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

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|  | Public Meeting held June 3, 2010 |
| Commissioners Present: |  |

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| James H. Cawley, Chairman | | |  |
| Tyrone J. Christy, Vice Chairman | | |  |
| 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 Update | Docket No. M‑00051865 |

**TRM ANNUAL UPDATE ORDER**

**BY THE COMMISSION:**

As explained in our prior 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”) to oversee the implementation, maintenance and periodic updating of the TRM.[[2]](#footnote-2) Additionally, in the Act 129 *Energy Efficiency and Conservation Program Implementation Order*,[[3]](#footnote-3) 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.”[[4]](#footnote-4) 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.[[5]](#footnote-5) In adopting the 2009 version of the TRM, the Commission recognized the importance of updating the TRM on an annual basis.[[6]](#footnote-6) With this Order, the Commission completes the annual update of the TRM to be applied beginning with the 2010‑2011 AEPS Act and Act 129 EE&C program compliance years, except as otherwise set forth in this Order.

**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 EDC’s 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 Test Manual and to provide suggestions for possible revisions and additions to these manuals. A Technical Working Group (“TWG”)[[7]](#footnote-7) 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 conjunction with a TWG, had reviewed the 2009 version of the TRM and proposed several changes and additions that were released for comment with this Commission’s adoption of a Tentative Order and Annex at its January 28, 2010 Public Meeting.[[8]](#footnote-8) The *Pennsylvania Bulletin* published a Notice of the Tentative Order and Annex on February 20, 2010. Comments were due on March 12, 2010, with reply comments due March 29, 2010.

The following parties filed comments to the proposed TRM update: Constellation NewEnergy, Inc. (“Constellation”); Duquesne Light Co. (“Duquesne”); The Energy Association of Pennsylvania (“EAPA”); Field Diagnostic Services, Inc. (“Field Diagnostic”); Metropolitan Edison Co., Pennsylvania Electric Co., and Pennsylvania Power Co. (collectively “FistEnergy”); PECO Energy Co. (“PECO”); PPL Electric Utilities Corp. (“PPL”); UGI Distribution Companies (“UGI”); and West Penn Power Co. d/b/a Allegheny Power (“Allegheny Power”). The following parties filed reply comments: EAPA, FirstEnergy, PECO and AP.

**DISCUSSION**

The improvements to the TRM focused on select commercial and industrial protocols and are made as part of the regular annual TRM update process. The Commission believes that these changes will make the TRM a more effective and professional tool for validating savings and providing support for the Act 129 goals. The major goals of the modifications adopted in this Order are as follows:

1. To appropriately balance the integrity and accuracy of savings estimates with costs incurred to measure those savings;
2. To improve the calculation methods in the prior versions of the TRM;
3. To broaden the scope of the TRM to enable the evaluation of a wider range of prescriptive measures, thereby minimizing the number of measures that must be evaluated through custom protocols;
4. To provide stipulated hours of use and demand coincidence factors, which were not specified in the prior versions of the TRM, in order to simplify the calculation of savings without requiring extensive measurement to evaluate saving; and
5. To provide reasonable methods for measurement and verification of the incremental energy savings without unduly burdening program or evaluation staff.

A summary of the adopted changes to the May 2009 TRM are as follows:

1. Section numbers added for navigation and cross-referencing.
2. Tables and text formatted consistently.
3. Updated references.
4. Footnotes added for references and notes.
5. Modified “Commercial and Industrial Energy Efficient Construction” to “Commercial and Industrial Electric Efficiency.”
6. Removed existing “Lighting Equipment” section.
7. Removed existing “Prescriptive Lighting” section.
8. Removed existing “Lighting Controls” section.
9. Removed existing “20% Lighting Power Density (“LPD”) Reduction” section.
10. Removed existing “Fluorescent Lighting Fixture” section.
11. Inserted “Lighting Improvement” section with “New Construction and Building Additions”, “Traffic Signal Lighting”, “Prescriptive Lighting”, and “Lighting Controls” subsections.
12. Removed existing “Motors” section.
13. Inserted “Premium Efficiency Motors” section.
14. Inserted “Variable Frequency Drive (“VFD”) Improvements” section.
15. Inserted “Industrial Air Compressors with Variable Frequency Drives” section.
16. Modified EFLH table under the “HVAC Systems” section.
17. Modified “Electric Chillers” section.
18. Removed “Variable Frequency Drives” section.
19. Removed “Air Compressors with Variable Frequency Drives” section.
20. Inserted additional appendices.

Below, we will discuss in more detail the more significant TRM changes and updates the Commission is adopting. Minor administrative changes will not be discussed. Specifically, major modifications have been made to the commercial and industrial lighting (6.2), motors (6.3), variable frequency drive (6.4), HVAC systems (6.6), and chiller (6.7) sections.

