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|  | **PENNSYLVANIA**  **PUBLIC UTILITY COMMISSION**  Harrisburg, PA. 17105-3265 |  |

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|  | Public Meeting held February 24, 2011 |
| Commissioners Present: |  |

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| James H. Cawley, Chairman | | |  |
| Tyrone J. Christy, Vice Chairman, Dissenting  John F. Coleman, Jr. | | |  |
| Wayne E. Gardner | | |  |
| Robert F. Powelson | | |  |
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| Implementation of the Alternative Energy Portfolio  Standards Act of 2004: Standards for the Participation  of Demand Side Management Resources – Technical  Reference Manual 2011 Update | Docket No. M‑00051865 |

**TRM ANNUAL UPDATE ORDER**

**BY THE COMMISSION:**

As explained in our prior Orders at this docket, in implementing the Alternative Energy Portfolio Standards Act (“AEPS Act”), as amended,[[1]](#footnote-1) this Commission had adopted an *Energy‑Efficiency and DSM Rules for Pennsylvania’s Alternative Energy Portfolio Standard, Technical Reference Manual* (“TRM”).[[2]](#footnote-2) In adopting the original version of the TRM, this Commission directed the Bureau of Conservation, Economics and Energy Planning (“CEEP”) to oversee the implementation, maintenance and periodic updating of the TRM.[[3]](#footnote-3) Additionally, in the Act 129 *Energy Efficiency and Conservation Program Implementation Order*,[[4]](#footnote-4) this Commission adopted the TRM as a component of the Energy Efficiency and Conservation (“EE&C”) Program evaluation process. In that *Implementation Order*, this Commission also noted that “as the TRM was initially created to fulfill requirements of the AEPS Act, it will need to be updated and expanded to fulfill the requirements of the EE&C provisions of Act 129.”[[5]](#footnote-5) Soon after the adoption of the EE&C Program *Implementation Order*, Commission staff initiated a collaborative process to review and update the TRM with the purpose of supporting both the AEPS Act and the Act 129 EE&C program that culminated in the adoption of the 2009 version of the TRM at the May 28, 2009 Public Meeting.[[6]](#footnote-6) In adopting the 2009 version of the TRM, the Commission recognized the importance of updating the TRM on an annual basis.[[7]](#footnote-7) The Commission again updated the TRM in 2010 with its adoption of the 2010 version on June 3, 2010.[[8]](#footnote-8) With this Order, the Commission completes the annual update of the TRM for 2011, to be applied beginning with the 2011‑2012 AEPS Act and Act 129 EE&C program compliance years.

**BACKGROUND**

Act 129 of 2008, P.L. 1592, specifically directed this Commission to establish an evaluation process that monitors and verifies data collection, quality assurance and the results of each electric distribution company’s (“EDC”) EE&C plan and the EE&C program as a whole.[[9]](#footnote-9) To assist in meeting this obligation, the Commission contracted with GDS Associates, Inc. in August 2009 to perform these duties as the Act 129 Statewide Evaluator (“SWE”). As part of its duties, the SWE is to review the TRM and the Total Resource Cost Test Manual (“TRC”) and to provide suggestions for possible revisions and additions to these manuals. A Technical Working Group (“TWG”)[[10]](#footnote-10) was formed to provide guidance to the SWE in clarifying savings measurement protocols and plans by recommending improvements to the existing TRM and other aspects of the EE&C program.

The SWE, in collaboration with the TWG and Commission staff, reviewed the 2010 version of the TRM and proposed several changes and additions that were released for comment with the Commission’s adoption of a Tentative Order on November 19, 2010.[[11]](#footnote-11) The *Pennsylvania Bulletin* published a Notice of the Tentative Order on December 4, 2010. Comments were due on December 27, 2010, with reply comments due January 6, 2011.

The following parties filed comments to the proposed TRM update: Citizen Power (“Citizen”); Duquesne Light Co. (“Duquesne”); The Energy Association of Pennsylvania (“EAPA”); Metropolitan Edison Co., Pennsylvania Electric Co., and Pennsylvania Power Co. (collectively “FirstEnergy”); the Office of Consumer Advocate (“OCA”); PECO Energy Co. (“PECO”); PPL Electric Utilities Corp. (“PPL”); and West Penn Power Co. d/b/a Allegheny Power (“Allegheny Power”). The following parties filed reply comments: Citizen and PECO.

**DISCUSSION**

The changes and improvements to the TRM are based on more recent research and data, as well as the needs and experiences of the EDCs. The EDCs provided, through the SWE evaluation and verification process, much of the data that forms the basis of the changes and improvements being adopted in the 2011 version of the TRM. Specifically, the current changes were the result of SWE site inspections, Conservation Service Provider (“CSP”) comments, independent evaluations and EDC proposals for new EE&C measures. The adopted changes focus on protocols for additional residential, and commercial and industrial (“C&I”) EE&C measures and clarify when the TRM is to be used and applied. The Commission believes that these adopted changes will make the TRM a more effective and professional tool for validating energy savings and providing support for the Act 129 goals. The major goals of the adopted changes are as follows:

* To add additional measures that were not in the 2010 TRM to cover additional EE&C measures being implemented by the EDCs and to broaden the scope of the TRM;
* To appropriately balance the integrity and accuracy of claimed energy savings estimates with costs incurred to measure and verify the claimed energy savings;
* To clarify existing calculation methods;
* To minimize the number of EE&C measures that must be evaluated through custom protocols;
* To improve the functionality and scope of the TRM Appendix C (Lighting Inventory Tool) and Appendix D (Motor and Variable Frequency Drive Inventory Tool); and
* To provide additional reasonable methods for measurement and verification of incremental energy savings associated with EE&C measures without unduly burdening EDC EE&C program and evaluation staff.

Below, we will discuss in more detail the more significant TRM changes and updates that are being adopted. Minor administrative changes will not be discussed.

1. **Additional Residential EE&C Measure Protocols**

The Commission understands that the expansion of the residential section of the TRM is essential for the accurate, timely and cost-effective measurement and verification of the EDCs’ EE&C programs. This update to the TRM includes the addition of 18 new residential EE&C measure protocols, many of which are measures that constitute a large portion of the EDCs’ reported energy and demand savings. The EDCs’ independent evaluators, in collaboration with the SWE, produced, reviewed and edited these new residential EE&C measure protocols. The following new residential EE&C measures and associated protocols are being adopted in the 2011 TRM update:

* Ceiling/Attic and Wall Insulation;
* Electric Clothes Dryer with Moisture Sensor;
* Ductless Mini-Split Heat Pumps;
* Efficient Electric Water Heaters;
* Electroluminescent Nightlights;
* LED Nightlights;
* ENERGY STAR Televisions;
* Furnace Whistles;
* Heat Pump Water Heaters;
* Home Audit Conservation Kits;
* Low Flow Faucet Aerators;
* Low Flow Showerheads;
* Programmable Setback Thermostats;
* Room Air Conditioner Retirement;
* Smart-Strip Plug Outlets;
* Solar Water Heaters;
* Water Heater Pipe Insulation; and
* Whole House Fans.

Of the eighteen new residential measures proposed in the Tentative Order, comments were received on seven. Duquesne commented that it agreed with adding new residential and C&I energy efficiency measures, noting that they were appropriate, as with the clarifications contained in the 2011 TRM. (Duquesne Comments at 6.) PECO and PPL also commented on several of the new residential measures, providing edits and suggested substantive changes to some of the new measures. The comments for the low flow faucet aerators, room air conditioner retirement, water heater pipe insulation and whole house fan protocols were editorial and we have accepted these changes and the TRM has been updated accordingly.

1. **Ceiling, Attic and Wall Insulation**

This measure applies to the installation or retrofit of new or additional insulation in a ceiling, attic, or walls of existing residential homes with a primary electric heating and/or cooling source. The installation must achieve a finished ceiling or attic insulation rating of R-38 or higher, and the wall insulation must be an R-6 or greater rating.

* 1. **Comments**

PPL proposed to change three default values found in Table 2-33: Default values for algorithm terms. The proposed changes would reduce the default values of the Seasonal Energy Efficiency Ratio of existing home central air conditioners (“SEERCAC”) and the Seasonal Energy Efficiency Ratio of existing home air source heat pumps (“SEERASHP”) from 13 to 10 and would reduce the default value of the Heating Seasonal Performance Factor for existing home heat pumps (“HSPFASHP”) from 7.7 to 6.8. PPL asserted that the changes will result in Table 2-33 conforming to the baselines used for residential programmable thermostats. (PPL Comments at 23.)

* 1. **Disposition**

The Commission agrees with PPL to the extent that PPL’s proposed changes to Table 2-33 relate to early replacement measures. Specifically, the default baseline values for SEERCAC and SEERASHP are changed from 13 to 10 for early replacement measures only. The default baseline values for SEERCAC and SEERASHP shall remain at 13 for replace on burnout measures. The latest U.S. Department of Energy (“DOE”) energy efficiency standards, effective in 2006, require that the minimum baseline efficiency for this equipment be 13. The Commission notes that this approach is consistent with the deemed baseline values for SEERCAC and SEERASHP for early replacement and replace on burnout measures listed in the *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs*.[[12]](#footnote-12)

The default baseline value for HSPFASHP is changed from 7.7 to 6.8 for early replacement measures only. The default baseline values for HSPFASHP shall be 7.7 for replace on burnout measures. This allows for the deemed baseline values for HSPFASHP for early replacement and replace on burnout measures to be consistent with the International Energy Conservation Code 2009 (“IECC 2009”).[[13]](#footnote-13)

1. **Ductless Mini-Split Heat Pumps**

ENERGY STAR ductless mini-split heat pumps utilize high efficiency energy performance factors including a SEER of 14.5 or higher, an Energy Efficiency Ratio (“EER”) of 12 or higher and an HSPF of 8.2 or higher. This technology typically converts an electric resistance heat home into an efficient single or multi-zonal ductless heat pump system. Homeowners choose whether to install an ENERGY STAR qualified model or a standard efficiency model.

