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

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|  | Public Meeting held September 22, 2011 |
| Commissioners Present: |  |

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| Robert F. Powelson, Chairman | | |  |
| John F. Coleman, Jr., Vice Chairman  Wayne E. Gardner | | |  |
| James H. Cawley | | |  |
| Pamela A. Witmer | | |  |
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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 2012 Update | Docket No. M-00051865 |

**2012 TRM ANNUAL UPDATE Tentative Order**

**BY THE COMMISSION:**

As explained in our Order, entered June 1, 2009 at this docket, in implementing the Alternative Energy Portfolio Standards Act (“AEPS Act”), 73 P.S. §§ 1648.1‑1648.8,this Commission had adopted an *Energy‑Efficiency and DSM Rules for Pennsylvania’s Alternative Energy Portfolio Standard, Technical Reference Manual* (“TRM”).[[1]](#footnote-1) In adopting the original version of the TRM, this Commission directed the Bureau of Conservation, Economics and Energy Planning (“CEEP”)[[2]](#footnote-2) 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) With this Tentative Order, the Commission advances the third annual update of the TRM to be applied beginning with the 2012‑2013 AEPS Act and Act 129 EE&C program compliance year.

**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. *See* 66 Pa. C.S. § 2806.1(a)(2). 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 (“TRC”) Test Manual and to provide suggestions for possible revisions and additions to these manuals. A Technical Working Group (“TWG”)[[8]](#footnote-8) 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 Commission, in a Tentative Order adopted on January 28, 2010, sought comments on a proposed 2010 TRM annual update.[[9]](#footnote-9) In an Order, adopted June 3, 2010, the Commission promulgated the 2010 TRM.[[10]](#footnote-10)

The Commission, in a Tentative Order adopted on November 19, 2010, sought comments on a proposed 2011 TRM annual update.[[11]](#footnote-11) In an Order, adopted February 24, 2011, the Commission promulgated the 2011 TRM.[[12]](#footnote-12)

The SWE, in collaboration with the TWG and Commission staff, reviewed the 2011 version of the TRM and proposes several changes and additions for consideration for inclusion in the 2012 version of the TRM. This Tentative Order discusses the significant changes proposed for the 2012 version of the TRM. With the adoption of this Tentative Order, the Commission seeks comments on the proposed 2012 version of the TRM. The proposed 2012 version of the TRM and its associated Appendixes can be found on the Commission’s website at <http://www.puc.state.pa.us/electric/Act129/TRM.aspx>. A Notice of the adoption of this Tentative Order and the proposed 2012 version of the TRM will be published in the *Pennsylvania Bulletin* with comments on the proposed 2012 version of the TRM due within 20 days after publication of the Notice and reply comments due within 30 days after publication of the Notice.

**DISCUSSION**

The proposed improvements to the TRM are based on more recent research and 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 these recommended improvements. Specifically, the current proposed improvements were the result of SWE site inspections, Conservation Service Provider (“CSP”) and Independent Evaluator comments, and EDC proposals for new EE&C measures. The proposed improvements focus on protocols for additional Residential, and Commercial and Industrial (“C&I”) EE&C measures and on clarifying when the TRM is to be used and applied. The Commission believes that these proposed 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 proposed modifications are as follows:

1. To add protocols for EE&C measures being implemented by the EDCs and to broaden the scope of the TRM;
2. To appropriately balance the integrity and accuracy of claimed energy savings estimates with costs incurred to measure and verify the claimed energy savings;
3. To clarify existing calculation methods;
4. To minimize the number of EE&C measures that must be evaluated through custom protocols;
5. 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; and
6. To provide guidance regarding the implementation and evaluation of demand response programs.

A summary of the changes proposed in 2012 TRM update follows:

1. Inclusion of ten new Residential EE&C measure deemed protocols;
2. Inclusion of seventeen new C&I EE&C measure deemed protocols;
3. Clarification of the following Residential EE&C measure deemed protocols:
   * 1. Clarification of the Heating, Ventilation, and Air-Conditioning (“HVAC”) protocols for heat pumps and high efficiency furnace fans;
     2. Clarification of Lighting protocols regarding the hours of usage (“HOU”) and the determination of delta watts for compact fluorescent light (“CFL”) bulbs and the implementation of federal legislation and regulations regarding residential lighting; and
     3. Determination of an ENERGY STAR appliance default fuel mix;
4. Clarification of the following C&I EE&C measure deemed protocols:
   * 1. Clarification of lighting protocols regarding the implementation of federal legislation and regulations, usage group thresholds, HOU and coincidence factor, and metering requirement lighting projects;
     2. Clarification of Motors and Variable Frequency Drive (“VFD”) protocols regarding energy savings and demand savings factors, as well as metering requirements; and
     3. Clarification of Table 3-19: Variables for HVAC Systems;
5. Addition of a demand response section; and
6. Revision of the TRM formatting.

Below, we will discuss in more detail the more significant proposed changes and updates. 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 and timely measurement and verification of the EDCs’ Act 129 energy efficiency programs. This proposed update to the TRM includes the addition of ten new residential EE&C measure protocols. 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 proposed for the 2012 TRM update:

* ENERGY STAR Light-Emitting Diodes (“LED”),
* Occupancy Sensors,
* Appliance Recycling and Replacement with non-ENERGY STAR Refrigerators,
* Holiday Lights,
* Low-Income Lighting,
* Pool Pump with Load Shifting,
* Pool Pump with VFD Motor and Load Shifting,
* Pool Pump with VFD Motor,
* Pool Pump with Two-Speed Motor, and
* Water Heater Tank Insulation.