1. **Commercial and Industrial Lighting Protocol**

The 2009 TRM provides three classifications of measurement for lighting improvements to existing facilities. Prescriptive Lighting assumes a T12 magnetic ballast baseline, the Super T8 retrofit assumes either a standard T8 baseline or a T12 baseline, and the Custom Measure option anticipates a site specific baseline. The savings protocols for these classes of measurement are neither uniform nor coordinated. The 2009 TRM does not specify a methodology to determine the operating hours for different usage groups and has a limited number of lamp and ballast combinations. The current list of lamp and ballast combinations does not reflect the diversity in the field of preexisting lighting stock and is very limited in retrofit design options relative to what is usually seen in commercial lighting projects. Adding additional lamp and ballast combinations could have a significant positive impact toward achieving savings for the lighting programs.

The Prescriptive Lighting TRM Protocol, while giving the appearance of administrative simplicity, actually introduces some confusion into the process of auditing the savings of real world lighting improvements that may not conform to the categories as defined by Table 12 of the 2009 TRM. This may also have the unintended consequence of encouraging limited lighting design options, which can result in less energy savings than would otherwise be achieved. Currently there are multiple types of T-8 lamps and multiple energy efficient electronic ballasts on the market and in the field. This creates many design configurations to optimize the energy use while attaining the required light levels and can dramatically affect the actual savings achieved using any stipulated value. In the 2009 TRM, there is no methodology to account for the differences between varying wattages and ballast factors, both of which are significant determinants of savings. In addition, the assumption in the 2009 TRM that the C&I lighting baseline is 100% T12 magnetic ballast technology is clearly erroneous and is based on a study done in New Jersey between 1995 and 1999. The Tentative Order proposed changes to the Commercial and Industrial Lighting Protocols found in Sections 6.1 and 6.2 were designed to resolve these concerns and provide a more complete and useful TRM.

**Comments**

Allegheny Power, Duquesne and FirstEnergy have suggested a return to the original 2009 TRM Table 12 for smaller projects and recommend retaining the proposed baseline of 34 watt T-12 lamps and energy efficient magnetic ballasts inherent in Table 12. FirstEnergy suggests that smaller projects should be defined as projects less than 20 kW in savings; Duquesne suggests 50 kW savings as the threshold. (Allegheny Power comments at 7, Duquesne comments at 4 and 5 and FirstEnergy comments at 4 and 5.)

Allegheny Power states that “while many projects for lighting are custom in nature and will be handled by the expanded Prescriptive Lighting Table in Appendix C, the Company believes that small common lighting projects should not be encumbered with the additional rigor (and cost) of the larger or custom type lighting installation.” (Allegheny Power comments at 7.)

Duquesne states that Table 12 “is particularly useful for calculating savings for small projects because it is prescriptive and saves on administrative costs for estimating and measuring savings. Establishing reasonable and prototypical baseline assumptions for use when calculating savings associated with prescriptive lighting measures facilitates implementation of mass market focused mail in rebate program.” (Duquesne comments at 4 and 5.)

FirstEnergy states that “while the Companies support the use of Appendix C for larger projects (i.e. over 20 kW of load reduction), the Companies strongly suggest that Table 12 from the 2009 TRM be maintained in the 2010 TRM (either as an additional table in Appendix C or in the body of the TRM) in order to enable a standard, prescriptive lighting table to continue to streamline and simplify processes for smaller C/I projects.” (FirstEnergy comments at 5.)

In addition, FirstEnergy claims that they based their program design and estimated program impacts on the 2010 TRM. FirstEnergy agrees with many of the proposed changes to the lighting protocol in the proposed 2010 TRM and agrees that the new approach would be more accurate. However FirstEnergy asserts that use of the recommended approach for small lighting projects saving less than 20 kW would “preclude the use of a streamlined lighting incentive program and application process for smaller lighting applications.” (FirstEnergy comments at 4.)

**Disposition**

The TRM’s main purpose is to provide tools to evaluate standard measures and to facilitate the validation of real energy savings. It is not to provide “guaranteed savings” for artificial or overly broad categories of lighting measures. The distinction between program implementation and the requirements of evaluation needs to be clearly drawn. Site inspections need to retain their primary purpose of providing feedback to assess real world realization rates without inappropriately fixing the baseline to out of date values. Implementers do not need to be evaluators. The desire for simplicity by implementers must be balanced with the need for a reasonable level of scientific and technical validity to the energy savings.

Prescriptive lighting programs should be undertaken judiciously. There is a tendency to over simplify lighting programs for ease of marketing and short‑term penetration without proper consideration of longer‑term technical and economic ramifications. Prescriptive lighting programs, if based on unrealistic assumptions about baseline usage, run the risk of not delivering the energy savings end-use customers expect. This would be counter‑productive for the program. However, for smaller customers without access to technical experts, there is a place for well conceived prescriptive programs.