* 1. **Comments**

PPL proposed edits to the ductless mini-split heat pump protocol, including revised equations and updated values for a number of parameters (*e*.*g*., Equivalent Full Load Hours for secondary heating or cooling systems). (PPL Comments Appendix 2.) PECO noted that it had discussed the errors in the ductless mini-split heat pump measure protocols with other EDCs and they were in agreement with the PPL proposal as modified by PECO. (PECO Comments Appendix at 4.)

* 1. **Disposition**

The Commission adopts the changes proposed by PECO and PPL and has revised TRM accordingly.

1. **Home Audit Conservation Kits**

Home Audit Conservation Kits are energy conservation kits consisting of four compact fluorescent light bulbs (“CFLs”), four faucet aerators, two smart power strips and two light-emitting diode (“LED”) night lights. Kits are sent to participants in home energy audit programs.

* 1. **Comments**

PPL commented that the in-service rate for CFLs provided to residential customers who have received a home audit conservation kit is inconsistent with the in‑service rate for residential CFLs in the ENERGY STAR lighting protocol. (PPL Comments at 21.) The home audit conservation kit measure currently has the in-service rate value for CFLs listed as “variable” and the source listed as “EDC Gathering Data.” The ENERGY STAR lighting protocol lists the in-service rate value as 84 percent and the source for this value is the Nexus Market Research, *Impact Evaluation of the Massachusetts, Rhode Island and Vermont 2003 Residential Lighting Programs Final Report*.[[14]](#footnote-14) PPL proposed that the in-service rate value be 84 percent for both the home audit conservation kit and ENERGY STAR lighting measures, as using “EDC Information Gathering” is unnecessarily costly. (PPL Comments at 21.)

* 1. **Disposition**

The Commission accepts PPL’s proposal to change the in-service rate value to 84 percent for the Home Audit Conservation Kit protocol as based on the Nexus Market Research report noted above as this value reflects similar data collected by the SWE. The TRM has been updated accordingly.

**B. Additional Commercial and Industrial EE&C Measure Protocols**

Based on collaborative discussions between the SWE and the EDCs, and the available research, the following additional C&I EE&C measures and associated protocols were proposed in the Tentative Order for adoption in the 2011 TRM update:

* Anti Sweat Heater Controls;
* High Efficiency Refrigerator Freezer Cases;
* High Efficiency Evaporator Fan Motors for Reach-In Refrigerator Cases;
* High Efficiency Evaporator Fan Motors for Walk-In Refrigerator Case;
* ENERGY STAR Office Equipment;
* Commercial Smart Strip Plug Outlets;
* Beverage Machine Controls;
* High Efficiency Ice Machines; and
* Wall and Ceiling Insulation.

The Comments relating to the new C&I measures were favorable (*e*.*g*. Duquesne Comments at 6) or provided minor non-substantive changes and corrections. Therefore, the Commission adopts the nine new C&I measures and associated protocols for inclusion in the 2011TRM update.

**C. Improvements to Existing Commercial and Industrial EE&C Measure Protocols and Processes**

Significant improvements to the 2009 TRM were made in the 2010 TRM Update. As program year one[[15]](#footnote-15) (“PY1”) progressed, it became apparent that other improvements to existing TRM protocols and processes would help the EDCs attain the goals of the EE&C Program. Specifically, the proposed 2011 TRM Update clarifies code references and protocols for the C&I lighting, motors, variable frequency drives (“VFD”), and chillers. These recommended improvements to existing EE&C measure protocols and processes will improve the functionality of the TRM and enhance its scope.

* 1. **Clarification of Lighting Protocols**

The proposed expansion and improvement to the C&I Lighting protocols contained in Appendix C of the TRM are important improvements. In addition to increasing the number of standard lamp ballast combinations available, the lighting protocol now supports more building types to eliminate the need for custom metering. To increase the flexibility of Appendix C, the proposed 2011 update clarifies the process for entering new lamp ballast combinations supported by appropriate documentation. This new process allows EDCs to use new, well-documented, lamp and ballast combinations without waiting for further TRM Updates. This added flexibility is expected to improve the ability of lighting designers to use the best and newest lighting technology as part of an EDC EE&C program with reduced evaluation, measurement and verification (“EM&V”) expenditures.

The proposed 2011 TRM also expanded the available lamp and ballast combinations found in Appendix C to the TRM, which is expected to increase EDCs’ ability to achieve savings for the offered lighting programs with a corresponding reduction in EM&V costs. Additional proposed changes to the C&I lighting section of the TRM are designed to make the section easier for program implementers and evaluators to use and to reduce the amount of time spent re-entering data from electronic vendor lighting audits into the TRM Appendix C Lighting Audit and Design Tool. The proposed changes will allow EDCs to leverage vendor electronic documentation to provide verification of values calculated in the Lighting Audit and Design Tool.

* 1. **Comments**

Many of the Commenters addressed the TRM Section 3.2: Lighting Equipment Improvements and Appendix C, Lighting Audit and Design Tool. These comments included requests for modifications to tables used in the calculation of savings, to address inconsistencies and to provide clerical corrections.

Several comments centered on Table 3.2: Hours of Use for Usage Groups and Table 3.5: Lighting EFLH and CF by Building Type.[[16]](#footnote-16) PPL suggested that these tables be combined. (PPL Comments at 25.) PPL further noted that it does not support the addition of any new lighting hours of use stipulated in Table 3.2 that are less than those currently approved in the 2010 TRM. (PPL comments at 26.) Duquesne, FirstEnergy and PPL suggested that additional functional use patterns be added to Tables 3.2 or 3.5. These Commenters also suggested other additions to Table 3.2, including one, two and three shift industrial facilities categories, adding an industrial office space category and adding a refrigerated warehouse category with an appropriate interaction factor (“IF”) in Table 3.6. (Duquesne Comments at 6 and 7, FirstEnergy Comments at 15, and PPL Comments at 26.)

Allegheny Power acknowledged that the expansion and improvement of Table 3.2 is a good idea, but needed further review by the TWG. Allegheny Power suggested that a TWG review would ensure justification of the changes, as well as their applicability to Pennsylvania. (Allegheny Power Comments at 7.)

Duquesne further suggested that if lighting hours are “known” to be different from the stipulated values in Table 3.5, hours measured by usage group as shown in Table 3.2 should be allowed for projects less than 50 kW in addition to the currently accepted use of Table 3.2 for projects greater than 50 kW. (Duquesne Comments at 6.)

PECO suggested that methods requiring quantification of hours of use for projects over 50 kW in savings should not apply to *ex ante* estimates of savings but should only apply to the sample used to verify savings.[[17]](#footnote-17) (PECO Comments at Appendix page 7.) PECO also noted that baseline wattages specified for exit signs may be inappropriate. Noting that some exit signs are double sided and have two incandescent lamps as specified in the TRM, but many have only one lamp of 20 watts. The assumption of two lamps at a total of 40 watts as the baseline would overstate the savings as currently specified. In addition, the estimation of the distribution of incandescent and fluorescent lamps in baseline fixtures is not based on recent Pennsylvania data. PECO suggested that actual baseline data may be more appropriate and the TRM values should only be used as the default when more project-specific data is not available. (PECO Comments Appendix at 7.)

Many of the Commenters also provided editorial assistance and suggestions that may be considered going forward. This included noting inconsistencies between Appendix C and the TRM, noting inaccurate references, suggesting more supporting documentation and references be provided and suggesting modifications to Appendix C.

* 1. **Disposition**

The Commission carefully reviewed the comments provided and made changes to address those comments where a simple resolution was possible. The changes that were implemented included, but are not limited to, the following:

* Modification of table references and headings for consistency.
* Changes to Appendix C to address the following:
* The use of cut sheets in lieu of wattage table values when the difference is greater than 10%
* The conformity of Appendix C values to TRM Table 3.2 values
* The consistency of definitions

The Commission rejects the suggestion by PPL to combine Tables 3.2 and Tables 3.5. The structure of the TRM defines a whole building approach to quantifying hours of use in Table 3.5 for lighting projects less than 50 kW. Retaining this more simplified approach is desirable. For projects over 50 kW, the more complex “usage group method” for which Table 3.2 is designed is both more accurate and justified.

The Commission also rejects the recommendation by PECO that the TRM lighting protocols for projects over 50 kW be used only for *ex post* savings of sampled projects. This would be a substantial change in approach and would reduce the accuracy of savings measurement for the largest lighting projects where the extra expense required to determine hours of use is most justified.

The Commission accepts the recommendation by PECO to include additional configurations of exit sign lights. The TRM has been updated to incorporate single and double sided exit signs and to account for baselines which are either incandescent or fluorescent. This addition will make the TRM more accurate.

The Commission notes that many of the changes proposed by individual Commenters cannot be made without more review and consideration. Therefore, the Commission recommends that the changes proposed by Commenters that are not being adopted in this TRM update be referred to and considered by the TWG for subsequent TRM updates.

* 1. **Clarification of Commercial and Industrial Motor & VFD Protocols**

The proposed 2011 TRM made two clarifications to the motor and VFD protocols. First, based on feedback from EDCs, the proposal clarified the use of adjustment factors for duplex motor sets. This clarification provided additional guidance for installations where one of the duplex motors is not a backup machine. The second clarification involved the use of Energy Savings (“ESF”) and Demand Savings (“DSF”) Factors for the installation of VFDs. The prior ESF and DSF were developed based on constant volume systems. The proposal added language clarifying the proper application of the ESF and DSF for drives.