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

As with Residential measures, expansion of the C&I section of the TRM is also essential for the measurement and verification of the EDC EE&C programs. Based on collaborative discussions between the SWE and the EDCs and the availability of research supporting deemed energy savings values, the following additional seventeen C&I EE&C measures and associated protocols are being proposed for the 2012 TRM update:

* Exterior Lighting for New Construction,
* LED Signage,
* Ductless Heat Pump,
* Heat Pump Refrigerant Charge Correction,
* Network Power Management Enabling for Office Equipment,
* Refrigeration – Night Cover,
* Refrigeration – Strip Curtains for Walk-In Unit,
* Refrigeration – Auto Closers,
* Refrigeration – Door Gaskets,
* Refrigeration – Bare Suction Pipe Insulation,
* Refrigeration – Evaporator Fan Controller,
* Refrigeration – Special Doors for Low Temperature,
* Electric Steam Cooker,
* Clothes Washer,
* Electric Water Heater,
* Heat Pump Water Heater, and
* Low Flow Pre-Rinse Sprayer.

1. **General Improvements**

Several issues not particular to a measure have been identified by the TWG as overarching TRM issues and are addressed in Section 1 of the TRM. Additionally, some issues from the 2011 TRM update were referred to the TWG for resolution. Discussion of each issue and proposed actions are presented in this section.

* 1. **Mapping Zip Codes to Reference Cities for Weather-Dependent Measures**

The performance of and savings achieved by some measures are dependent on weather conditions unique to the area in which the measure is installed. This is most pertinent for HVAC measures and other measures that depend on refrigeration, including Section 3.6: HVAC Systems and Section 3.7: Electric Chillers. According to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (“ASHRAE”), Pennsylvania exhibits weather conditions from three of the six defined climate zones,[[13]](#footnote-13) leading to the conclusion that differences in weather from one area to the next should be accounted for when determining energy and demand savings. Previous iterations of the TRM have used several Pennsylvania cities[[14]](#footnote-14) as reference cities to reasonably estimate weather-dependent variables without needing to define such variables for every city. Three improvements are being proposed.

First, the Commission proposes adding Allentown as an additional reference city, which was previously omitted in C&I protocols. Allentown, in addition to Erie, Harrisburg, Philadelphia, Pittsburgh, Scranton, and Williamsport, will serve as the seven reference cities when weather-dependent variables are required. Any weather-dependent measure installation will use weather-dependent variables from one of these seven reference cities.

Second, the Commission proposes the use of a zip code mapping table to assign a reference city to each zip code in Pennsylvania. This table, presented in Section 1.16: Impact of Weather, serves to promote consistency across EDCs. This table was derived by calculating the distance from each zip code to each of the seven reference cities and assigning the zip code to the closest reference city. Some exceptions were made in the southeastern area of the state, where proximity to bodies of water affects the climate zone. In such areas, if the ASHRAE climate zone of a zip code was determined to be more similar to Philadelphia (ASHRAE climate zone 4) instead of Allentown or Harrisburg (ASHRAE climate zone 5), zip codes were assigned to Philadelphia as the reference city, even if the zip code was geographically closer to Allentown or Harrisburg. In most of these cases, the distance to Philadelphia was only marginally farther than its distance to Allentown or Harrisburg.

Third, the Commission proposes the use of a mapping table, Table 1-2: California CZ Mapping Table, to assign a California Climate Zone to each reference city in Pennsylvania. This table is mainly relevant when the California Database for Energy Efficient Resources (“DEER”) is relied on as the primary source for determining savings for weather-dependent measures. For the purposes of energy efficiency, California is divided into 16 climate zones defined by the California Public Utilities Commission (“CPUC”), which are markedly different than the ASHRAE climate zones. Each Pennsylvania reference city was assigned a California climate zone by comparing key weather characteristics, such as cooling degree days, heating degree days, and dry bulb and wet bulb temperatures. Although this estimation is not perfect, i.e. there are no direct matches of weather characteristics between California and Pennsylvania, it serves as a reasonable proxy to translate savings from DEER.

* 1. **Determination of Baselines for Measures Replaced Upon Failure or at End of Useful Life**

First-year annual savings (for goal compliance) and lifetime savings (for TRC calculations) for a measure are highly dependent on what is considered the baseline for that measure. Differences exist primarily between the “burnout” and “early replacement” scenarios.[[15]](#footnote-15) The baseline for burnout scenarios is typically considered to be either the minimal code compliant or industry standard equipment or technology, which represents a participant’s probable course of action in the absence of the program. The baseline for the early replacement scenarios is typically considered to be the equipment or technology already in place just prior to the improvement. Existing equipment or technologies may represent efficiency ratings from codes and standards that are several generations old, leading to a difference in savings determinations. Therefore, the Commission proposes defining these scenarios in the 2012 TRM.

The Commission proposes that the baseline be defined for each scenario as needed on a measure-by-measure basis, beginning with the high impact measures. The determination of burnout versus early replacement is highly contingent on the measure itself. Federal standards, alternative and emerging technologies, and market trends all play unique roles in determining baselines for burnout and early replacement for each individual measure and cannot be generalized to establish overarching rules. In addition, program delivery methods may or may not require a distinction between burnout and early replacement for a particular measure.

* 1. **Eligibility of Fuel Switching (Non-Electric to Electric)**
     + 1. **Baseline Fuel Source**

The 2011 TRM included a residential measure[[16]](#footnote-16) that allowed for a baseline heating system to be an electric or non-electric fuel-based system. It has come to the Commission’s attention that concern has arisen regarding whether or not non-electric fuel-based systems should be permitted to be used as baseline heating systems.