Based on the comments received from the EDCs, the Commission adopts the revised and updated Appendix C, Lighting Audit and Design Tool to replace Table 12 with a new prescriptive lighting table and to address other concerns expressed by the EDCs. Improvements to this tool include the following:

1. The development and inclusion of a prescriptive lighting table for customers self-certifying their baseline lighting systems. Baseline options for the customer include T-12 fixtures with electronic ballasts, T-12 fixtures with energy efficient magnetic ballasts, probe start metal halide fixtures, and others. If the customer misallocates or incorrectly certifies their baseline, the evaluators may catch the errors on random pre-installation inspections and adjust the realization rates programmatically so the implementation process is minimally affected. This approach facilitates streamlined incentive programs for smaller customers. The application process can then be designed as the EDCs see fit, taking whatever risk on the realization rates they choose as long as random access by evaluators and the SWE to pre-installation inspections is facilitated.
2. To make the Audit Work Sheet in Appendix C more user-friendly, it has been simplified and instructions have been provided to clarify its use. Pull down menus are available for hours and other TRM specified factors. In addition, a lamp ballast code generator has been added.
3. An alternative wattage coding sheet has been provided enabling customers and lighting professionals to reference manufacturers’ cut sheets in lieu of using the wattage table if desired. This allows new fixtures or lamp ballast combinations to be added with appropriate back up documentation.

These modifications to Appendix C provide a reasonable approach for maintaining the validity of the savings measured and address EDCs’ concerns by including a standardized prescriptive lighting table in Appendix C in lieu of reinstating Table 12 from the 2009 TRM. The improvements have streamlined and simplified the Lighting Audit and Design Tool for projects greater than 20 kW and have included a prescriptive lighting table for customers with less than 20 kW in savings who self-certify that they are replacing T-12 systems or other prescriptive base case configurations. The process proposed by the SWE maintains the credibility of the evaluation process by allowing evaluators to evaluate savings without being restricted to an artificial baseline that should not be applied to all customers implementing lighting projects no matter what they are replacing.

**B. Commercial and Industrial Motor & VFD Protocol**

The 2009 TRM provides protocols (algorithms and stipulated variables) for the measurement of savings for both motors and variable frequency drives that would be difficult or impossible to implement as currently written. Both protocols rely on a definition of Rated Load Factor (“RLF”) that may be a mischaracterization of a motor’s service factor. An actual motor load factor is the operating input power divided by the nameplate full-load input power. Thus, load factors vary by application and can only be determined by measurement.

In addition, the use of Equivalent Full Load Hours (“EFLH”) in the context of the proposed motor and VFD algorithm does not seem appropriate. There is no table of deemed EFLHs for different types of motor functions, like there is for air conditioning where the term is more appropriate.

The protocol for VFDs is particularly problematic. While on the surface the algorithm seems simple and clear, examination of Energy Savings Factor (“ESF”) and the Demand Savings Factor (“DSF”) reveals cumbersome underlying definitions and supporting documentation that taken as a whole is unintelligible. In Table 22, kWh/motor HP and Full Load Hours of the VSD are not coherently defined and would be impossible to implement in practice without significant creative interpretation.

The actual loading of a motor with a VFD is dependent on the control system employed and the physical design of the system it serves. When making generalizations for the purpose of stipulating VFD savings, they should be made carefully considering these factors. Otherwise it may be most appropriate to consider VFDs as a custom measure with appropriate metering of the pre and post loading on the motor to be controlled by the VFD. The Tentative Order proposed changes to the Commercial and Industrial Motor and VFD Protocols found in Sections 6.3 and 6.4 and Appendix D that were designed to resolve these concerns and provide a more complete and useful TRM.

**Comments**

Allegheny Power has suggested that “pre-measurement and verification measurement requirements for small variable frequency drives which fall outside the defined prescriptive measures and deemed as a custom application in the draft TRM should not be required.” (Allegheny Power comments at 8 and 9.)

Allegheny Power has requested that various software products be considered for estimating savings from VFDs. The Company believes that software tools “provide acceptable estimates for the energy savings for small VFD applications. The Company goes on to say that software should be leveraged to ensure cost-effectiveness and future viability of this program to “our small and large, commercial and industrial and governmental customers.” (Allegheny Power comments at 9.)

FirstEnergy asserts that time did not allow revisions to the C&I HVAC and motors to be vetted in the same manner as the lighting. (FirstEnergy comments at 6.)

**Disposition**

The number of categories of standard motors is a direct result of the nature of the function provided by the motor. Non-standard motors with variable loading, no matter the size, are considered in the 2010 TRM to be Custom Measures that require measurement prior to retrofit to determine loading. Savings values (ESFs and DSFs) should be stipulated only for categories over which the potential coefficient of variance for that category is expected to be low. Therefore, we decline to make changes to the standard values in Appendix D for motors and VFDs contained in the 2010 TRM provided as part of the Tentative Order issued January 28, 2010.

In addition, it is not reasonable to combine categories representing distinct and different functions with different standard savings values. This introduces unnecessary variance in the protocol and makes observation of actual savings inaccessible to evaluators who could discover a distribution of subcategories other than what was assumed.

For Custom Measure VFD applications, pre-approved software, with uniformly applied assumptions for all EDCs may be considered in conjunction with pre‑measurement or otherwise credible establishment of load shape. The software approval and the establishment of load shape would be defined in a pre-approved Custom Measure Protocol using procedures established in the Audit Plan as approved by the Director of CEEP.

