. A cost of \$0.24 per kWh can realistically be achieved with well-designed comprehensive programs that do not resort to cherry picking or to measures with high likely net-to-gross ratios.

- In addition to energy savings, the portfolio produces a peak demand reduction of 160 MW. This reduction is higher than what would be produced by equivalent energy savings from Pennsylvania's current portfolio, since HVAC measures have a greater portion of energy use occur during peak hours.
- The total annual portfolio cost to the EDCs is approximately \$210 million, compared with the average annual cost of the proposed Phase III program of approximately \$225 million. This is mainly due to the DR carveout assumed in the analysis for the model portfolio.
- The portfolio assumes \$500,000 will be spent on codes and standards, with no associated savings in the first year. This is because it takes multiple years for codes and standards efforts to begin yielding savings. Further, there are issues on how to attribute savings to the utility and screen for cost effectiveness before savings can be estimated. This model will have to be accepted by the regulators before moving forwards. However, if the EDCs and the necessary stakeholders commit to a codes and standards program, significant low cost savings can be expected in future years.
- The cost per kWh of behavioral programs is \$0.07. This is taken from other states that have more wider participation than Pennsylvania. In Pennsylvania, the current programs are more highly targeted at higher energy usage, and so achieve a cost closer to \$0.04/kWh.
- None of the programs relies on mail-in energy savings kits with CFLs and aerators, especially in the commercial sector. Pennsylvania programs should start to move away from mail-in CFLs as a means of generating savings.

DRAFT STRAWMAN PORTFOLIO FOR ACT 129 PHASE III

	Spending (thousand \$)	Annual Savings (MWh)	Lifetime Savings (MWh)	Peak Reduction n (MW)	\$/annual kWh	\$/lifetime me kWh	Annual % Savings	Lifetime % savings
Residential New Construction	11,044	8,885	126,929	3	1.24	0.09	1%	1%
Residential Home Energy Services	50,029	53,308	644,975	7	0.94	0.08	6%	7%
Residential Behavioral	7,262	97,732	97,732	12	0.07	0.07	11%	1%
Residential Lighting (includes upstream)	10,674	115,501	1,071,866	15	0.09	0.01	13%	12%
Residential HVAC	6,399	26,654	363,906	5	0.24	0.02	3%	4%
Residential Products (non-lighting or HVAC)	10,665	53,308	434,913	9	0.20	0.02	6%	5%
Total Residential	96,072	355,389	2,740,321	52	0.27	0.04	40%	30%
Low-income	10,938	26,654	257,189	4	0.41	0.04	3%	3%
Commercial New Construction - Lighting	15,566	79,963	861,269	14	0.19	0.02	9%	9%
Commercial New Construction - Non Lighting	15,506	62,193	848,191	16	0.25	0.02	7%	9%
Commercial Large Retrofit - Lighting	27,563	115,501	1,431,378	20	0.24	0.02	13%	16%
Commercial Large Retrofit - Non Lighting	29,318	142,156	1,675,927	36	0.21	0.02	16%	18%
Commercial Direct install	11,585	62,193	741,672	11	0.19	0.02	7%	8%
Commercial CHP	3,896	44,424	645,696	7	0.09	0.01	5%	7%
Total C&I	103,433	506,429	6,204,133	104	0.20	0.02	57%	67%
Total without Codes	210,443	888,472	9,201,643	160	0.24	0.02	100%	100%
Codes and Standards	500							
TOTAL	210,943	888,472	9,201,643	160	0.24	0.02	100%	100%

Comparison with Current Portfolio

The table below compares some key metrics of the model portfolio with the statewide PY 5 programs and the goals set forth in the recent commission order. There are a few important things to note in the comparison:

- The PY5 portfolio and the Commission order both have about 60% of savings coming from the residential sector and 40% coming from the C&I sector. The model portfolio reverses this ratios, with 40% coming from residential and 60% from C&I. We believe that this split better reflects the long term savings opportunity and sales distribution of Pennsylvania customers.
- For the model portfolio we present estimated lifetime energy savings. A comparable value for the PY5 portfolio or the commission order are not available. However, we do estimate the approximate lifetime savings from the current PY 05 portfolio. Note that even though the PY5 portfolio produces more annual savings, it gets lower savings on a lifetime basis. However, this is a high level estimate, and actual lifetime savings from the PY5 portfolio could vary. To reduce this uncertainty, we recommend that this important metric should be reported going forward. Reporting lifetime savings would give a more holistic view of the portfolio, and help create a portfolio that better correlates with economic benefits.
- The lifetime for some programs in the model portfolio is lower than typical, due to the requirement in Pennsylvania that no measure have a lifetime of greater than 15 years. Without this requirement, the lifetime savings would be even higher.
- The last row of the table looks at the percent of total prescriptive residential and C&I program savings coming from lighting. The data in the table reflect PPL's PY5 programs (rather than statewide values), they are fairly representative for overall EDC performance. Note that there is a significant decrease in the percent of savings coming from lighting in the model portfolio – from 97% to under 60%.
- The cost per annual kWh is higher in the model portfolio than it is in either the PY5 results or the commission order. We believe that this is a reasonable trade-off in exchange for better programs that reach more customers with a much wider variety of efficiency measures. Further, due to a longer average measure life in the model portfolio, this difference will be strongly diminished if looked at on a \$/lifetime kWh basis.