The Fuel Switching Working Group (“FSWG”) Staff Report[[17]](#footnote-17) released on April 30, 2010,[[18]](#footnote-18) provided some direction on this issue. In the report, the FSWG asserted that “in so far as fuel switching programs are shown to be a cost-effective means to meet the energy reduction requirements of EDCs, there is no reason to preclude an EDC from offering such programs as part of its EE&C plan portfolio.”[[19]](#footnote-19)

Further, in a Secretarial Letter released on May 21, 2010, that summarized and adopted the FSWG Staff Report, the Commission directed “CEEP to develop deemed evaluation, measurement and verification protocols for specific energy efficiency measures that involve switching from electricity to another fuel source, to be considered for inclusion in the TRM. CEEP is to develop these protocols in conjunction with the Statewide Evaluator and through the annual TRM revision process.”[[20]](#footnote-20) It should be noted, however, that the FSWG’s focus was primarily on fuel switching from electric to alternative energy sources and not the reverse.

Given that the EDCs are charged with reducing electric load, having customers switch to electric from non-electric equipment could be perceived as counterproductive, as those customers who are switching to electric service are adding load to the grid. Act 129, however, allows for increased electric load in that it states that “load reduction in consumption shall be measured against the electric distribution company’s expected load as forecasted by the Commission.”[[21]](#footnote-21) Therefore, we believe that an EDC gaining customers or customers increasing their loads would not adversely impact an EDC’s load reduction requirement, as the EDCs’ original forecasts included the addition of future load.

We are concerned, however, that improperly constructed incentives could unfairly impact non-electric fuel sources. Essentially, improperly constructed rebates could be construed as marketing devices that incentivize fuel switching for the primary purpose of increasing market share, as opposed to incentivizing efficient use of energy. We believe the focus of the rebates should be to encourage the purchase of high efficiency appliances by those customers who had already decided to change energy sources and we will base our review of proposed rebates on such a premise.

Therefore, with the clarifications noted above, the Commission proposes to allow EDCs to continue proposing fuel switching programs based on both electric and non-electric energy sources as part of their Act 129 EE&C plans.

* + - 1. **Impacts and Measure Lives**

In their June 3, 2011 Comments to the TRC Order,[[22]](#footnote-22) the FirstEnergy Companies recommended that the Commission expand the TRM to provide fuel switching deemed impacts and measure lives where appropriate, similar to the impacts and measure lives provided for electric measures. In addition, the FirstEnergy Companies requested that the Commission expand the TRM to provide instruction on the cost of the alternative fuels that should be used and the impacts and measure lives if fuel switching measures are implemented.

In the Final Order for the 2011 TRC Update,[[23]](#footnote-23) the Commission stated that if a stakeholder wishes to expand the TRM to provide deemed impacts and measure lives where appropriate, similar to the impacts and measure lives provided for electric measures, the stakeholder should raise the issue at the TRM docket. Therefore, while we will not propose specific deemed impacts and measure lives herein, we encourage parties to provide their specific comments on fuel switching deemed impacts and measure lives.

* 1. **Use of Residential Protocols in Commercially Metered Spaces**

The TRM is organized into two main sections for energy efficiency measures, (1) Residential and (2) C&I. Protocols in the Residential section quantify savings for measures typically found in residential areas under residential meters. Likewise, protocols in the C&I section quantify savings for measures typically found in C&I areas under C&I meters. However, there is some overlap where measure type, usage and the sector do not match.

One such example is where a measure typically found in residences is operating as it would in a residential setting but is behind a commercial meter. This is common for multi-family housing projects where the building is master-metered under a commercial account. If participants are tracked by their account numbers in EDC tracking systems, they will show as C&I participants, not residential participants. For this scenario, the Commission proposes the use of a Residential protocol because the measure operates as it would in a residential setting. The C&I protocol would be inappropriate because the measure is not operating under C&I conditions, even if the participant was captured under a commercially-metered account.

Another example is where a measure typically found in a residence is operating as it would in a commercial setting and is behind a commercial meter. This is common for small commercial spaces and offices, where residential conveniences such as refrigerators and dishwashers may be found. In addition, some multi-family housing buildings may have central laundry rooms, where the clothes washers and dryers operate in a way more similar to businesses rather than residences. For this scenario, the Commission proposes the use of C&I protocols that are based on the Residential protocols with adjusted usage characteristics. The Residential protocol would be inappropriate because the measure is not operating under residential conditions.

The Commission proposes that the EDCs use protocols from the Residential or C&I section according to usage characteristics rather than the sector under which the account is metered.

1. **Improvements to Existing Residential EE&C Measure Protocols and Processes**

The following sections describe clarifications and modifications to Residential protocols:

* 1. **Clarification of Electric HVAC Protocols**
     + 1. **Heating Savings for Heat Pumps**

The Residential electric HVAC protocols were constructed in such a way to account for cooling savings only. These algorithms are sufficient for air conditioning measures but do not account for heating season savings for heat pumps. The Commission proposes the addition of heating season savings for heat pumps by crediting

the incremental efficiency gain between a high-efficiency heat pump and a minimally code-compliant heat pump.

* + - 1. **Modification of High Efficiency Furnace Fan Protocol**

The furnace fan protocol was modified in the 2011 TRM,[[24]](#footnote-24) based on comments from the EDCs and their evaluators, to update the savings values. Due to the difficulty of collecting specific independent variables for this measure, the Commission proposes that the furnace fan protocol be changed back to the original form described in the 2010 TRM[[25]](#footnote-25) with the adoption of stipulated variables.