**C. Commercial and Industrial HVAC Systems & Chiller Protocol**

The 2009 TRM provides protocols (algorithms and stipulated variables) for the measurement of savings for HVAC systems and chillers that are generally reasonable in theory but overly simplistic when considering the stipulated numbers. In Tables 19 and 21 of the 2009 TRM,[[9]](#footnote-9) EFLH values are fixed based on location, inferring that every HVAC and chiller system in a particular region operates at the same number of hours regardless of building type or function. This assumption is flawed, as one HVAC system could serve a school operating from 7AM to 5PM on weekdays only, while another HVAC system could serve a retail space operating from 9AM to 9PM every day in the same region. The same is true for chiller systems. Therefore, a more nuanced determination of the stipulated EFLH values is required to function properly in the established algorithms. The proposed new EFLH values for Commercial and Industrial HVAC systems and chiller systems are found in Section 6.6 and 6.7, respectively.

Tables 19 and 20 of the proposed 2010 TRM issued with the Tentative Order on January 28, 2010 provide a large number of categories of Equivalent Full Load Hours (EFLHs) by building type from the US Department of Energy’s Energy Star Calculator and Bin Analysis Models. These categories represent the results of detailed research and provide reasonable estimates for the stipulated energy savings in these categories. Many of the categories provide similar values and represent similar functionality relative to cooling and heating loads.

The chiller protocols deem savings according to similar algorithms and stipulated values as those for HVAC systems. In addition to variations by building type, chiller plants are usually more complicated and can have multiple chillers serving the same load. In these cases, a more nuanced determination of the stipulated EFLH based on loading is required for the algorithms to be realistic when more than one chiller serves a single load.

Chiller measures may also represent a large proportion of total program savings due to applications in large commercial and industrial facilities. Therefore, valid and accurate determination of savings is important.

**Comments**

For HVAC systems, Allegheny Power recommends that Tables 19 and 20 “be consolidated and standardized to main categories similar or equal to Table 6-6 to reduce customer application confusion, EM&V costs and EDC data tracking costs, and to provide a more uniform building type selection for program development and implementation purposes.” (Allegheny Power comments at 8.)

FirstEnergy suggests that the “TRM should strive to adopt a consistent, limited set of building types. The Companies support the use of standardized values for ‘partially deemed’ protocols and generally commend the SWE and the TWG’s support for the recommended values”. (FirstEnergy comments at 6.)

For Electric chillers, FirstEnergy raises the concern that the 2009 TRM formed the basis of the development of their chiller programs including incentives and the quantification of kW and kWh savings. Therefore, they assert, eliminating the prescription chiller program and the assumptions set forth in the 2009 TRM Table 21 would be contrary to the approval of their plan provided by the Commission. FirstEnergy suggests restoring basic algorithms for chillers while addressing concerns regarding the use of averages and variability of EFLH or CF between applications by categorizing standard and non-standard chiller applications. (FirstEnergy comments at 5 and 6.)

FirstEnergy states, “[r]ather than abandon the algorithms altogether for loosely defined custom processes, the Companies recommend, at a minimum, restoring the basic algorithms (including references to baselines, standards, etc.) and address the SWE's concern about the use of averages and the variability of EFLH or CF between applications by describing applications that can use standard values and describing alternative processes for determining parameters for non-standard applications (e.g., building simulation or other).” (FirstEnergy comments at 5.)

**Disposition**

Concerning HVAC systems, the Commission has reviewed comments concerning the building types in Tables 6-19 and 6-20 and the Commission agrees that some of these categories do not provide a degree of precision that materially adds to the overall accuracy of the evaluation process. Therefore, these building categories have been collapsed and the tables have been revised accordingly.

However, the Commission does not agree with combining categories representing distinct and different functions and values relative to heating and cooling loads. The Commission does not support providing a common building type list across multiple tables because different measures (i.e. lighting, motors, HVAC) depend on different factors.

The Commission agrees with FirstEnergy that a distinction must be made between standard and non-standard chiller applications. Standard chiller applications are now defined as a unitary electric chiller serving a single load at the system or sub-system level. Non-standard chiller applications are new defined as any chiller system outside of the standard chiller definition, including chillers in plants with multiple chillers configured to serve a common load. To do otherwise would over simplify the key input assumptions (% load, CF, EFLH) in complex chiller systems.

The Commission adopts the addition of a protocol for standard applications for the 2010 TRM, based on the basic algorithm referenced in the 2009 TRM with modifications. The modifications include the addition of a “Peak Load Coincidence Factor” to the demand and energy savings algorithms as a more reasonable representation of the chiller percentage load during peak hours, which is estimated to be 90%. The current 2010 TRM equation estimates energy and demand savings under the assumption that all chillers in the chiller plant run at the same load during peak hours and that each chiller serves 100% of design capacity. This assumption over simplifies the reality by not considering chiller plants with multiple units serving the same load and having more than 100% of design capacity. The modifications also include the addition of a stipulated EFLH table by facility type to ensure a more nuanced determination of the stipulated EFLH values. All non-standard applications should follow a custom measure protocol.

**D. Retroactive Treatment of the Proposed 2010 TRM Modifications**

The Commission has committed to updating the TRM in an annual process with changes to apply prospectively. Some of the changes proposed in the 2010 TRM Update are designed to rectify shortcomings in the 2009 TRM and to eliminate the need for extensive measurements of lighting, motors and VFDs applications. The Commission sought comments on whether these requirements should be applied retroactively.