1. **Comments**

Although modifications to the Premium Efficiency Motors section and the VFD Improvement sections of the 2010 TRM were minimal, PECO provided several comments and clerical improvements. PECO requested that the applicability of the motor protocol be extended to New Construction. This modification is already included in Table 3-12: Building Mechanical System Variables for the 2011 TRM. PECO also asserted that the reference for New Construction baseline efficiencies would be the same as those listed in Tables 3-13 and 3-14 for PY1 and program year two (“PY2”) and program years three (“PY3”) and four (“PY4”), respectively.[[18]](#footnote-18) (PECO Comments Appendix at 8.) PECO also suggested confirmation of the baseline efficiencies, noting that Table 3-13 for PY1 and PY2 did not correspond to the current EPAct standard as originally indicated in the 2010 TRM. This reference was to the EPAct 1992 standard.[[19]](#footnote-19) (PECO Comments Appendix at 9.) PECO noted that Appendix D should reflect the modification set forth in the TRM and the efficiencies in Table 3-13 and 3-14 should be available in separate tabs for the appropriate program years. (PECO Comments Appendix at 9.) PECO also noted that modifications to Appendix D to automate functions may be possible and implied that this would improve usability. (PECO Comments Appendix at 10 and 11.)

PECO suggested clarification to the calculation and definition of load factor (“LF”); LF = Measured motor kW / (Rated motor HP x 0.746 /nameplate efficiency). In addition, PECO suggested that uniform definitions of LF be used in both the TRM and Appendix D. (PECO Comments Appendix at 10.)

For the VFD protocol, PECO recommended two improvements. First, PECO recommended that the protocol be applied to New Construction, as well as retrofit situations. Second, PECO noted that in many VFD applications, the baseline is not a constant volume system. Rather than require all these systems to use custom measure protocols, PECO recommended that an additional table or tables be developed for ESF and DSF for different baseline conditions. (PECO Comments Appendix at 9 and 10.)

**b. Disposition**

Many of the suggestions recommended by PECO were already incorporated into the proposed 2011 TRM. Other clerical improvements have been incorporated into the 2011 TRM and Appendix D. Recommended changes that are now included in the documentation include:

* New Construction applications can now use the Premium Efficiency Motor Protocol. For PY1 and PY2, the baseline motor efficiency is based on the NEMA EPAct standards. For PY3 and PY4, the baseline motor efficiency is based on the NEMA Premium motor standards.[[20]](#footnote-20)
* The footnote shown in Table 3-13, has been changed to the appropriate reference, EPAct standard efficiency.
* Appendix D has been modified to support savings calculations using the corresponding code standards for PY1 and PY2 (EPAct Efficiency Standard), and PY3 and PY4 (NEMA Premium Standard) as the baseline.
* The definition of load factor has been clarified according to PECO’s suggestion and has been made uniform in motor applications, in VFD applications and in Appendix D. This modification will improve the reasonableness and consistency of the TRM.

The Commission rejects the recommendation by PECO to allow New Construction projects incorporating VFDs to use a constant volume system as the baseline. Many new systems are routinely specified with VFDs; therefore, using a constant speed baseline is not appropriate as it would not represent what is actually being installed.

The Commission supports the expansion of the VFD protocol to include applications other than those with constant volume systems as the baseline. The Commission believes, however, that these VFD protocols require further development and review before they can be incorporated into the TRM. Therefore, we direct that that the values for ESF and DSF for these additional VFD applications be developed using similar models as those used in the development of the existing ESF and DSF values used for the constant volume baseline calculations. This work is to be undertaken by the TWG to develop such protocols for inclusion in future TRM updates.

* 1. **Clarification of the Chiller Protocols**

The 2010 TRM did not include several varieties of chillers and their energy use per ton of cooling produced. The proposed 2011 TRM added chiller categories and energy use based on the IECC 2009 standards for water cooled positive displacement chillers, reciprocating chillers, and water cooled centrifugal chillers. In addition, many of the commenting parties discussed clarification, baseline efficiencies, and other aspects of the chiller protocols as categorized below.

1. **Language Clarification, Definition of Terms, and Algorithms**
   * 1. **Comments**

PECO noted that the first sentence of the introductory paragraph of Section 3.7 states, “This protocol estimates savings for installing high efficiency electric chillers compared to standard efficiency chillers.” PECO claimed that this statement is incorrect as the baseline set by the standard is the code-minimum performance chiller of the same type. PECO suggested the first sentence be corrected to read, “This protocol estimates savings for installing high efficiency electric chillers as compared to chillers that meet the minimum performance allowed by the current PA Energy Code.” (PECO Comments Appendix at 14 and 15.) PECO also commented that the third sentence of the first paragraph of the introductory section and the second paragraph of the introductory section of Section 3.7 limit the scope of the measure relative to VFDs on chillers. PECO noted that these statements specifically remove chillers with VFDs from the applicability of Section 3.7. (PECO Comments Appendix at 16.)

PECO suggested that the last sentence of the introductory paragraph of Section 3.7 be tempered to read as follows:

The savings calculated using the prescriptive algorithms need to be supported by certification that the chiller operates above 70 percent load for a majority (50% or more) of operating hours AND the estimated load during peak periods (Path A), or below 70% load for a majority of operating hours (Path B) and estimated load during peak periods.

(PECO Comments Appendix at 15.) PECO made several additional comments with respect to Section 3.7, including comments pertaining to chiller algorithms, applicability of the chiller protocol to new construction applications, definition of terms, Table 3-25 and Table 3-26. (PECO Comments Appendix at 17-19.)

FirstEnergy commented that the label “Space Type” in Table 3-26 should be renamed “Building Type” to avoid confusion. (FirstEnergy Comments at 16.)

* + 1. **Disposition**

The Commission accepts PECO’s suggestion to modify Section 3.7. In the TRM, Section 3.7, the first sentence of the introductory paragraph has been modified according to PECO’s recommendation, thereby clarifying that the chiller protocol estimates savings between high efficiency electric chillers and chillers that meet minimum performance allowed by PA Energy Code. Additionally, to clarify which chiller applications must follow a site specific custom protocol, the last paragraph of the introductory section of Section 3.7 has been modified to read as follows:

All other chiller applications, including existing multiple chiller configurations, existing chillers with Variable Frequency Drives (VFDs), and existing chillers serving multiple load groups, and chillers in industrial applications are defined as non-standard applications and must follow a site specific custom protocol.

The second sentence of the last paragraph of the introductory section has been modified as well. Furthermore, to provide a level of assurance of proper chiller sizing in situations where chiller savings are determined using prescriptive algorithms, the last sentence of the first paragraph of the introductory section of Section 3.7 has been modified accordingly.

The Commission accepts FirstEnergy’s recommendation to rename the header of the first column in Table 3-26 to provide clarification with respect to the use of the table. The TRM has been updated accordingly.

Regarding other changes relating to algorithms, new construction, definitions of terms, and Tables 3-25 and 3-26, the Commission adopts certain clarifying modifications to Section 3.7, including:

* Changes to clarify variables and operations within the ∆kWh and ∆kW formulas;
* Additional verbiage within the integrated part load value (“IPLV”) definition to clarify that the chiller IPLV is to be in accordance with Air-Conditioning and Refrigeration Institute (“ARI”) Standards;
* Definition of the variable CF; and
* Verbiage added to the equivalent full load hour (“EFLH”) definition referencing Table 3-26 to determine the most appropriate EFLH value.

The Commission refers other clarification type comments to the TWG for discussion and possible recommendations for future TRM updates.

1. **Review of Chiller Baseline Efficiencies (IECC 2009)**
2. **Comments**

PECO commented on the need for a review for consistency and validation of the values in Table 3-25: Electric Chiller Baseline Efficiencies (IECC 2009) against IECC 2009 Table 503-2-3(7). Specifically, PECO requested that truncation of IECC values, in addition to “primarily full load” and “primarily part load” qualifying notations and corresponding footnotes, be reconsidered. (PECO Comments Appendix at 17.)

1. **Disposition**

The Commission agrees that the tables included in the TRM should be consistent with IECC 2009 values. Where appropriate, the TRM has been modified to ensure adherence to the standards.

1. **Mapping Zip Codes to Reference Cities**
2. **Comments**

PECO suggested the need to modify Table 3-26 to reflect EFLH values based on zip code mapping, which would assign each Pennsylvania zip code to a city referenced in the table. (PECO Comments Appendix at 19.)

1. **Disposition**

The Commission considered PECO’s suggestion and finds there may be some value in zip code mapping, however, time will be needed to study this issue and costs associated in developing such mapping. Since it is unclear at this time if there would be sufficient benefit to justify expending such time and costs, the Commission refers this issue to the TWG to discuss and provide recommendations.

* 1. **Clarification of HVAC Protocols**

The proposed 2011 TRM included clarification to the HVAC protocols to properly address heating and cooling savings for heat pumps. The Commission sought comments on the proposed clarifications.

1. **Comments**

Several of the Commenters noted typographical and other minor errors in the proposed 2011 TRM. Some Commenters also provided several substantive comments pertaining to specific provisions to modify the scope of the HVAC Systems protocols.

PECO commented that HVAC systems with variable speed controllers for compressors should be excluded or the protocol expanded to include treatment. PECO stated that a factor for adjustment for older buildings or buildings with high thermal mass should be added to Section 3.6.1 to account for changes in EFLH for heating and cooling. PECO stated that the algorithms section under HVAC Systems includes Room Air Conditioning (“AC”), but no baseline efficiency values are shown for Room AC in Table 3-21. (PECO Comments Appendix at 11 and 12.)

PPL suggested providing conversions from coefficient of performance (“COP”) to HSPF and EER to SEER for Ground Source Heat Pumps (“GSHP”) and Water-Source Heat Pumps (“WSHP”) under 65,000 Btuh in 3.6.1. (PPL Comments at 29.)