* 1. **Clarification of Lighting Protocols**
     + 1. **CFL Hours of Operation per Day**

The 2009 TRM[[26]](#footnote-26) adopted a stipulated value of 3.0 hours of use per day for CFLs based on an ENERGY STAR calculator for residential lighting. This value was also adopted in the 2010 TRM update.[[27]](#footnote-27) In the ensuing years, the TWG researched and reviewed CFL hours of use studies from other states and found values ranging from 1.9 to 6.7 hours per day. The wide array of estimates stems from several variations on determining the number. First, primary data collection can occur by directly metering fixtures, by surveying residents or by a hybrid approach. Second, the study population may reflect socioeconomic, attitudinal and behavioral biases of one location versus another. Similarly, regional variations may also lead to differences in values. Lastly, studies may target and weight room types and sockets in a variety of ways.[[28]](#footnote-28)

Because of the variations noted above, in the 2011 TRM Final Order, the Commission directed the TWG to “discuss and develop CFL HOU study proposals to be submitted to the Commission by June 1, 2011.”[[29]](#footnote-29) These proposals were to include a variety of factors including, but not limited to, market penetration, light metering, light logging, estimated costs and funding methodologies.

This direction led the SWE and Commission staff to further research CFL lighting studies conducted by various consulting firms in other jurisdictions. In determining the applicability of results from these studies, the SWE and Commission staff looked at qualities such as the age of the program, the geographic location, demographics and sampling techniques. Because geographic location affects the hours of usage for CFL, staff determined this to be a major criteria in reviewing studies. As such, two studies were chosen for more thorough review by Commission staff, the SWE and the TWG.

The first study was completed by Nexus Market Research, Inc., RLW Analytics, Inc. and GDS Associates and submitted to the Markdown and Buydown Program Sponsors in Connecticut, Massachusetts, Rhode Island and Vermont. This study, completed in 2009, included lighting logger metering and socket surveys. The researchers concluded that an average HOU value for CFLs purchased through the markdown programs in these states should be 2.97 hours of use per day for CFLs installed in kitchens, living rooms, family rooms, dining rooms and offices and 2.05 hours of use per day for all other rooms.[[30]](#footnote-30)

The SWE, the TWG and Commission staff also reviewed a study performed by Navigant Consulting entitled “EmPOWER Maryland 2010 Interim Evaluation Report – Chapter 5: Lighting and Appliances” which was presented to Baltimore Gas and Electric, Potomac Electric Power Company, Delmarva Power and Light, Southern Maryland Electric Cooperative, and Allegheny Power.[[31]](#footnote-31) This study was submitted on January 15, 2011 and updated on March 9, 2011. The researchers performing this study installed 222 light loggers in a sample of 61 households. However, upon reviewing data, 22 of the loggers were removed, decreasing the sample size to 59 households. Based on the data analyzed and adjusting for hours of daylight across the year, Navigant developed a “mean-annualized HOU estimate of 2.98.”[[32]](#footnote-32)

The Commission proposes maintaining 3.0 as the value for CFL HOU in the 2012 TRM. As the Maryland market, geographic attributes, weather and other factors are similar to Pennsylvania, the Commission believes the values found in the latter study, presented by Navigant Consulting in early 2011, are also representative of conditions in Pennsylvania, and confirm the applicability of the existing 3.0 CFL HOU value for use in the 2012 TRM.

* + - 1. **Methodology for Determining Delta Watts for CFLs**

Annual energy savings for residential CFLs are determined by multiplying hours of usage in one year, in-service rate and delta watts (the difference between the CFL and the baseline bulb). The 2011 TRM stipulates hours of use and the in-service rate,[[33]](#footnote-33) but relies on data gathering to determine the delta watts.

The Commission proposes that the delta watts be determined by calculating the difference between the CFL wattage and the “equivalent incandescent bulb” wattage, which is defined as the incandescent bulb with similar lumen output as the new bulb. For general service bulbs, CFLs are mapped to an equivalent incandescent bulb based on lumen output – essentially, CFLs replace incandescent bulbs that provide similar lighting levels. The baseline for specialty bulbs is determined by a mapping table,[[34]](#footnote-34) created using a combination of lumen ranges and manufacturer specified data. Standardizing a methodology will ensure consistency across all EDCs.

* + - 1. **Implementation of Federal Legislation and Regulations Related to Residential Lighting**

The Energy Independence and Security Act of 2007 (“EISA 2007”)[[35]](#footnote-35) introduced new minimum efficacy standards for general service bulbs, effectively phasing out current incandescent bulbs between 2012 and 2014. New standards are introduced January 1st of each of the associated years, starting with the 100 watt bulb in 2012, 75 watt bulb in 2013, and 60 watt and 45 watt bulbs in 2014. This effectively reduces the energy consumption of a standard incandescent bulb and the energy savings of any measure using the incandescent bulb as the baseline, such as CFLs.

The Commission proposes that the baseline for CFLs be updated per the EISA 2007 standards. The baseline change will coincide with the TRM updates, which serves two purposes. First, only one deemed savings value will be in effect for the duration of the program year, which prevents a domino effect of implementation and evaluation issues to consider. Second, retail stores and participants may stock up on incandescent bulbs prior to the effective date of the EISA 2007 standards. Some delay to account for this stockpile effect is recommended.

* 1. **Refrigerator and Freezer Retirement and Recycling**

Appliance recycling programs are prevalent in many DSM programs across the nation, but a standard approach to assessing the savings is still a topic of discussion. Central to the debate is quantifying how much energy would the appliance have consumed if the recycling program did not exist? Over the past decade, evaluation studies have been conducted to capture the precise energy savings using a variety of methodologies while attempting to capture effects of age, configuration, usage, weather, location, household size and other factors.