**Comments**

The retroactive use of the proposed 2010 TRM is generally supported by all EDCs and the Energy Association (EA, comments at 1) to clarify and improve the 2009 TRM. In many cases the EDCs have been using the proposed 2010 TRM already.

Allegheny Power states that it “has been using the draft TRM for current program implementation activities and the development of the companies EM&V plans. Applying the proposed changes retroactively will simplify the company’s administration, measurement and verification of the energy programs.” (Allegheny Power comments at 2.)

However, Allegheny Power wishes to “be permitted to request specific waivers for application of the draft TRM to June 1, 2009, and does not believe any future TRM revisions should be made retroactively.” (Allegheny Power comments at 2.)

While generally accepting the retroactive nature of the 2010 TRM Update, some of the EDCs have expressed concern that some of the revisions proposed will increase the cost and complexity of their programs and change the basis upon which their plans were submitted.

**Disposition**

The Commission will accept the retroactive application of the revised 2010 TRM Update to the program year beginning in 2009. Future TRM revisions will not be retroactive, unless so specified by the Commission. EDCs may file a petition for a waiver of specific items in the 2010 TRM Update.

**E. Demand Response Programs**

PJM has established both residential and commercial demand response protocols. The EDCs would like to use the PJM demand response protocols for simplicity and decreased administrative costs. In meetings with Commission staff in Harrisburg on January 19, 2010 and February 23, 2010, conceptual issues related to the measurement of demand response program impacts were discussed in detail. Among the issues discussed were potential problems with the scientific validity of certain measurement methods when considered in the context of the indiscriminant application of those methods by PJM DR market actors. In addition, there is some question as to the relationship between PJM economic programs, PJM emergency programs and the Act 129 top 100 hours, and the applicability of methods which exclude previous events in the calculation of the baseline use before the DR Event. These are complex, nuanced issues that relate to both the credibility of methodologies used to evaluate savings and the context in which the methodologies are applied.

Discussions are currently underway in the TWG regarding the appropriate methods to measure the impact of demand response programs. Demand response protocols that would benefit from clarification, include the protocols for direct load control programs (DLC) and load curtailment programs sponsored by aggregators of load reduction. Aggregators may participate in both Act 129 load reduction and PJM programs simultaneously and get credit for savings if they receive funding under an EDC’s Act 129 EE&C program. There is expected to be high correlation between the Act 129 peak 100 hours and the economic or emergency capacity programs sponsored by PJM. Market participants claim that protocols acceptable to PJM should be acceptable under Act 129 without regard to differences in the dispatch process, participant selection bias in PJM economic program protocols applied to Act 129 events, and the general nature of guidelines set forth by PJM for measuring performance.

**Comments**

The comments by Duquesne and FirstEnergy seek to clarify the applicability of PJM protocols to Act 129. Duquesne wishes to relocate a paragraph stating that the PJM methodology will be accepted as a reporting method to reference all demand response protocols. (Duquesne comments at 6.) FirstEnergy wants “additional language associated with demand response programs in order to clarify important impacts and protocols.” (FirstEnergy comments at 7.)

In reply comments PECO “supports the recommendation of Constellation NewEnergy, Inc. to allow all PJM Interconnection, LLC protocols in the TRM as options for measurement and verification.” (PECO reply comments at 2.)

**Disposition**

Many demand response programs are complex and are not standard. The protocols needed are complex and made more so by the overlap of Act 129 events with PJM events. The choice and application of PJM baseline methodologies are important, specifically as they are applied to Act 129 events. These protocols are most appropriately considered Custom Measures in the context of Act 129 at this time. The Commission determines that Demand Response protocols for C&I applications will be removed from the TRM entirely and that adequate time be allocated to the discussion processes currently underway in the TWG.

Residential demand response measures, such as direct load control, will also be removed from the TRM until an acceptable protocol can be defined or recommended in future TRM updates after further research and investigation by CEEP in conjunction with the SWE, based on collaborative discussions in the TWG.

**F. Clarification of Peak 100 Hours**

The TRM specifies coincidence factors for energy efficiency measures originally derived using definitions of peak periods that are not the same as the Act 129 peak 100 hours for the purpose of defining peak demand impact.

**Comments**

FirstEnergy requests clarification regarding the evaluation process and the applicability of Coincident Peak Demand Savings to the top 100 hours. (FirstEnergy comments at 7.)

**Disposition**

The determination of additional coincidence factors, specifically for the Act 129 peak hours, may not materially improve accuracy and could be costly and technically challenging. It would require matching individual EE&C measure load shapes to the Act 129 peak 100 hours to determine the coincidence factor over the 100 hours. The issue is further complicated because the peak 100 hours are not fixed as to the time of day and are variable relative to the severity of the cooling season.

The Commission rejects changes to the Coincidence Factors for application to the Act 129 peak 100 hours. It is unclear whether that research would be cost-justified and if it would materially affect results. Therefore, the definition of the existing Coincident Peak Demand Savings has been clarified to apply to the top 100 hours as long as the EE&C measure class is operable during the summer peak of June through September.