	Comparison	PA PY 05	Model Portfolio	Commission Order
Percent of total savings	Residential	60%	40%	59%
	Low Income	4%	3%	6%
	C&I	35%	57%	35%
\$/annual kWh	Residential	\$ 0.12	\$ 0.27	n/a
	Low Income	\$ 0.42	\$ 0.41	n/a
	C&I	\$ 0.15	\$ 0.20	n/a
	Total	\$ 0.14	\$ 0.24	\$ 0.184
Total Annual Savings (MWh)	Residential	569,264	355,389	721,543
	Low Income	43,704	26,654	67,362
	C&I	390,132	506,429	435,863
	Total	1,003,100	888,472	1,224,768
Total Lifetime Savings (MWh)	Residential	3,761,850	2,740,321	n/a
	Low Income	453,524	257,189	n/a
	C&I	4,069,869	6,204,133	n/a
	Total	8,285,243	9,201,643	n/a
Percent of prescriptive program from lighting (PPL)	Residential	97%	59%	36%
	C&I	97%	56%	40%

Model Portfolio Program Descriptions

Residential New Construction

The Residential New Construction (RNC) Program aims to encourage new buildings to exceed the applicable state energy code. A well designed RNC program will provide both prescriptive pathways, which offer deemed incentives for a package of pre-defined measures covering a variety of end uses, and a performance pathway, which requires that the home achieve energy savings versus code. Ideally, the incentive structure is set up so there is more money available the higher the improvement over code. Also, the program should require that builders install ENERGY STAR rated LEDs in all hard wired sockets. As seen in the proposed portfolio, the RNC program has a significantly higher cost per annual kWh than the portfolio as a whole. This is acceptable because an efficiently built home will continue to generate savings for many years into the future, and significant lost opportunities are created when a home is not

constructed efficiently. Significant non-electric fuel savings from envelope, HVAC and DHW measures and non-energy benefits are created due to the efficient construction.

Residential Home Energy Services

The Home Energy Services (HES) Program provides home audits that give the home owner general knowledge about efficiency, identify energy savings opportunities and directly install CFLs and LEDs, aerators, low-flow showerheads, and programmable thermostats. The savings from these direct install measures, on average, should offset the expected cost of the visit. The auditor may schedule follow up visits for air sealing, insulation, HVAC maintenance/replacement, or other needed efficiency measures or, potentially, offer air and duct sealing during the initial visit. Due to the comprehensive nature of the program, as well as the fact that some of the money is spent on measures largely impacting heating fuel savings, costs are also higher for this program than for the overall portfolio. This is acceptable, as long as significant effort is made to go beyond the low-cost measures and achieve significant penetration in envelope and HVAC measures.

Residential Behavioral Program

Residential Behavioral Programs can take many specific forms, but typically involve sending homes a regular monthly energy report, either hard copy or via email, with information on their energy usage, a comparison with the neighbor's usage, and ideas for reducing the energy usage. Evaluation reports have shown that these reports lead to a small per home reduction in energy usage which, when spread across many homes, causes a significant reduction in energy usage. However, the program has a short measure life, and so looks much more expensive on a lifetime basis than on an annual basis. That said, there is evidence that behavioral programs play an important role in driving participation in other programs.

Residential Lighting

This program provides incentives for residential lighting products. Ideally, it will achieve significant market penetration through upstream incentives, but also provide for an online catalog channel, and more traditional mail-in rebates, but primarily for those retailers unable to participate in an upstream program. Due to changes in the lighting baseline caused by EISA, and the resulting uncertainty in the marketplace, residential lighting programs face challenges in the near future. Early indications show that halogen incandescents are gaining significant traction in the market as a replacement for traditional incandescents, and so there are still large opportunities for standard CFLs. Nevertheless, the residential lighting program should begin to shift away from promoting standard CFLs and towards LEDs in the coming years. LED performance characteristics exceed those of CFLs in nearly all categories including, but not limited to, lifetime, efficacy, run-up time, cold temperature performance, and dimming. On a \$/lifetime kWh basis specialty LEDs are already as cost efficient as specialty CFLs.