The 2010 TRM contained averaged results from seven evaluation studies to derive a deemed energy savings of 1,728 kWh per recycled appliance (not considering replacement scenarios).[[36]](#footnote-36) The 2011 TRM contained adjusted deemed energy savings downward to 1,659 kWh per recycled appliance based on EDC specific data collected by JACO.[[37]](#footnote-37)

Because both of the estimates noted above rely on averages that may or may not accurately reflect conditions in Pennsylvania, the Commission proposes that the TWG review the applicability of the California Appliance Recycling Program’s regression model,[[38]](#footnote-38) based on in situ metering data, to update deemed savings values every year. Specifically, under this proposal, the TWG would compile appliance characteristics from each EDC and calculate statewide averages that feed into the models independent variable inputs. Each year, the averages would be recalculated using up to date information collected from the EDCs. Though the use of this model does not guarantee complete accuracy, it is considered a reasonable approach to estimating savings because it accounts for differences in key variables compared to other programs. The TWG would determine if the deemed savings values as calculated using this model are more accurate and more reflective of the Pennsylvania market. The TWG is to provide recommendations regarding the use of the California regression model to determine savings values for the refrigerator/freezer retirement and recycling protocols to the Commission during future TRM updates.

* 1. **ENERGY STAR Appliances Default Fuel Mix**

There may be multiple options for fuel sources used for water heating and dry heating for several ENERGY STAR appliances, such as dishwashers, clothes washers and clothes dryers. Because heating comprises a significant portion of the energy consumption for these appliances, the incremental electric energy savings depend on the heating fuel source. Depending on program delivery mechanics, the EDC may not be able to determine the heating fuel source and need to assume a default fuel mix.

The Commission proposes the use of the default fuel mix as described in Section 2.25: ENERGY STAR Appliances.  This default fuel mix was provided as a recommendation from the TWG after the review and discussion of data provided by the EDCs on appliances currently in place and key specifications, such as heating fuel type. While we are proposing to include a default fuel mix in the TRM to address potential instances of fuel switching, we believe it will still be necessary for the EDCs to continue to collect data regarding instances of fuel switching as directed in our prior Orders.[[39]](#footnote-39) Such data will further inform the Commission, the EDCs and interested parties on the extent to which fuel switching occurs.

1. **Improvements to Existing Commercial and Industrial EE&C Measure Protocols and Processes**
   1. **Clarification of Lighting Protocols**
      * 1. **Implementation of Federal Legislation and Regulations Related to Commercial Lighting**

The Energy Policy Act of 2005 (“EPACT 2005”)[[40]](#footnote-40) and EISA 2007 standards introduced new efficacy standards for linear fluorescent bulbs and ballasts, effectively phasing out magnetic ballasts (already in place) and most T-12 bulbs (starting July 14, 2012). This induces a shift in what a participant would have purchased in the absence of the program because T-12 bulbs on magnetic ballasts are no longer viable options and, therefore, adjusts the baseline assumption. Leftover retail stock may sustain sales for T-12 bulbs (and use of T-12 systems) for a period, but its market share is expected to decrease naturally as T-8 systems are adopted and the existing stock of T-12s is exhausted.

C&I lighting retrofit projects, for Act 129, are all considered early replacement scenarios, i.e. the baseline is defined as what was previously in place rather than minimally code compliant equipment. Therefore, the new federal standards are not immediately relevant. The Commission believes that further consideration be given to market effects of the new federal standards and modify lighting protocols accordingly. As such, the Commission proposes that these standards and protocols continue to be monitored by, and discussed in, the TWG and recommendations for their implementation be provided to the Commission for future TRMs.

* + - 1. **Modification of Usage Group Thresholds**

The annual energy savings for C&I lighting are heavily dependent on the annual hours of usage. In the 2010 and 2011 TRMs, the C&I lighting protocol differentiated between projects with a connected load savings of 50 kW or more and projects with a connected load savings below 50 kW.[[41]](#footnote-41) Projects above 50 kW of savings were required to use a minimum number of usage groups and define the annual hours of usage for each usage group. This methodology was driven by the assumption that larger projects tend to incorporate more space types.

Through the course of Act 129, this assumption has proven to be inaccurate. The need for usage groups corresponded not to the size of the project, but rather to the scope of a project. For example, an under 50kW project could consist of a retail store, office areas, and a warehouse, each area with its own unique operating schedule. On the other hand, an over 50kW project could consist of a large warehouse, where hours are regimented and uniform.

The Commission proposes to eliminate requirements for usage groups and proposes that EDC implementers determine when usage groups are most appropriate for each customer. The revised protocol also proposes that evaluators verify that usage groups are reasonably applied. In doing so, Table 3-1: Usage Groups Recommended per Building Type and Table 3-2: Hours of Use for Usage Groups, which state the minimum number of usage groups per building type and stipulated hours of use for usage groups respectively, will be removed. [[42]](#footnote-42)

* + - 1. **Determination of Hours of Use and Coincidence Factor**

Annual hours of usage stipulated in Table 3-5: Lighting EFLH [equivalent full load hours] and CF [coincidence factor] by Building Type or Function of the 2011 TRM, when compared to on-site findings, have been consistently underestimating savings for certain building types. This is especially true of warehouses, convenience stores and other facilities operating 8,760 hours per year. Previous editions of the TRM mandated that logging the actual hours of usage was the only acceptable means of modifying the stipulated hours of usage, even for facilities able to prove 8,760 hours of operation without metering.

The Commission proposes that additional flexibility be built into the C&I lighting protocol such that sufficient means of documentation can serve as an alternative source for determining hours of usage for a particular building. Such forms of documentation can include a written statement by the facility manager, documented interview, physically posted hours of operation, hours posted on a website or utility interval metered data. Metering, along with its associated costs, should be preserved for projects with high uncertainty and high impact, as opposed to projects where hours of operation can be easily identified.