PECO suggested that all variables in Table 3-20, particularly coincidence factor, should be supported with additional sources. PECO noted that the use of heating and cooling time period allocation factors is not explained in Table 3-20. PECO recommended that either a sentence be added which explains how these allocation factors are used or they should be removed from the table. (PECO Comments Appendix at 12.)

PECO stated that Table 3-21: Baseline SEER and EER efficiency values should be adjusted as noted and that New Construction values should be added in the last two rows. PECO also recommended several other revisions to Table 3-21, mainly concerning IPLV requirements, deletions and added items, and a footnote. (PECO Comments Appendix at 12-14.)

PPL and FirstEnergy stated that the proposed baseline for the GSHP in Table 3-21 is inconsistent with the residential sector where the baseline is the air-source heat pump (“ASHP”). (FirstEnergy Comments at 16 and PPL Comments at 29.) PPL stated that the GSHP is not the appropriate baseline because the incentive is not designed to promote a higher efficiency GSHP, but rather to promote a GSHP instead of an ASHP. (PPL Comments at 29.)

PPL requested that the efficiency baseline changes currently included in Table 3-21 become effective June 1, 2013, so as not to adversely affect program delivery or participation. (PPL Comments at 28.) Duquesne disagreed with Table 3-21 baseline efficiencies for ASHPs and central air conditioners as the referenced IECC and American Society of Heat, Refrigerating and Air-Conditioning Engineers (“ASHRAE”) documents, and suggested that these are not applicable for retrofit projects. (Duquesne Comments at 5.)

PECO requested that a zip code mapping table be developed and included in the TRM which maps all Pennsylvania zip codes to an appropriate city as listed in Tables 3‑22 and 3-23. PECO supported its request by stating the nearest geographic location may not be most applicable. (PECO Comments Appendix at 14.) PPL requested the addition of Allentown to Tables 3-22, 3-26, and 3-56 for consistency with locations in other tables. (PPL Comments at 29.)

1. **Disposition**

Typographical and other minor errors identified by the Commenters have been incorporated into the 2011 TRM, improving the quality, clarity and consistency of the document.

Relative to the current HVAC protocol, EFLH values referenced in Tables 3-22 and 3-23, do not take into consideration the use of variable speed controllers or VFDs in either the baseline or retrofit conditions. Therefore, the language has been modified to exclude the use of VFDs, and the TRM has been updated accordingly.

The Commission rejects PECO’s request to modify savings protocols to account for thermal mass as it considers this to be too complex for inclusion in the TRM. Therefore, projects in which thermal mass in buildings is a consideration should be treated as custom projects. The amount of thermal mass present can be highly variable from building to building, and developing a factor that would approximate this effect over the entire range of possible thermal mass values would be impractical.

Regarding PECO’s comments concerning the applicability of algorithms stated in 3.6.1, the Commission believes these were not intended to include Room AC, which is typically considered a residential measure. Therefore, the Commission has removed the reference to Room AC in Section 3.6.1: Algorithms.

The Commission rejects PPL’s request to add conversion factors in Section 3.6 for SEER and EER and for HSPF and COP. SEER and HSPF measure a seasonal efficiency across the entire cooling and heating seasons, whereas EER and COP measure an instantaneous efficiency at a single operating point. Standard testing procedures to determine seasonal efficiencies and instantaneous efficiencies use differing testing conditions. Therefore, there is no exact conversion factor.[[21]](#footnote-21) Other jurisdictions have made attempts at approximations; however the appropriate conversion factors vary due to differences in seasonal weather profiles. In addition, the efficiency values for equipment with capacities less than 65,000 Btuh are typically specified in the appropriate units. Therefore, the Commission deems this to be an unproductive exercise.

Regarding PECO’s request for modifications to Table 3-20: Variables for HVAC Systems, most values and references were inherited from the original 2009 TRM. The cooling allocation factor and heating allocation factor were remnants from the old protocol and no longer apply. These factors have been deleted from the TRM. Modifications to the stipulated values and references, such as the IF, will be referred to the TWG for discussion and recommendations.

PECO recommended several modifications to Table 3-21 related to baseline SEER, EER, and IPLV Values and the addition of a measure for New Construction. All of the recommended changes are consistent with IECC 2009 HVAC code, which is the basis of Table 3-21, and the TRM has been updated accordingly.

The Commission refers PPL’s comment regarding the appropriate baseline for Ground-Source Heat Pump, Groundwater-Source Heat Pump, and Water-Source Heat Pump to the TWG. Due to differences in load profiles, levels of equipment penetration, and program design between the residential and commercial sectors, the residential baseline may not be appropriate for the commercial baseline, and, therefore, requires further review. The TWG will review the baselines and provide recommendations to the Commission for future TRM updates. The TWG will do the same for ASHPs and room air conditioners in commercial buildings.

The Commission considered PECO’s suggestion to add zip code mapping for Tables 3-22, as well as the addition of Allentown to Tables 3-22, 3-26, and 3-56, and refers this issue to the TWG for consideration and recommendations.

1. **New Codes and Standards**

The Commission sought input on how changes to federal and state standards should affect the TRM. EPAct 2005 affects lighting standards, EISA 2007 affects lighting, appliance and motor standards, and IECC 2009 affects HVAC standards.

1. **Federal Legislation and Regulations Related to Lighting**

The Illuminating Engineering Society of North America (“IESNA”) 2007 standards require that lighting in newly constructed commercial buildings and additions to commercial buildings adheres to the following[[22]](#footnote-22):

* Magnetic ballasts are to be phased out;
* Occupancy sensors are required in classrooms, conference rooms, and break rooms;
* Automatic lighting shutoff is required for all buildings larger than 5,000 square feet;
* Exterior lighting must be controlled by a time switch or photosensor
* Exit signs are limited to 5 Watts per face; and
* Hotel/motel guest room lighting must be controlled at room entry.

In addition to seeking comments on the proposed changes to the lighting protocols discussed above in Section C, Subsection 1, the Commission sought input on how the TRM should account for federal legislation and regulations that prohibit or restrict the production and sale of less efficient lighting. Specifically, provisions in EPAct 2005 established minimum ballast efficacy standards that effectively do not allow the manufacture and sale of magnetic ballasts after July 1, 2010.[[23]](#footnote-23) As such, it appears that as a result of this legislation, the baseline used in the current TRM lighting protocols will change over time, as magnetic ballasts burn out and become unavailable. Furthermore, the DOE released regulations in 2009 that, among other changes, effectively prohibit the production and sale of four-foot and eight-foot T12 lamps after July 14, 2010.[[24]](#footnote-24) These regulatory changes appear to affect the TRC Test valuation for associated lighting projects as the energy savings and their useful life are reduced each year, due to the changing lighting baseline values as such lighting becomes unavailable. The Commission requested input as to whether the TRM should account for the changing lighting baseline and if so, how it should do so.

1. **Comments**

FirstEnergy and PECO stated that any changes to the TRM resulting from federal legislation should be phased in over time as determined by discussions with the TWG. (FirstEnergy Comments at 12 and PECO Comments at 9.) PECO noted that the appropriate phase-in period and annual reductions in baseline wattage are technology and measure specific and should be established through a collaborative process with the TWG and SWE. (PECO Comments at 9.)

Allegheny Power recommended that all changes be referred to the TWG to review and propose changes to the TRM, including the timing of such changes, based on the specific technology. (Allegheny Power Comments at 4 and 5.)

Duquesne and PPL both stated that any changes should not be implemented until the next Act 129 obligation period, beginning June 1, 2013. (Duquesne Comments at 6 and PPL Comments at 27.) PPL also stated that the TWG should develop recommendations for any federal legislation changes that would become effective June 1, 2013, and that any changes post-2013 should be implemented using a phase-in method. (PPL Comments at 27.)

Regarding the lighting baseline itself, PPL stated that any changes before May 31, 2013, should affect the wattage of the replacement lighting and not that of the baseline lighting. PPL noted that baselines for lighting retrofits should continue to be based on the actual light fixture the customer is replacing during the remaining time of this 4-year EE&C planning cycle, not based on a change in lighting regulations that becomes effective during the term of the current EE&C Planning cycle. (PPL Comments at 27.)

1. **Disposition**

Due to the complex nature of incorporating new legislative measures, the Commission agrees with Allegheny Power that any baseline changes for lighting resulting from federal legislation be discussed by the TWG. The TWG will then provide recommendations, including implementation and timing strategies, to the Commission as to how future TRMs should incorporate the baseline changes.

1. **Federal Legislation and Regulations Related to Motors**

The Energy Independence and Security Act of 2007 (“EISA 2007”) was signed into law on December 19, 2007. This included an increase in standards for motor efficiencies to the current NEMA Premium standard. This increase in motor efficiency standards impacts the savings attributed to the Act 129 motors programs and TRC test ratios.

1. **Comments**

Parties did not file comments directly addressing the new motors standards independent of the above discussed new lighting standards.

1. **Disposition**

The federal standard for efficiency of new motors as of December 19, 2010, is the NEMA Premium standard. The Commission believes that replacement upon failure of a motor or replacement at end of useful life of a motor, in which a customer has to replace the motor regardless of program involvement, is typically treated in the same manner as new construction with regard to replacement measures. Code efficiency requirements should also dictate measure efficiency requirements in the case of replacement on failure of existing equipment. This requires that NEMA Premium motor minimum efficiencies be considered the baseline for new installations and for cases of motor replacement upon failure.

Due to the adoption of new standards in the middle of a program year, the Commission has amended the Motors protocol such that the baseline values for PY1 and PY2 remain the old EPAct Standard, while the baseline values for PY3 and PY4 reflect the new EISA 2007 motor baseline values, based on NEMA Premium efficiency levels.