**G. Additional Deemed Savings Measures**

The 2010 TRM Update is limited to revisions of the commercial and industrial sections, which typically generate the largest impact per program. The SWE, in collaboration with the TWG, discussed and negotiated the scope of these changes. However, the EDCs’ approved programs contain measures not addressed by the proposed 2010 TRM Update and the EDCs expressed concern that savings achieved by these measures may not be allowed to contribute to the overall impact of their programs.

The Audit Plan Prepared by the SWE outlines a process for review and evaluation of both Custom Measures and Interim TRM Measures. The SWE has requested and received lists from all EDCs of measures that they would like to have incorporated in future TRM updates.

**Comments**

Allegheny Power suggested that several additional appliance measures that were not in the 2009 TRM be approved as part of this current TRM update process. Allegheny Power further notes that these appliance measures have been submitted to the SWE. (Allegheny Power comments at 3-7, and reply comments at 2.)

Allegheny Power requests “that these [high efficiency appliance or equipment measures] be included in the TRM in addition to those meeting the minimum efficiency level for Energy Star (CEE Tier 1).” (Allegheny Power comments at 3.) PECO “believes that increasing the use of deemed savings in the TRM would better balance the needs of the customer, the utility, and the overall program cost.” (PECO comments at 5.)

**Disposition**

The SWE and the EDCs through the Technical Working Group will use an interim measure review process to develop additional measures for incorporation into future TRM updates. This process will require EDCs to identify all measures for which they request interim review, prioritize each measure by need and impact, and provide technical information supporting savings for each measure. Many EDCs anticipate using similar measures and have submitted deemed savings values for their proposed measures. The SWE has tabulated the different measures requested for SWE evaluation. The deemed values proposed by the EDCs for similar measures often differ widely and in many other cases are not supported by appropriate scientific research or the research cited differs. This collaborative process will create credible deemed savings values which can be uniformly applied to all EDCs and have been reviewed in a process which enables all EDCs to provide pertinent technical input. Based on this process, the SWE will issue guidance for those measure protocols that it recommends for use between TRM updates.

**H. Appropriate Coincident Factor for Residential CFLs**

The coincidence factor (CF) is the ratio of the installed unit’s connected load to the demand of the measures installed and on at time of system peak. The CF used for residential CFLs in the current 2009 TRM is 5%. The proposed 2010 TRM Table 4-3 used a CF of 5%. For CFLs installed in residential facilities this factor includes both the percentage of CFLs that are routinely used during the day and the coincidence of the use with the peak period (100 hours). Some EDCs suggested that the hours of use of CFLs that occurs during the period of system peak should be greater. Available research from other states suggests that the value may be between 5% and 10% for the coincidence of installed CFL use with the peak period in these jurisdictions.

**Comments**

Duquesne and Allegheny Power suggest and PECO supports Duquesne’s position that CFLs are used throughout the system coincident peak period, and the three hours of average use per day for residential CFLs are likely to occur between noon and 8 p.m. They believe that a CF of 5% to be extremely low and a better estimate of CF should be 37.5% (3/8). (Duquesne comments at 2 and 3, Allegheny Power comments at 7 and PECO reply comments at 2.)

**Disposition**

The Commission agrees with the EDCs that a 5% CF may be slightly low; however, a CF of 37.5% suggested by Duquesne is approximately 500% higher than the summer kW Coincidence Factor set forth in the Massachusetts Statewide Technical Reference Manual dated October 23, 2009.[[10]](#footnote-10) The Commission concludes that the actual CF is somewhere in between but does not have adequate information at this time to decide what the number should be. For the 2010 TRM, the Commission will continue to use the 5% CF but refers this issue to CEEP to conduct appropriate research in conjunction with the SWE to determine at what level the CF for residential lighting should be set. The new CF value will be used in subsequent TRM updates.

**I. Small C&I Lighting**

As stated in the discussion under Commercial and Industrial Lighting Protocol, prescriptive lighting programs should be undertaken judiciously. There is a tendency to over simplify lighting programs for ease of marketing and short term penetration without proper consideration of longer term technical and economic ramifications of eliminating the opportunity for better engineered retrofits using a full palette of design options. However, for smaller customers without access to technical experts, there is a place for well conceived prescriptive programs.

The 2010 TRM Appendix C replaces Table 12 from the 2009 TRM. Table 12 was used to calculate the energy and demand savings for small and common lighting upgrades. Section 6.2.4.1 in the 2010 TRM provides that lighting measures less than 20 kW in savings are not required to provide a detailed inventory but information sufficient to validate savings according to the 2010 TRM algorithm must be included in the documentation. This includes identification of baseline equipment utilized for quantifying kW base and building type.

**Comments**

Allegheny Power, Duquesne and FirstEnergy request that Table 12 from the 2009 TRM be retained in the new 2010 TRM. They believe that small common lighting projects should not be encumbered with the additional rigor and cost of the larger or custom type lighting installations. (Allegheny Power comments at 7, Duquesne comments at 4 and 5, and FirstEnergy comments at 4 and 5.) Duquesne defines small lighting projects as less than 50 kW. (Duquesne comments at 4 and 5.) FirstEnergy defines small projects as less than 20 kW. (FirstEnergy comments at 4 and 5.)