In addition, the Commission proposes that flexibility be introduced to calculate custom coincidence factors, if hours of operation are determined for a site, using the non-weather dependent coincident peak demand calculator, which calculates demand by weighting time bins according to when the top 100 hours are most likely to occur based on historical data. This is possible for lighting because the load shape in most cases corresponds to the hours of operation.

* + - 1. **Modification of Metering Requirement for Lighting Projects**

Quantifying hours of usage by direct measurement, which is typically considered the most reliable source of data, can identify where the stipulated tables have misrepresented the hours of usage and generate more accurate estimates, but also requires additional resources beyond normal verification activities. The bulk of these direct measurement activities should target projects with high impacts and uncertainty.

The Commission, therefore, proposes metering requirements for the evaluation of C&I lighting projects for high impact and high uncertainty projects. High impact projects are considered to be projects with connected load savings of over 200 kW. High uncertainty projects are considered to be projects where hours are variable and/or are difficult to ascertain and can be determined at the discretion of the evaluator.

* 1. **Clarification of Motor and Variable Frequency Drive Protocols**
     + 1. **Determination of Energy Savings Factor and Demand Savings Factor Values for Baseline Conditions for Non-Constant Volume Systems**

VFDs add controls to motor systems to allow them to modulate motor speed and power output based on the load required. In order to quantify savings, the baseline control system must be identified. The 2011 TRM provides a methodology for quantifying savings against constant volume systems and requires that any other baseline system be considered as a custom measure.[[43]](#footnote-43)

The Commission proposes expanding the VFD protocol such that savings for other baseline systems, such as inlet guide vane and discharge damper systems, can be quantified using the TRM. In the absence of primary data collection, the Commission proposes that the EDC research secondary sources to inform the stipulated energy and demand savings variables.

* + - 1. **Metering Requirement for Motors and VFD Projects**

Usage characteristics of VFD improvement projects, which generally drive energy savings, are captured for typical motor functions in the form of stipulated equivalent full load hour values. The 2011 TRM states that all other motor functions not directly listed in the TRM are to be treated as custom measures, which limits the applicability of the TRM protocol from small process motors.[[44]](#footnote-44) This may have the unintended consequence of requiring metering for a plethora of projects that have relatively small contributions to the program and the overall portfolio.

The Commission proposes that all motors under a certain threshold be eligible for deemed savings according to the TRM protocols to appropriately balance cost and rigor. An average value may serve as a reasonable and conservative value that could be corrected through the evaluation. All motor projects achieving total energy savings above 50,000 kWh per year, and selected in the evaluation sample, must be metered by the evaluator to verify savings. If the motor project includes a function not listed in the deemed savings table, the threshold is reduced to 20,000 kWh. This methodology maintains ease of implementation for EDCs, but also ensures that proper level of rigor is achieved on the back end.

The Commission also proposes that the TWG conduct additional research to examine and propose an appropriate baseline for motor replacements. This research effort should include interviews with industry experts, contractors, motor distributors, and industrial customers (including participants and non-participants) to better understand the current market in Pennsylvania. According to a research study conducted by the Department of Energy (“DOE”),[[45]](#footnote-45) a significant portion of large industrial motors are rewound instead of replaced, which suggests that a National Electric Manufacturers Association (“NEMA”) premium efficiency motor is not always appropriate for a “burnout” scenario. To compensate for this finding, the baseline should be adjusted to account for this scenario. Based on its research, the TWG is to provide recommendations for an appropriate baseline to the Commission during future TRM updates.

* 1. **Clarification of HVAC Protocols**
     + 1. **Addition of Sources to Table 3-19: Variables for HVAC Systems**

Several variables for HVAC measures use engineering estimates as the basis for a stipulated value, which is not ideal and difficult to substantiate. The Commission proposes the use of 80 percent for coincidence factor for both HVAC and chiller measures, which is an average of coincidence factors found in other TRMs.[[46]](#footnote-46) Only coincidence factors applicable for the summer months were considered in this average.

* + - 1. **Determination of Heat Pump Baselines**

EDC program incentives for water-source, ground-source and groundwater-source heat pumps are not intended to encourage high-efficiency water-source, ground-source and groundwater-source heat pumps, but rather are intended to encourage customers to switch from an air-source heat pump to a water-source heat pump. This equipment, even at minimally code compliant efficiency standards, qualifies as high efficiency because it is more efficient than an air-source heat pump.

The Commission proposes adjusting all baselines for water-source, ground-source and groundwater-source heat pumps to represent incremental efficiency gains over air-source heat pumps.

1. **Demand Response**

Based on feedback from the EDCs, we believe it is important to provide guidance on the determination of peak load reductions under Act 129. We find this guidance particularly necessary given the complexities and challenges of dynamic system loads and the EDCs’ reliance on PJM wholesale demand response initiatives that are consistent to a significant degree, but nonetheless independent from Act 129.

The 2009[[47]](#footnote-47) and 2010[[48]](#footnote-48) TRMs contained sections regarding demand response protocols for both the C&I and Residential sectors. However, demand response protocols related to the C&I and Residential sectors contained in the 2009 and 2010 TRMs were not included in the 2011 TRM.

With this 2012 TRM update, the Commission proposes the inclusion of a new demand response or peak load reduction section. This section addresses three specific demand response topics.