Replacement upon failure is treated as a distinct situation from replacement with remaining useful life, in which the customer chooses to make an investment in more efficient replacement equipment when the existing equipment is still functional, often with significant program involvement. In this latter case, the baseline may be considered to be the existing equipment until at the time that the equipment would have burned out or failed anyway, at that point, the baseline becomes standard efficiency equipment.

1. **Code Updates Related to HVAC**

Pennsylvania has adopted the IECC 2009 standards. The 2011 TRM update revises references to IECC 2009 such that protocols conform to the most recently adopted standards. The Commission specifically solicited comments on how to address code changes and increased standard efficiency requirements.

1. **Comments**

The EAPA supported minor clarifications to the TRM. (EAPA Comments at 4.) The EAPA stated that it expects the TRM to change over time to incorporate current data that reflects changes in national or state energy efficiency codes. The EAPA goes on to offer that any changes require consideration of the impact on EDC EE&C plans before being adopted in the TRM. (EAPA Comments at 7.)

Duquesne commented that the TRM should not impose the referenced ASHRAE standards on retrofit projects and programs, and any changes to published minimum baseline HVAC efficiencies should differentiate between retrofit and new construction. Duquesne stated that ASHRAE 90.1-2007 is applicable to new construction and major retrofit projects subject to new construction codes and standards, and Duquesne’s portfolio does not include any new construction programs. Additionally, the revised values exceed current minimum federal standards for existing building retrofit projects and programs. (Duquesne Comments at 5.)

PECO requested that the TRM sections related to equipment performance, where there is a new minimum code, be expanded to include new construction. PECO believed that new construction projects can use the same algorithms, baseline equipment performance, operating hours and other factors that the TRM provides for retrofit projects. PECO stated that Table 3-21: Baseline SEER and EER Values should be adjusted and new construction values added. (PECO Comments at 10.)

PPL noted that C&I HVAC baseline efficiencies increased for ASHPs and central air conditioners. PPL believed this change was intended to reflect the new IECC requirements, and PPL understood that these HVAC equipment measures assume replacement upon failure, so the baseline should be dictated by the current code. PPL, however, believed that this change will result in reduced savings making program implementation more difficult. For these reasons, PPL stated that this change should not become effective until June 1, 2013. (PPL Comments at 28.)

PPL and FirstEnergy stated that the proposed baseline for the GSHP is inconsistent with the residential sector, where the baseline is the ASHP. PPL stated that the GSHP is not the appropriate baseline because the incentive is not designed to promote a higher efficiency GSHP, but rather to promote a GSHP instead of an ASHP. (FirstEnergy Comments at 16 and PPL Comments at 29.)

PECO believed that the modification and truncation of the values from IECC 2009 Table 503-2-3(7) and the addition of the qualifiers Primarily Full Load and Primarily Part Load in the Path A and Path B headers of Table 3-25 are unclear and will result in inconsistent application of the baseline values in the savings algorithms. PECO noted that this protocol also does not allow for trade-offs between peak demand impacts and annual kWh impacts. PECO further recommended that Table 3-25 be modified to be consistent with the source table from IECC 2009. (PECO Comments Appendix at 4.)

1. **Disposition**

Pennsylvania has adopted the 2009 International Energy Conservation Code (IECC) pursuant to 34 Pa. Code § 403.21 (Uniform Construction Code), effective December 31, 2009, by reference to the International Building code and the ICC electrical code. The TRM has been amended consistent with the new Pennsylvania Uniform Construction Code. The Commission believes that the Uniform Construction Code should dictate minimum efficiency levels and baseline conditions for C&I lighting, motors, and HVAC measures. IECC 2009 § 503.2.3 stipulates HVAC equipment performance requirements for commercial air conditioners, heat pumps, and chillers in new commercial buildings and additions to commercial buildings.

Consistent with Section C, Subsection 4 above, the Commission agrees with PECO’s suggestion to modify Table 3-21 to make it consistent with IECC 2009 and to include an additional measure for new construction. The Commission, however, rejects PPL’s suggestion that the baseline for GSHPs, Groundwater-Source Heat Pump and WSHPs be changed to the ASHP baseline. The Commission refers this issue to the TWG to discuss and provide recommendations as to the appropriate baseline for GSHPs, Groundwater-Source Heat Pumps and WSHPs.

The Commission believes that measures replaced upon failure or at end of useful life (*i*.*e*. a customer who has to replace the equipment regardless of program involvement) are typically treated in the same manner as new construction. Code efficiency requirements should also dictate measure efficiency requirements in the case of replacement upon failure of existing equipment. This requires that the minimum efficiency requirements listed in Section 503.2.3 of IECC 2009 be considered the baseline efficiencies for air conditioners, heat pumps, and chillers in new commercial buildings, additions to commercial buildings, and in cases of replacement upon failure of HVAC equipment. Replacement upon failure is treated as a distinct situation from replacement with remaining useful life, in which the customer chooses to make an investment in more efficient replacement equipment when the existing equipment is still functional, often with significant program involvement. In the latter case, the baseline may be considered to be the existing equipment until that point in time when the equipment would have burned out or failed anyway. Due to the complexity of the recommendations provided by the commenting parties, the Commission refers these matters to the TWG to discuss and provide recommendations for future TRM updates.

**E. Demand Reduction Figures for Time-of-use and Real-time Price Plans**

The TRM sets forth measures that include algorithms for calculating energy savings and demand savings from implementation of the measure. Inclusion of demand savings into the TRM enables the EDCs to claim these savings toward their peak demand reduction goals.

1. **Comments**

Citizen commented that the unit peak demand reduction for some measures will be less than estimated by the TRM for customers under time-of-use rates (“TOU”) or real‑time price plans. Citizen postulated that TOU customers will have a lower demand CF for some measures because they will be influenced by TOU to shift load to off-peak periods. Citizen recommended that the CF be adjusted for measures where TOU customers are able to shift to non-peak hours in order to account for alleged load shifting behavior. (Citizen Comments at 2 and 3.)

Duquesne noted that the proposed 2011 TRM excluded demand response programs that were included in the 2010 TRM. The 2010 TRM included residential demand response values for air conditioner cycling and Duquesne stated that its residential demand response program is geared towards the 2010 TRM air conditioner cycling values. Duquesne stated that there is no reason not to count the demand reduction from air conditioning programs and recommended that the load reduction value per unit air conditioner found in the 2010 TRM be retained. (Duquesne Comments at 8.)

1. **Disposition**

The Commission rejects Citizen’s recommendation to adjust the CF of measures that include customers under TOU or real-time price plans. Citizen did not provide evidence to support their claim of load shifting by TOU customers, nor did they provide documentation quantifying the effects of the alleged load shifting occurring in each EDC territory. For Citizen’s proposal to be considered further, supporting evidence with a confidence level of 90%, indicating that the load shifting occurs on a regular basis, must be provided.

The Commission rejects Duquesne’s recommendation for retaining demand response programs in the 2011 TRM. The Commission’s Secretarial Letter dated January 12, 2011, clarifies that PJM measurement and verification protocols in effect for June 2012 through May 2013 will be used for the basis of measurement and verification for Act 129 load curtailment performance.[[25]](#footnote-25) The letter further specifies that the direct load control protocols found in PJM Manual 19, Attachment B, in effect for planning year 2012-2013 and appropriately applied can be used to value Act 129 direct load control. Demand response programs that differ from PJM protocols are more appropriately addressed by use of the custom measure protocol process.[[26]](#footnote-26)

**F. CFL Hours of Operation per Day**

The Proposed 2011 TRM revised the CFL hours of operation per day value (“HOU”) from 3.0 hours to 1.9 hours based on a KEMA study. The KEMA study entitled *Results from California’s Residential Lighting Metering Study* was based on a large scale comprehensive residential lighting metering study of 1,200 randomly selected households completed in 2010.

1. **Comments**

Most of the Commenters opposed the proposed change in the HOU baseline for CFLs. (Allegheny Power Comments at 5, Duquesne Comments at 3, EAPA Comments at 9, FirstEnergy Comments at 6, PECO Comments at 3 and PPL Comments at 12.) The opposition to this change was summarized by the EAPA, wherein they objected to the validity of applying the results of the KEMA study to the Pennsylvania marketplace. The EAPA stated that the California market has a different market saturation level for CFLs, different geography affecting hours of natural light and different electricity pricing, all of which may affect the HOU. In addition, the EAPA noted that there may be a difference between California and Pennsylvania in customer behavior and environmental consciousness that may affect CFL penetration rates in each state. (EAPA Comments at 9-11.)

The EAPA and some of the other Commenters cited several studies from other Northeastern states that arrived at different HOUs that were higher than the 1.9 value proposed by the Commission. (EAPA Comments at 11 and 12, PECO Comments at 7 and 8, and PPL Comments at 15.) These studies reported average daily HOU values that ranged from 2.0 to 3.4. (EAPA Comments at 12, PECO Comments at 7 and PPL Comments at 16.) Both PECO and PPL provided HOU information based on preliminary studies recently conducted in their respective service territories that arrived at varying HOU values using different methodologies than those utilized in the KEMA study. PECO arrived at an overall estimated average daily HOU of 2.23 based on their preliminary study that relied, in part, on data reported by customers, as opposed to light metering or logging. (PECO Comments at 7 and 8.) PPL arrived at an average HOU of 3.8 based on their preliminary study that also relied on self-reporting by customers instead of light metering. (PPL Comments at 15.)

The wide range of reported HOU values from studies conducted in other Northeastern states, as well as reported HOU values from preliminary studies done by PECO and PPL, has led to suggestions that a statewide lighting study be conducted to arrive at a new HOU figure to be utilized in the future. (Duquesne Comments at 3, EAPA Comments at 13, PECO Comments at 9 and PPL Comments at 15.) The EAPA suggested that the EDCs conduct a statewide lighting study to determine the most realistic estimated CFL HOU for Pennsylvania. Alternatively, the EAPA suggested that the Commission use EDC money to perform a lighting study to determine HOU values. (EAPA Comments at 13.) PECO and PPL provided similar suggestions that Pennsylvania-specific research be conducted via a statewide lighting logger study to determine the most realistic estimated CFL HOU for Pennsylvania. (PECO Comments at 9 and PPL Comments at 17.) As an alternative, PPL noted that the Commission could coordinate a statewide study, funded by the EDCs, using the same funding and cost collection mechanisms as the Act 129 SWE contract. (PPL Comments at 17.)