Residential HVAC

The residential HVAC program gives prescriptive rebates for energy efficient HVAC and DHW equipment, as well as for quality installation verification (QIV). Some jurisdictions have begun offering an upstream program for HVAC and DHW, which has seen some success in achieving much higher market penetration than traditional prescriptive incentives. Home

energy management systems are another possible addition to this program, as the technology continues to rapidly advance. Ideally, a residential HVAC program will also give incentives for services related to the proper functioning of HVAC equipment. These services may include quality installation verification (QIV), duct sealing, and equipment downsizing. In conjunction with this, the program will need to provide QIV training, to ensure that there are sufficient qualified contractors in the area.

Residential Products

This program provides rebates for products not included in the lighting or HVAC programs, such as advanced power strips, consumer electronics, refrigerators, and room air conditioners. It also contains an appliance recycling component similar to what is already being offered in Pennsylvania. Although incentives are typically structured as downstream mail-in or point of purchase rebates, leading jurisdictions have begun experimenting with mid- and upstream models. Further, many ENERGY STAR appliances and electronics already have significant market share. The program administrator should stay aware of the market share of the rebated products, and, if necessary, increase the minimum performance required for a rebate to a ENERGY STAR's Most Efficient specification, or a higher CEE tier.

Low-Income

The low-income program is similar to the home energy services program, except that all measures are installed at no cost to the customer. Because this program pays the full cost installed cost on a comprehensive set of measures, and because low-income customers are typically harder to reach, low income programs typically have the highest program costs per kWh of any in the portfolio, and often do not pass the standard cost-effectiveness tests unless co-implemented with other fuel providers or if non-energy benefits are included in the cost-effectiveness tests, WAP providers and/or non-resource benefits are included in the cost-effectiveness calculation. This is typically deemed acceptable, as low-income programs also achieve widely accepted non-energy benefits.

Commercial New Construction

This program has two main components. First, there is an upstream lighting component for commercial lighting. This is similar in structure to the residential upstream lighting program, but focuses on commercial lighting fixtures, such as linear fixtures, troffers, downlights, and high bays. The second component provides technical assistance and prescriptive or custom incentives for efficient new construction and major renovation. It is highly encouraged for the program administrator to achieve non-lighting savings in this program. For this reason, lighting and non-lighting savings are shown separately above. Note that some Pennsylvania EDCs have separate programs for institutional and industrial customers. In this portfolio, both would fall under the “commercial” umbrella.

Large Commercial Retrofit

This program provides technical assistance and financial incentives to existing large commercial and industrial customers to reduce the energy use in their facilities. This program will ideally include specialized technical assistance by commercial and industrial sector, especially for key market segments such as wastewater treatment facilities, hospitals, and

important industrial segments. Further, successful programs typically employ account managers who foster long-term one on one relationships with the largest energy users in their jurisdiction. These account managers get to know the key customer's budget cycle, investment criteria, and key barriers, and work with each customer to structure projects and incentives that make sense for both parties. Other jurisdictions have seen significant success with account managers, and it is typical that these relationships generate projects with significant savings year after year.

Small Direct Install

The Small Direct Install (SBDI) program was described above, and includes a free audit alongside incentives for the direct installation of easy-to install measures. Higher incentive portions and a hard to reach customer segment mean that the cost per kWh tends to be higher than other C&I programs. However, it is still an important way to ensure that small business customers share in the benefits of energy efficiency. As noted earlier, some but not all Pennsylvania EDCs already offer a similar program.

Combined Heat and Power

This program is also discussed earlier. Projects are often very large, and one or two CHP projects can contribute to a significant portion of savings in a portfolio. As a result, savings from CHP tend to be lumpy from year to year, depending on when large projects happen to finish. The numbers in the table above represent a reasonable average target for CHP installations.

CONCLUSION

This portfolio contains programs and program components designed to go beyond lighting and easy to install measures in order to achieve deeper savings in a variety of market segments. As a result, the cost per kWh is somewhat higher than the current programs in Pennsylvania, and the portfolio will achieve lower annual savings. However, we believe that this is an acceptable tradeoff in order to ensure that comprehensiveness is achieved, all market segments are reached, and lost opportunities are avoided. Further, creating consistent programs across the EDCs will reduce confusion in the market place when one contractor has to work with multiple EDCs, facilitate communication across EDCs, and increase the reporting transparency. We believe that the portfolio above, or a similar portfolio, will help Pennsylvania forge a leading role in efficiency, and establish a sustainable regime that continues to create significant benefits for Pennsylvania residents.