The first topic is the determination of Act 129 peak load reductions. The Commission proposes the inclusion of guidance within the 2012 TRM as to how hourly peak load reductions will be determined and evaluated. We propose that total hourly Act 129 peak load reductions should be a summation of Peak load reductions from Load Control, Critical Peak Pricing, and Direct Load Control DR Measures[[49]](#footnote-49) and Constant Load Reductions from non-dispatchable measures.

The second topic is the determination of the 100 hours of highest peak load which the EDCs are to use to meet their demand response obligations. The Commission proposes the inclusion of guidance as to how the EDCs will determine the load curve reconstructions associated with these 100 hours of highest peak load. This guidance addresses the subject of “add-backs,” pre-cooling and snapback effects and the calculation of customer baselines.

The third topic provides proposed guidance on determining the Act 129 average peak load reduction during the 100 hours of highest peak load. The proposed demand response guidance provides the EDCs with the calculation procedure necessary to determine the average peak load reduction during the 100 hours of highest peak load. This information is needed to determine whether the EDCs have acquired enough demand reduction to meet their Act 129 goals.

**CONCLUSION**

With this Tentative Order, the Commission seeks comments on the proposed additions and updates to the TRM. This Tentative Order represents the Commission’s continuing efforts in establishing a comprehensive TRM with a purpose of supporting both the AEPS Act and the EE&C Program provisions of Act 129. We look forward to receiving comments from interested stakeholders regarding the proposed changes to the TRM. This Tentative Order, the proposed TRM update and filed comments will be made available to the public on the Commission’s Act 129 Information web page. [[50]](#footnote-50)

**THEREFORE,**

**IT IS ORDERED:**

1. That the proposed 2012 Technical Reference Manual update is issued for comment.

2. That a copy of this Tentative Order shall be served upon the Office of Consumer Advocate, the Office of Small Business Advocate, the Commission’s Bureau of Investigation and Enforcement, the Pennsylvania Department of Environmental Protection and all parties who commented on the 2011 Technical Reference Manual update.

3. That the Secretary shall deposit a notice of this Tentative Order and proposed 2012 version of the TRM with the Legislative Reference Bureau for publication in the *Pennsylvania Bulletin*.

4. That interested parties shall have 20 days from the date the notice is published in the *Pennsylvania Bulletin* to file an original and three (3) copies of written comments referencing Docket Number M‑00051865 to the Pennsylvania Public Utility Commission, Attention: Secretary, P.O. Box 3265, Harrisburg, PA 17105‑3265.

5. That interested parties shall have 30 days from the date the notice is published in the *Pennsylvania Bulletin* to file an original and three (3) copies of written reply comments referencing Docket Number M‑00051865 to the Pennsylvania Public Utility Commission, Attention: Secretary, P.O. Box 3265, Harrisburg, PA 17105‑3265.

6. That comments and reply comments shall be electronically mailed to Gregory A. Shawley at [gshawley@pa.gov](mailto:gshawley@pa.gov) and Kriss Brown at [kribrown@pa.gov](mailto:kribrown@pa.gov). Attachments may not exceed three megabytes.

7. That this Tentative Order, the proposed 2012 version of the TRM and all filed comments and reply comments related to this Tentative Order be published on the Commission’s website.

 8. That the contact person for technical issues related to this Tentative Order and the proposed 2012 version of the TRM is Gregory A. Shawley, Bureau of Technical Utility Services, 717-787-5369 or [gshawley@pa.gov](mailto:gshawley@pa.gov). The contact person for legal and process issues related to this Tentative Order and the proposed 2012 version of the TRM is Kriss Brown, Law Bureau, 717-787-4518 or [kribrown@pa.gov](mailto:kribrown@pa.gov).

**BY THE COMMISSION**

Rosemary Chiavetta

Secretary

(SEAL)