FirstEnergy commented that the 3.0 HOU contained in the 2009 and 2010 TRMs is just and reasonable and should be used until empirical data specific to Pennsylvania can be obtained. (FirstEnergy Comments at 10.)

1. **Disposition**

The Commission finds that there is insufficient Pennsylvania specific data currently available and supported by sound research methodology, such as light metering/logging studies, to revise the 3.0 HOU for CFLs contained in the 2010 TRM. Therefore, the 2011 TRM retains the 3.0 HOU value. The 3.0 HOU value was based on information from the DOE ENERGY STAR Calculator as of March 16, 2009.[[27]](#footnote-27)

While the Commission believes that the 3.0 HOU value to be the best current value for this variable, the comments and data provided by the various Commenters suggests that this may not be the most accurate value to use in the future. As such, the Commission directs the TWG to discuss and develop CFL HOU study proposals to be submitted to the Commission by June 1, 2011. The study proposals should address the merits of looking at the HOU for all bulbs and sockets in residential applications, as well as the CFL market penetration in Pennsylvania. The study proposals should also address the merits of using light metering and logging methodologies and methods that arrive at results that apply to each EDC’s service territory. The estimated costs and recommended funding methods should also be included in the study proposals.

**G. Refrigerator and Freezer Retirement and Recycling**

The proposed TRM specified changes to the deemed savings value for removal of refrigerators and freezers and added a new measure to account for the situation where a refrigerator or freezer is removed and then replaced with a new, high efficiency refrigerator or freezer. The deemed savings value proposed for refrigerator/freezer removal with no replacement was reduced from 1,728 kWh to 1,659 kWh, and the deemed savings value for removal and replacement of a refrigerator or freezer (a new measure added to the TRM) was proposed as 1,205 kWh.

1. **Comments**

The EAPA, PPL, and Duquesne all disagreed with the proposed changes to the refrigerator/freezer retirement and recycling TRM protocols. These Commenters stated that, similar to the CFL HOU proposed change, consistency in baseline assumptions is necessary when EDCs are implementing their approved EE&C plans. They stated that the deemed savings per refrigerator/freezer should remain constant for the duration of approved EE&C plans in order to allow EDCs sufficient time to adjust their plans. (EAPA Comments at 13, Duquesne Comments at 3 and PPL Comments at 17.)

Additionally, the EAPA, PPL, and Duquesne disagreed with the updated savings estimate proposed for the 2011 TRM. They disagreed with the use of the ENERGY STAR calculator, asserting that it is only designed to provide end users with an idea about energy usage, to be a professional evaluation resource. [[28]](#footnote-28) (Duquesne Comments at 4, EAPA Comments at 13 and 14, and PPL Comments at 17 and 18.) Duquesne requested that the Commission reevaluate and study this change before enacting it. (Duquesne Comments at 4.)

The EAPA and PPL suggested implementing a statewide *in situ* metering study. In the alternative, the EAPA and PPL recommended basing the savings on a robust appliance consumption database, specifically the California Energy Commission’s database.[[29]](#footnote-29) (EAPA Comments at 14 and PPL Comments at 18.)

The EAPA, PPL, and Duquesne further stated that they do not support additional proposed eligibility requirements including requiring a refrigerator to be ten or more years old and to be a secondary refrigerator that will not be replaced. These companies stated that the additional requirements are impractical for implementation purposes and could be a disincentive for participation, thereby decreasing overall energy savings attributable to refrigerator recycling and retirement programs. (Duquesne Comments at 4, EAPA Comments at 15 and PPL Comments at 18-20.) PPL also commented that Section 2.29 in the draft TRM appears to duplicate Section 2.23. (PPL Comments at 20.)

In its comments, FirstEnergy requested that the TRM include a measure for the replacement of a refrigerator or freezer with a standard efficiency unit. FirstEnergy stated that this protocol would account for a savings of 1,125 kWh, as determined by the subtraction of 80 kWh (reflecting the difference between an ENERGY STAR and standard unit) from 1,205 kWh (used for the replacement of a refrigerator or freezer with an ENERGY STAR unit). (FirstEnergy Comments at 14.) This protocol, in addition to the other refrigerator/freezer protocols, would provide the EDCs the ability to claim savings for refrigerator/freezer retirement, replacement with an ENERGY STAR unit and replacement with a standard efficiency unit.

1. **Disposition**

The Commission finds that the revised deemed savings value of 1,659 kWh for residential refrigerator/freezer removal with no replacement and 1,205 kWh for residential refrigerator/freezer removal with replacement are reasonable values and should be included in the 2011 TRM. These kWh savings values, separated by age, size and type of refrigerator/freezer, were obtained from the publicly available data on the ENERGY STAR web site. The Commission has relied on values from the ENERGY STAR calculator for other adopted TRM values, such as the 3.0 HOU for residential CFLs.

In addition, the SWE calculated the weighted average kWh deemed savings value for the TRM based upon the specific size, age and type of refrigerators/freezers actually removed during PY1 in the EDCs’ programs. The SWE used data from over 18,000 units that were removed by the EDC programs during PY1. Thus, the deemed savings values calculated by the SWE for refrigerator/freezer removal are confirmed based on EDC‑specific data, assuring the validity of the value used. Furthermore, the Commission finds this change to be reasonable in that the savings value of 1,659 kWh is only 4% less than the 1,728 kWh in the 2010 TRM.

The prior TRM did not have a deemed savings value for removal of a refrigerator or freezer that is then replaced with a new, more efficient unit. In many situations, the refrigerators have been removed and replaced with a new refrigerator, however, many of the EDCs have not reduced the deemed savings value of 1,728 kWh to reflect this scenario. The Commission finds that the deemed savings value for refrigerators/freezers that are removed then replaced with new equipment must be added to accurately reflect all potential scenarios and the savings they produce. Furthermore, we find it significant that no Commenters provided alternative calculations for deemed savings values for these two measures.

For all of these reasons, the Commission adopts the deemed savings values for refrigerator/freezer removal and for refrigerator/freezer removal with replacement as provided for in the proposed 2011 TRM. The Commission also adopts the addition of Section 2.22 to the TRM in order to provide a deemed savings value for refrigerators/freezers that are removed and then replaced with new equipment as an important and necessary addition to the TRM.

The Commission, however, agrees with the Commenters that the additional refrigerator/freezer recycling reporting requirements contained in the 2011 proposal are onerous and unnecessary and have removed them from the 2011 TRM update. The Commission also agrees that Section 2.29 in the proposed 2011 TRM did duplicate Section 2.23 and has deleted Section 2.29 from the 2011 TRM update.

The Commission rejects FirstEnergy’s request to include a protocol for the replacement of a refrigerator/freezer with a standard efficiency unit. The Commission believes that including such a measure would not be in keeping with the objective of Act 129. Specifically, the language within Act 129 states that the Commission shall adopt a program “to require electric distribution companies to adopt and implement cost-effective energy efficiency and conservation plans to reduce energy demand and consumption…” See 66 P.S. §§ 2806.1(a). The replacement of a unit with a standard efficiency unit does not adequately reflect a reduction in energy demand or consumption.

The Commission would like to note that the proposed 2011 TRM contains a new refrigerator/freezer protocol for replacement with an ENERGY STAR unit. This protocol allows EDCs to claim 1,205 kWh of savings for each refrigerator/freezer removed and replaced with an ENERGY STAR model. The Commission believes that this measure is more appropriate in keeping with the mission of Act 129 in increasing energy efficiency and reducing consumption. This measure is also consistent with other TRM measures designed to incent customers to select high efficiency appliances rather than standard efficiency appliances.

**H. Low Income Baseline**

The TRM includes baselines from which to calculate savings for implemented energy efficiency measures. Baselines are typically based on previous studies or industry agreed upon data that use the average across all income groups for the specific sector, such as residential or C&I.

1. **Comments**

The OCA commented, with agreement from Citizen, that consideration should be given to develop a separate set of baseline data for the low-income residential sector. (Citizen Reply Comments at 2 and 3, and OCA Comments at 4.) The OCA Further noted that the 2011 TRM appears to have given specific attention to the low income baseline for the refrigerator/freezer recycling and replacement measure, but it is unclear if other measures incorporate deployment in low-income households. The OCA stated that consideration should be given to low income baseline data for other measures, in addition to segmentation of the low-income baseline for determining savings for low-income programs. (OCA Comments at 4.) The OCA asserted that the use of baseline data to identify deemed savings that does not sufficiently account for the needs of low-income households could create inadequate incentive levels or could lead to the rejection of certain program measures for low-income programs. The OCA noted that savings from certain measures may be quite different when the measures are deployed in low-income households than when the same measures are deployed in average households. Low‑income programs have unique challenges, and the OCA submitted that it is important to have baseline data specific to the low-income population to ensure that an appropriate level of deemed savings is included in the TRM and to avoid the possibility that low-income program measures’ savings are perceived as not being cost-effective. (OCA Comments at 5.)

1. **Disposition**

The Commission rejects the addition of low-income specific baseline data to the TRM. Adding measure baselines for the low-income sector would add an unnecessary level of complexity when programs are already being appropriately monitored and measured within measures that have already been included in the TRM. The TRM is a manual consisting of standardized measures to be widely applied. Low-income baseline measures are determined by studies of the low-income population of each EDC’s territory. Therefore, one baseline measure for low-income could not be applied statewide. Creating a low-income baseline for each EDC would not be cost-effective and would add an unmanageable level of complexity to the TRM.