PECO agrees with the other EDCs in principle and specifically believes that the requirement that base case fixture codes identified should be relaxed for the <20 kW projects. They suggest that base case fixture type and delta watts can be inferred with appropriate accuracy from the similar retrofits on the larger projects, for which the data is available or can be generated by limited market studies. PECO also recommends that the TRM allow use of stipulated operating hours and coincidence factors for projects with up to 100 kW savings. (PECO comments at 3.)

**Disposition**

A new prescriptive lighting table is now included in the revised Appendix C, which can be utilized to estimate savings for small, simple projects under 20 kW in savings. This new table strikes a balance between reducing customer burden and the need for credible determination of savings by allowing customers to self-certify baseline conditions without requiring additional implementation costs.

The new prescriptive table in Appendix C uses values which are derived from specific design configurations and is both transparent and appropriate for smaller projects. It allows customers to self-certify their baseline lighting systems without conducting a detailed lighting audit. The previous Table 12 was neither transparent nor credible in assessing saving because it assumed a baseline derived from data from New Jersey between 1995 and 1999 and the potential variations in ballasts were not addressed. The revised Appendix C retains an appropriate role for evaluation in accessing real savings while facilitating flexibility in program design and marketing. Prescribed baseline options for the customer include T-12 fixtures with electronic ballasts, T-12 fixtures with energy efficient magnetic ballasts, probe start metal halide fixtures, and others. The distinction between baseline T12 systems is particularly important because T-12 systems with electronic ballasts result in dramatically less savings than T-12 systems with magnetic ballasts. Electronic ballasts have become more accepted since the data from New Jersey was assembled between 1995 and 1999.

If the customer misallocates or incorrectly certifies their baseline, the evaluators may catch the errors on random pre-installation inspections and adjust the realization rates programmatically so the implementation process is minimally affected. The application process can then be designed as the EDCs see fit, taking whatever risk on the realization rates they choose as long as random access by evaluators and the SWE to pre‑installation inspections is facilitated.

**J. Additional CFL and Other Lighting Classifications in Appendix C**

Several Energy Star certified spiral CFLs and certain other lighting retrofit options are not included in the Expanded Prescriptive Lighting Wattage Table in Appendix C of the proposed 2010 TRM.

**Comments**

Allegheny Power requests that all Energy Star certified Spiral CFL wattages be included in the Expanded Prescriptive Lighting Wattage Table in Appendix C of the 2010 TRM. (Allegheny Power comments at 6) Duquesne further notes that screw in compact fluorescents (CFLs) do not always match the Description in Appendix C that show hard wired fixtures, additional CFL lamps are necessary for 13 watt and 26 watt spiral lamps, additional lamps are needed for Display Lighting, Cold Cathode Fluorescent Lamps 2w, 3w, 5w, 8w, 13w, and 18w, additional lamps are needed for Display Lighting, Screw-in CFL Relector-R20, R30, and R40 lamps (14-26 watts), and no LED lighting technologies are addressed. (Duquesne comments at 5.)

**Disposition**

The Commission agrees that Appendix C must be modified to accept current Energy Star certified Spiral CFL wattages. In addition, proven technologies suggested by Duquesne on pages 5and 6 of their comments are incorporated in Appendix C. Cold Cathode and LED lighting technologies will be reviewed and addressed by the interim measure review process.

**K. Dusk-to-Dawn Lighting**

Values for dusk-to-dawn lighting do not appear in the proposed 2010 TRM. First Energy and PECO support the inclusion of dusk-to-dawn values in Table 6-6 of the 2010 TRM. (PECO comments at 4 and FirstEnergy reply comments at 2.)

**Comments**

For dusk-to-dawn lighting values, FirstEnergy recommends 4,300 Equivalent Full Load Hours (EFLH) and 0% CF. PECO originally suggested 4,100 EFLH but supports a value of 4,300 EFLH. (FirstEnergy reply comments at 2 and PECO reply comments at 1.)

**Disposition**

The Commission has added a new row in Table 6-6 of the 2010 TRM that will specify an EFLH of 4,300 and 0% CF for dusk-to-dawn lighting.

**L. Usage Group Requirement for Lighting Retrofits**

The minimum number of usage groups for different building types provided in Table 6-1 could potentially serve as a barrier to certain retrofit lighting measures. Retrofit lighting measures can provide significant energy savings but often focus on a limited number of the most cost-effective usage groups.

**Comments**

PECO has identified this as one area where it believes the updated TRM could add clarity. It recommends that the minimum number of usage groups be modified so that even single space use retrofit lighting measures can be easily calculated. (PECO comments at 3.)

**Disposition**

The Commission has modified the TRM to allow less than the minimum number of usage groups for projects over 50 kW in savings when the operation of the portion of the lighting system subject to modification can reasonably be estimated using fewer than the required number of usage groups because of the narrow focus of the installation.