ORDER ADOPTED: September 22, 2011

ORDER ENTERED: September 23, 2011

1. Order entered on October 3, 2005, under the above‑referenced Docket Number. [↑](#footnote-ref-1)
2. As of August 11, 2011, the Bureau of CEEP was eliminated and its functions and staff transferred to the newly created Bureau of Technical Utility Services. *See Implementation of Act 129 of 2008; Organization of Bureaus and Offices*, Final Procedural Order, entered August 11, 2011, at Docket No. M-2008-2071852, at page 4. [↑](#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 (*Implementing the energy efficiency and conservation program requirements of Act 129 of 2008*, 66 Pa.C.S. §§ 2806.1). [↑](#footnote-ref-4)
5. *Id*. [↑](#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. 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-8)
9. *See Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update*, Tentative Order at Docket No. M‑00051865, entered February 2, 2010. [↑](#footnote-ref-9)
10. *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-10)
11. *See Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update*, Tentative Order at Docket No. M‑00051865, entered November 24, 2010. [↑](#footnote-ref-11)
12. *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 February 28, 2011. [↑](#footnote-ref-12)
13. See ASHRAE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings. [↑](#footnote-ref-13)
14. The six Pennsylvania cities are: Erie, Harrisburg, Philadelphia, Pittsburgh, Scranton and Williamsport. [↑](#footnote-ref-14)
15. Burnout is also called “replace on burnout”, “replace on failure” or “end of useful life.” Early replacement is also called “early retirement.” [↑](#footnote-ref-15)
16. See Section 2.17: Ductless Mini-Split Heat Pumps, pp. 68-72, of the *Implementation of the Alternative Energy Portfolio Standards Act of 2004: Standards for the Participation of Demand Side Management Resources – Technical Reference Manual Update*, Manual at Docket No. M-00051865, entered February 28, 2011. [↑](#footnote-ref-16)
17. <http://www.puc.state.pa.us/electric/Act129/Fuel_Switching.aspx> [↑](#footnote-ref-17)
18. Adopted by the Commission on May 21, 2010, *See* Secretarial Letter at M-00051865, issued on May 21, 2010. [↑](#footnote-ref-18)
19. Fuel Switching Working Group Staff Report at 8. [↑](#footnote-ref-19)
20. May 21, 2010, Secretarial Letter at M-00051865. [↑](#footnote-ref-20)
21. *See* 66 Pa.C.S. § 2806.1(c)(1) & (2). [↑](#footnote-ref-21)
22. *See* FirstEnergy Companies June 3, 2010 Comments filed at Docket No. M-2009-2108601, at page 11. [↑](#footnote-ref-22)
23. *See* *Implementation of Act 129 of 2008 – Total Resource Cost (TRC) Test - 2011 Revisions* Order at Docket No. M‑2009-2108601 at pages 28 and 29. [↑](#footnote-ref-23)
24. See Section 2.1.1: Furnace High Efficiency Fan, page 13, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-24)
25. See Section 2.1.4: Furnace High Efficiency Fan, page 10, of the 2010 *Technical Reference Manual.* [↑](#footnote-ref-25)
26. See Residential ENERGY STAR Lighting, pages 24-26, of the 2009 *Technical Reference Manual.* [↑](#footnote-ref-26)
27. See Section 4.2: Residential ENERGY STAR Lighting, pages 24-26, of the 2010 *Technical Reference Manual*. [↑](#footnote-ref-27)
28. Ed Vine, “An Evaluation of Residential CFL Hours-of-Use Methodologies and Estimates”, Brooklyn, New York: International Energy Program Evaluation Conference, August 2005. Other sources of variation are also described in this paper. [↑](#footnote-ref-28)
29. *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 February 28, 2011, at page 36. [↑](#footnote-ref-29)
30. “Residential Lighting Markdown Impact Evaluation” by Nexus Market Research, Inc., RLW Analytics, Inc., and GDS Associates. Submitted to the Markdown and Buydown Program Sponsors in Connecticut, Massachusetts, Rhode Island, and Vermont on January 20, 2009. [↑](#footnote-ref-30)
31. “EmPOWER Maryland 2010 Interim Evaluation Report – Chapter 5: Lighting and Appliances” by Navigant Consulting. Presented to Baltimore Gas and Electric, Potomac Electric Power Company, Delmarva Power and Light, Southern Maryland Electric Cooperative, and Allegheny Power. Originally submitted January 15, 2011, and updated March 9, 2011. [↑](#footnote-ref-31)
32. *Id.* at page 43. [↑](#footnote-ref-32)
33. See Section 2.26: ENERGY STAR Lighting, pages 106-108, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-33)
34. Section 2.26: ENERGY STAR Lighting, page 104. [↑](#footnote-ref-34)
35. *See* 42 U.S.C.A. § 6295(i) (West Supp. 2011) and 10 C.F.R. § 430.32(x) (2011). [↑](#footnote-ref-35)
36. See Section 4.5: Refrigerator/Freezer Retirement, pages 29 and 30, of the 2010 *Technical Reference Manual*. [↑](#footnote-ref-36)
37. See Section 2.23: Refrigerator/Freezer Retirement (and Recycling), pages 94 and 95, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-37)
38. See <http://calmac.org/publications/FinalResidentialRetroEvaluationReport_11.pdf>, page 138. [↑](#footnote-ref-38)
39. *See, e.g*., *Petition of West Penn Power Company d/b/a Allegheny Power for Approval of its Energy Efficiency and Conservation Plan, Approval of Recovery of its Costs through a Reconcilable Adjustment Clause and Approval of Matters Relating to the Energy Efficiency and Conservation Plan*, Opinion and Order at Docket No. M-2009-2093218 (entered October 23, 2009) at 51, 52 and 104; and *Petition of PPL Electric Utilities Corporation for Approval of its Energy Efficiency and Conservation Plan*, Opinion and Order at Docket No. M-2009-2093216 (entered October 26, 2009) at 90. [↑](#footnote-ref-39)
40. *See* 42 U.S.C.A. § 6295(g)(8) (West Supp. 2011) [↑](#footnote-ref-40)
41. See Section 6.2.5: Quantifying Annual Hours of Operation, pages 38 and 39, of the 2010 *Technical Reference Manual and* Section 3.2.6: Quantifying Annual Hours of Operation, pages 128-131, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-41)
42. See Table 3-1: Usage Groups Recommended per Building Type and Table 3-2: Hours of Use for Usage Groups, pages 129-131, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-42)
43. See Section 3.4: Variable Frequency Drive (VFD) Improvements, pages 151-155, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-43)
44. See Section 3.3: Premium Efficiency Motors, pages 144-150, of the 2011 *Technical Reference Manual*. [↑](#footnote-ref-44)
45. U.S. Department of Energy, “United States Industrial Electric Motor Systems Market Opportunities Assessment”, December 1998. [↑](#footnote-ref-45)
46. Other sources are Ohio, New Jersey, the Mid-Atlantic, Massachusetts, Connecticut, Illinois, New York, CEE and Minnesota. Exact average value was 78.46% and 79.23% for HVAC and chillers respectively, which was rounded to 80% for both cases. [↑](#footnote-ref-46)
47. *See* pages 55 and 56 of the 2009 *Technical Reference Manual*. [↑](#footnote-ref-47)
48. *See* pages 63 and 64 of the 2010 *Technical Reference Manual*. [↑](#footnote-ref-48)
49. This will be 0 MW if there was not a curtailment event in that hour. [↑](#footnote-ref-49)
50. <http://www.puc.state.pa.us/electric/Act_129_info.aspx>. [↑](#footnote-ref-50)