**I. Technical Working Group**

The TWG is chaired by the SWE and is composed of representatives from the EDCs, Commission staff, and other interested parties. The TWG’s purpose is to encourage discussion of technical issues related to the EM&V of the EDCs’ EE&C programs. To date, priority has been given to the vetting of new measures and to addressing data tracking and reporting issues, as well as technical concerns.

1. **Comments**

Several parties commented on the work to be performed by the TWG. In many cases, the Commenters recommended that new items not previously reviewed by the TWG be addressed in this forum going forward. For example, the EAPA stated that changes to baseline data for residential CFLs and refrigerator/freezer retirement were not vetted through the TWG prior to baseline changes being introduced in the proposed 2011 TRM update. (EAPA Comments at 4.) Several other EDCs echoed the EAPA’s comments and recommended that going forward any baseline changes be vetted in the TWG before being added to future TRM updates. (Allegheny Power Comments at 2 and PECO Comments at 2.) Comments from FirstEnergy noted that changes in federal legislation affecting standards and baseline values should be discussed in the TWG as well. (FirstEnergy Comments at 12.)

1. **Disposition**

The 2011 TRM Annual Update Tentative Order contained 18 new residential, as well as nine new C&I, EE&C measures with deemed protocols that were vetted by the TWG. These items were a priority for the EDCs as the new measures were included in the EDCs’ Act 129 EE&C plans and there were no existing deemed savings values to cost-effectively address evaluation of these measures. Based on the comments, it is apparent that the EDCs wish to expand the issues considered by the TWG to include any baseline changes, whether driven by changes in federal or state legislation, or more current values based on EE&C program experiences in Pennsylvania or the region around Pennsylvania. The Commission adopts these recommendations and directs that, in the future, any new measures proposed to be incorporated into the TRM be discussed and vetted in the TWG, including any changes in baseline values. The Commission adopts this position as the TWG affords a reasonable forum for parties to advance new measures and changes for TRM. It also allows for open technical discussions to fully vet supporting data and documentation to arrive at credible energy saving values that can then be recommended for inclusion in subsequent TRM updates.

In conjunction with the expanded role of the TWG, the Commission wishes to clarify that the TWG is chaired by the SWE. The SWE chairs the discussions in meetings, which should be attended by Commission staff, EDC representatives and other parties, for the purposes of arriving at deemed savings values that realistically represent the actual savings that ratepayers will realize when such measures are installed. The Commission will also directs that any items suggested for inclusion in the 2011 TRM that were not adopted be referred to the TWG for further discussions and review for inclusion in future TRM updates.

**J. Application of Recent Baseline Data Changes**

In the proposed 2011 TRM update, the Commission proposed new baseline values for several measures contained in prior TRMs. Furthermore, in the *Tentative Order*,[[30]](#footnote-30) the Commission sought input on how to address changing baseline values. The Commission recognizes that the use of the most recent baseline data may result in lower deemed savings. The lowering of the deemed savings may require the deployment of additional measures to meet statutorily mandated targets. The Commission, however, also recognizes the need to ensure that the ratepayers are getting the energy savings, and the associated energy market effects for which they are paying. The Commission sought comments on how to fairly address the tradeoff between the use of baseline data derived from more recent data that reflects a more accurate assessment of current energy savings and the possibility that such adjustments may require greater market penetration to meet mandated goals.

1. **Comments**

Of the eight Commenters, six opposed the application of any baseline changes before the next Act 129 compliance period beginning June 1, 2013. (Allegheny Power Comments at 3, Duquesne Comments at 2, EAPA Comments at 8, FirstEnergy Comments at 5, PECO Reply Comments at 2, and PPL Comments at 47.) The EAPA stated that significant midcourse changes to the TRM may lead to situations where EDCs are faced with exceeding budgetary caps, falling short of mandated targets, becoming subject to penalties or facing loss of public confidence in energy efficiency and conservation programs in an effort to adhere to a standard which was not in place at the time the EDCs’ plans were approved by the Commission. (EAPA Comments at 7.) Many of the Commenters stated that the implementation of new baselines would be both time consuming and burdensome as the EDCs would have to draft and file updated EE&C plans with the Commission, await Commission approval and execute program changes in a timely fashion. (Allegheny Power Comments at 3 and 4, Duquesne Comments at 2, EAPA Comments at 8, and FirstEnergy Comments at 4 and 5.)

PECO suggested that, should a baseline change be approved, the baseline revision should phased in over a 12-month period so that the EDCs have time to review and update their EE&C plans. (PECO Comments at 2.) The OCA provided similar comments, stating that updates to the TRM should be coordinated with the EDC program year so that the TRM is finalized sufficiently in advance of the next program year filing. (OCA Comments at 6.)

The EAPA and PPL raised several legal and policy arguments against revising any TRM baseline value during the entire EE&C Program period from June 1, 2009, through May 31, 2013. First, the EAPA and PPL asserted that changes to the TRM baseline values improperly requires the EDCs to revise their previously approved EE&C plans in violation of Section 703(g) of the Public Utility Code, 66 Pa. C.S. § 703(g), suggesting that they were not provided notice and an opportunity to be heard on the proposed changes. (EAPA Comments at 17 and 18, and PPL Comments at 40-42.) Second, the EAPA and PPL argued that the changes would amount to a retroactive application of a regulation, in violation of Section 1926 of the Statutory Construction Act of 1972, 1 Pa. C.S. § 1926. (EAPA Comments at 18 and 19, and PPL Comments at 37-39.) Third, the EAPA and PPL argued that changing the TRM baselines improperly revise the EDCs’ EE&C plans in violation of Section 2806.1(b)(2) of Act 129, 66 Pa. C.S. § 2806.1(b)(2), and the Act 129 *Implementation Order* that establishes the procedures the Commission must use to modify EDC EE&C plans. (EAPA Comments at 19 and 20, and PPL Comments at 39, 42 and 43.) Fourth, the EAPA and PPL argued that the baseline changes proposed in the 2011 TRM update are not supported by substantial evidence. (EAPA Comments at 20 and 21, and PPL Comments at 43 and 44.) Lastly, the EAPA and PPL argued that making the baseline changes without hearings and substantial evidence are not in accordance with sound public policy are unjust and unreasonable and an abuse of discretion in that the EDCs had relied upon the 2009 TRM in designing their EE&C plans, which were approved after Commission hearings. (EAPA Comments at 22 and PPL Comments at 45 and 46.) PPL also argued that the TRM is not binding on the EDCs as it is not a statute or regulation. (PPL Comments at 34-36.)

1. **Disposition**

To begin with, the Commission rejects the Commenters’ request to delay the application of baseline changes to the TRM until after June 1, 2013. The Commission is obligated to establish an evaluation process that monitors and verifies data collection, quality assurance and the results of each EDC’s EE&C plan and the EE&C program as a whole, throughout the entirety of the program.[[31]](#footnote-31) In fact, Act 129 requires the Commission to conduct this evaluation process every year, as each EDC is to submit an annual report documenting the effectiveness of its plan, the energy savings measurement and verification, an evaluation of the cost-effectiveness of expenditures and any other information the Commission requires.[[32]](#footnote-32) In the *Implementation Order*, the Commission stated that it will use the TRM to help fulfill these evaluation process requirements, noting, however, that the TRM would have to be updated and expanded periodically to fulfill these requirements.[[33]](#footnote-33)

Inherent in the Commission’s obligation to verify[[34]](#footnote-34) the results of each EE&C plan, as well as the EE&C program as a whole, and to ensure EDC compliance with the mandated consumption and demand reductions,[[35]](#footnote-35) the Commission must use substantial credible facts to support such determinations. Therefore, as the Commission is allowing the EDCs to use the TRM to verify their energy savings, the TRM methods and values must be sound, accurate and credible. The original TRM was established based on the best available studies and data at that time. These studies and data, however, will become less reliable as the science and energy efficient equipment technology advances, and that technology gets deployed. As such, in order to remain credible and relevant, the TRM must continually be updated to reflect the changing energy conservation science and technology, and the level of deployment of that science and technology. Indeed, it would be unreasonable for the Commission to ignore more up-to-date and accurate information regarding the energy efficiency values of various programs, appliances and equipment. As such, after providing a notice and comment opportunity, the Commission will continue to update the TRM on an annual basis, based on sound, accurate and credible studies and data and apply these TRM values at the beginning of each subsequent AEPS Act and EE&C Program compliance years.

The Commission will continue to use its staff, the SWE, the TWG and its TRM annual review process to fully vet the soundness, accuracy and credibility of any proposed changes to the TRM. The Commission believes that this process has, to date, provided a reliable and credible TRM in a reasonable, cost-effective and timely manner that also provides adequate opportunity for those interested in and affected by the TRM to be heard. The adequacy of this process is clearly demonstrated in the instant proceeding, wherein, this Commission has rejected the change to the CFL HOU value and certain requirements for the refrigerator/freezer recycling measures, as not being credible or reasonable based on the comments and data provided by the EDCs.

We recognize the potential effect any changes to the TRM could have on the EDCs’ existing plans, to include the amount of savings that may be obtained by any individual program offering, the costs of the plans, and the cost-effectiveness of individual program offerings, as well as the program as a whole. We believe that the EDCs’ focus on potential penalties as they relate to the effect the TRM changes have on the amount of energy savings achievable under a plan and the public’s confidence in the plans is misplaced.

The purpose of the EE&C Program is to implement measures to obtain real energy consumption and demand reductions in a cost-effective manner. The amount of the energy consumption and demand reductions measured by the EE&C Program must be credible in order to determine, not only if the EDCs meet the mandatory targets, but to determine whether the ratepayers received real energy consumption and demand reductions and whether those reductions were obtained in a cost-effective manner. The Commission believes that these issues are the primary and proper reasons to use in assessing whether the TRM values should be updated.