**M. Use of Automated Electronic Processes**

The market has developed in the last few years tools to capture and analyze the performance of HVAC systems. These tools provide energy efficiency and unit reliability diagnostic advice to the technician concerning what they should do next during unit service. Data acquisition from these systems can be electronically transported back to validation servers so that the data can be certified against any specific program rules. This process is data driven and there is no human manipulation of the data.

**Comments**

Field Diagnostics recommends that the Commission encourage the utilities to adopt automated electronic processes as the alternative to physical data capture. They suggest that the TRM define tools that support the above process. (Field Diagnostics comments at 1and 2.) PECO does not support the recommendation of Field Diagnostic Service to include a “bank grade process” for the collection and transmission of HVAC diagnostic data in the TRM. PECO believes that the Technical Working Group (TWG) that the Commission has convened to address issues related to custom analyses of energy savings is the appropriate venue to address custom HVAC diagnostics and establish specific protocols for data collection. (PECO reply comments at 3.)

**Disposition**

The Commission encourages the EDCs to use cost-effective and efficient data collection and analysis tools, where appropriate to capture pertinent information, but we will not specify specific types of automated tools or software to accomplish these tasks.

**N. Fuel Substitution**

Substituting natural gas for electricity was proposed by PECO and PPL in their Act 129 programs, and UGI supports fuel substitution.

**Comments**

UGI commented that it would be appropriate to at least provide some guidance in the TRM concerning fuel switching programs proposed by PECO and PPL. UGI also believes the Commission should reaffirm in the TRM that the focus of Act 129 and Total Resource Cost testing is not on particular technologies but rather on bottom line energy efficiency and demand reduction. They also suggest that the TRM should clarify that the electric energy and demand savings associated with fuel substitution programs should be evaluated in the same manner as other energy efficiency measures are evaluated. (UGI comments at 3-5.)

Allegheny Power, First Energy and PECO do not support UGI’s recommendations. Allegheny Power submits that UGI’s comments are premature because the fuel switching working group’s final report has been. Allegheny Power suggests that in the event that fuel switching is determined to be acceptable by the Commission as a result of the fuel switching working group recommendation, then Allegheny Power suggests that the TRM should provide the specific instructions on any fuel switching measures needed to support complete cost-effectiveness testing of any proposed fuel switching programs. (Allegheny Power reply comments at 1and 2.)

FirstEnergy suggests that the adoption of UGI’s suggested language introduces issues addressed in the Total Resource Cost test that are not appropriate to be included in the TRM. FirstEnergy believes UGI’s suggested language would improperly modify the scope of the TRM to include policy statements related to the Total Resource Cost test and should be rejected. (FirstEnergy reply comments at 4 and 5.)

PECO does not support the recommendation of UGI to include specific guidance regarding fuel switching programs in the TRM. PECO believes it is appropriate to wait until the fuel switching working group report is available before addressing the issue in the TRM. (FirstEnergy reply comments at 2.)

**Disposition**

The Commission agrees with Allegheny Power, FirstEnergy and PECO that it would be premature to address fuel switching in the TRM before the fuel switching working group’s final report has been released and the Commission gives further direction.

**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 2010 Technical Reference Manual update contained in the Annex to this Order is adopted and replaces all prior versions of the Technical Reference Manual as of the entry date of this Order.

2. That the 2010 TRM Update be applicable retroactively to measures installed in the program year beginning June 1, 2009. Future TRM revisions will not be retroactive, unless so specified by the Commission. EDCs may file a petition for a waiver of specific items in the 2010 TRM Update that are being applied retroactively.

3. That the Bureau of Conservation, Economics and Energy Planning, in conjunction with the Statewide Evaluator conduct appropriate research to determine at what level the coincidence factor for residential lighting should be set to be proposed in a subsequent TRM update.

4. That a copy of this Order and Annex 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.

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

6. That this Order and Annex, as well as supporting data be published on the Commission’s website.

**BY THE COMMISSION**

Rosemary Chiavetta

Secretary

(SEAL)

ORDER ADOPTED: June 3, 2010

ORDER ENTERED: June 8, 2010

**Annex**

1. Order entered on October 3, 2005, under the above‑referenced caption and Docket Number. [↑](#footnote-ref-1)
2. *Id*. at page 13. [↑](#footnote-ref-2)
3. 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-3)
4. See page 13 of *Implementation Order* at Docket No. M‑2008‑2069887, entered January 16, 2009. [↑](#footnote-ref-4)
5. *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-5)
6. *Id*. at pages 17 and 18. [↑](#footnote-ref-6)
7. 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-7)
8. See the Tentative Order entered on February 2, 2010, under the same caption and docket number. [↑](#footnote-ref-8)
9. See pages 47 and 48 of the 2009 TRM. [↑](#footnote-ref-9)
10. This document, the "Massachusetts Statewide Technical Reference Manual for Estimating Savings from Energy Efficiency Measures", is located on the Massachusetts Energy Efficiency Advisory Council website at <<http://www.ma-eeac.org/docs/091023-MA-TRMdraft.pdf>>. The Summer Peak CF cited on page 15 should not be adopted without additional review, but still contributes evidence toward a lower range for the CF. [↑](#footnote-ref-10)