The Commission believes that the damage to the public’s trust would be greater if the Commission and the EDCs’ were to promise greater energy savings than the public realizes when participating in and installing the measures promoted by the Commission and the EDCs. This is especially true based on the fact that the customers participating in and installing these measures pay the lion’s share of the purchase and installation costs for these measures. The trust and confidence of these customers could be irreparably lost if these customers realize far less energy savings than promised after investing significant personal or corporate capital in the offered programs and measures. Whereas, if an EDC were to fail to meet the mandated energy consumption or demand savings, it is likely that the customers will lose confidence in the EDC’s ability to implement such a program, not the program as a whole, provided the savings realized were credibly predicted by the TRM.

The Commission disagrees with EAPA’s and PPL’s assertion that changes in the TRM improperly requires EDCs to revise their previously approved plans in violation of 66 Pa. C.S. §§ 703(g) or 2806.1(b)(2). To begin with, the EDCs’ original plans were based on many estimates and assumptions, to include the amount of savings each measure would obtain, based on the TRM values, custom EM&V protocols, custom measurement, the potential customer participation rates, the proper incentives, and the actual costs to implement each measure. The EDC savings estimates based on custom EM&V and custom measurement will change, and have likely changed, over time due to incorrect assumptions about existing equipment technology or changes in available equipment. As discussed above, the TRM values will change over time as well. In changing the TRM to reflect credible and accurate energy savings, the Commission is not changing any EDC plan; just one of the many assumptions the EDC relied upon in developing its plan. All of these changes or miscalculations in assumptions and estimates affect the results of the EDCs’ plans and will likely require EDCs to adjust their plans. Act 129 and the *Implementation Order* both recognized and accounted for this inevitability by requiring the EDCs to provide annual reports on the progress of their plans, as well as, providing a mechanism for the EDCs, the public, the Commission and any other interested parties to provide suggestions to improve the plans.

Regarding EAPA’s and PPL’s assertion that TRM changes amount to a retroactive application of a regulation in violation of Section 1926 of the Statutory Construction Act of 1972, 1 Pa. C.S. § 1926, we point out, as PPL recognized in its Comments, that the TRM is not a regulation. The TRM is merely guidance or a statement of policy that is not binding regulation. *See Pa. Human Relations Comm’n v. Norristown Area School Dist.*, 473 Pa. 334, 350, 374 A.2d 671, 679 (1977). If necessary, a final determination of an EDC’s EE&C Plan’s energy savings will be determined in an adjudicatory proceeding where the EDC will be afforded the opportunity to present evidence demonstrating what energy savings its plan obtained and the credibility of that evidence. An EDC is free to use any method to determine the energy savings produced by its plan, in place of the TRM, provided it can support such determinations with substantial credible evidence, if necessary. Furthermore, by updating the TRM methods and values based on the most recent credible and accurate data and facts, as they become known, is likely to reduce challenges to the credibility of the energy savings attributable to the EDCs’ Plans in any future proceeding.

**CONCLUSION**

This Order represents the Commission’s continuing efforts to establish a comprehensive TRM that supports the purposes of both the AEPS Act and the EE&C program established by Act 129. We extend our thanks to all who provided comments. **THEREFORE,**

**IT IS ORDERED:**

* + 1. That the 2011 Technical Reference Manual update as modified by this Order is adopted and replaces all prior versions of the Technical Reference Manual as of June 1, 2011.

2. That any change to the Technical Reference Manual suggested by a Commenter that was not adopted in the 2011 Technical Reference Manual update be referred to the Technical Working Group for further review and discussion for inclusion in future Technical Reference Manual updates.

3. That the Technical Working Group is directed to discuss and develop compact fluorescent lighting hours of use study proposals to be submitted to the Commission by June 1, 2011, as outlined in this Order.

4. That a copy of this Order shall be served upon the Office of Consumer Advocate, the Office of Small Business Advocate, the Office of Trial Staff, all jurisdictional electric distribution companies, all licensed electric generation suppliers, the Pennsylvania Department of Environmental Protection and all parties who filed comments.

5. That the Secretary shall deposit a notice of this Order and the 2011 Technical Reference Manual update with the Legislative Reference Bureau for publication in the *Pennsylvania Bulletin*.

6. That this Order and the 2011 Technical Reference Manual update, as well as supporting data be published on the Commission’s website.

**BY THE COMMISSION**

Rosemary Chiavetta

Secretary

(SEAL)

ORDER ADOPTED: February 24, 2011

ORDER ENTERED: February 28, 2011

1. *See* 73 P.S. §§ 1648.1-1648.8 and 66 Pa. C.S. § 2814. [↑](#footnote-ref-1)
2. Order entered on October 3, 2005, under the above-referenced caption and Docket Number. [↑](#footnote-ref-2)
3. *Id*. at page 13. [↑](#footnote-ref-3)
4. Order entered on January 16, 2009, at Docket No. M‑2008‑2069887, at page 13 (*Implementation Order*). [↑](#footnote-ref-4)
5. *Implementation Order* at page 13. [↑](#footnote-ref-5)
6. *See Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update* Order at Docket No. M‑00051865, entered June 1, 2009. [↑](#footnote-ref-6)
7. *Id*. at pages 17 and 18. [↑](#footnote-ref-7)
8. *See Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update* Order at Docket No. M‑00051865, entered June 8, 2010. [↑](#footnote-ref-8)
9. *See* 66 Pa. C.S. § 2806.1(a)(2). [↑](#footnote-ref-9)
10. The TWG is chaired by the SWE and is comprised of representatives from the EDCs and Commission staff for the purpose of encouraging discussion of the technical issues related to the evaluation, measurement and verification of savings programs to be implemented pursuant to Act 129. [↑](#footnote-ref-10)
11. See the *Tentative Order* entered on November 24, 2010, under the same docket number. [↑](#footnote-ref-11)
12. New York Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs* at page 38, prepared for the Department of Public Service by the New York Evaluation Advisory Contactor Team, October 15, 2010, which can be found at http://www.dps.state.ny.us/NY\_Standard\_Approach\_for\_Estimating\_Energy\_Savings\_12-08.pdf. [↑](#footnote-ref-12)
13. International Energy Conservation Code 2009 -- <http://www.energycodes.gov/publications/code_books.stm> [↑](#footnote-ref-13)
14. Nexus Market Research, *Impact Evaluation of the Massachusetts, Rhode Island and Vermont 2003 Residential Lighting Programs, Final Report*, October 1, 2004, p. 43 (Table 4-7). <http://publicservice.vermont.gov/energy/ee_files/efficiency/eval/marivtreportfinal100104.pdf> [↑](#footnote-ref-14)
15. PY1 is June 1, 2009, through May 31, 2010. [↑](#footnote-ref-15)
16. CF refers to Coincidence Factor: the percentage of the total lighting connected load that is on during electric system’s peak window. [↑](#footnote-ref-16)
17. *Ex ante* savings are also known as “claimed savings” and result directly from completed program-related actions taken by participants. *Ex post* savings are also known as “verified savings” and are based on an independent assessment of the reliability of the *ex ante* savings. [↑](#footnote-ref-17)
18. PY2 is June 1, 2010, through May 31, 2011. PY3 is June 1, 2011, through May 31, 2012. PY4 is June 1, 2012, through May 31, 2013. [↑](#footnote-ref-18)
19. EPAct of 1992 can be found at <http://www1.eere.energy.gov/femp/regulations/epact1992.html>. [↑](#footnote-ref-19)
20. The NEMA Premium motor standards can be found at <http://www.nema.org/gov/energy/efficiency/premium/>. [↑](#footnote-ref-20)
21. Some reports reference an equation from a paper titled *A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculation* (Wassmer 2003) as an acceptable approximation of the conversion factor between SEER and EER. The Commission recommends that the TWG review the applicability of this equation to commercial equipment as needed and provide recommendations. [↑](#footnote-ref-21)
22. The IESNA standards were developed in conjunction with the American National Standards Institute (“ANSI”) and the American Society of Heat, Refrigerating and Air-Conditioning Engineers in 2007. [↑](#footnote-ref-22)
23. *See* 42 U.S.C. § 6295(g)(8). [↑](#footnote-ref-23)
24. *See* 10 CFR Part 430. [↑](#footnote-ref-24)
25. Secretarial Letter issued under Docket No. M-2008-2069887. [↑](#footnote-ref-25)
26. EDCs may use different protocols for different participants so long as the use of such protocols are permitted under PJM business rules as set forth in PJM Manual 19 found at <http://ftp.pjm.com/~/media/documents/manuals/m19.ashx>. [↑](#footnote-ref-26)
27. The DOE ENERGY STAR calculator can be found at <http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LB>. [↑](#footnote-ref-27)
28. The Energy Star calculator can be found at <http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator>. [↑](#footnote-ref-28)
29. The database can be found at <http://www.energy.ca.gov/appliances/database/historical_excel_files/2009-03-01_excel_based_files/Refrigeration>. [↑](#footnote-ref-29)
30. *Tentative Order* (entered on November 24, 2010) at 11. [↑](#footnote-ref-30)
31. *See* 66 Pa. C.S. § 2806.1(a)(2). [↑](#footnote-ref-31)
32. *See* 66 Pa. C.S. § 2806.1(i)(1). [↑](#footnote-ref-32)
33. *Implementation Order* at 13 and 14. [↑](#footnote-ref-33)
34. Verify is defined as “[t]o prove to be true; to confirm or establish the truth or truthfulness of; to authenticate.” BLACK’S LAW DICTIONARY 1556 (7th ed. 1999). [↑](#footnote-ref-34)
35. *See* 66 Pa. C.S. § 2806.1(a)(9). [↑](#footnote-ref-35)