# State of Illinois

# Energy Efficiency

# Technical Reference Manual

## Effective:

## Friday, June 1st, 2012

**Version:**

**June 6, 2012 with some of the July 18th changes incorporated**

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## Acknowledgements

This document was created over the course of a six-month collaboration amongst the members of the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). The SAG is an open forum where interested parties may participate in the evolution of Illinois' energy efficiency programs. Parties wishing to participate in the SAG process may do so by visiting www.ilsag.org/questions and contacting the Independent Facilitator at Annette.beitel@futureenergyenterprises.biz.

| SAG Stakeholders |
|---|
| Ameren Illinois Company (Ameren) |
| Center for Neighborhood Technology (CNT) |
| Citizen's Utility Board (CUB) |
| City of Chicago |
| Commonwealth Edison Company (ComEd) |
| Energy Resources Center at the University of Illinois, Chicago (ERC) |
| Environment IL |
| Environmental Law and Policy Center (ELPC) |
| Future Energy Enterprises LLC |
| Illinois Attorney General's Office (AG) |
| Illinois Commerce Commission Staff (ICC Staff) |
| Illinois Department of Commerce and Economic Opportunity (DCEO) |
| Independent Evaluators (Navigant and Opinion Dynamics Corporation) |
| Integrys (Peoples Gas and North Shore Gas) |
| Metropolitan Mayor's Caucus (MMC) |
| Midwest Energy Efficiency Association (MEEA) |
| ~~National~~ Natural Resources Defense Council (NRDC) |
| Nicor Gas |
| Shaw Environmental |

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**Table 1.1: Revision History**

| # | Document Title | Date | Applicable to PY Beginning |
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# 1 Purpose of the TRM

The purpose of this Technical Reference Manual (TRM) is to provide a transparent and consistent basis for calculating energy (kilowatt-hours (kWh) or therms) and capacity (kW) savings generated by the State of Illinois' energy efficiency programs[1]. To this end, the Vermont Energy Investment Corporation (VEIC) was retained by the Illinois Energy Association (IEA) on behalf of the Department of Commerce and Economic Opportunity (DCEO) and the state's electric and gas utilities[2] (collectively, Program Administrators) to prepare this TRM for statewide use.

The TRM is a policy document that is filed with the Illinois Commerce Commission (ICC) for approval, and is intended to fulfill a series of objectives, including:

- "Serve as a common reference document for all utilities, stakeholders, ~~Utilities / Program Administrators~~[3] implementers, and the Commission, so as to provide transparency to all parties regarding savings assumptions and calculations and the underlying sources of those assumptions and calculations.
- Support the calculation of the Illinois Total Resource Cost test[4] (TRC), as well as other cost-benefit tests in support of program design, evaluation and regulatory compliance. Actual cost-benefit calculations and the calculation of avoided costs will not be part of this TRM.
- Identify gaps in robust, primary data for Illinois, that can be addressed via evaluation efforts and/or other targeted end-use studies.
- …[Contain] a process for periodically updating and maintaining records, and preserve a clear record of what deemed parameters are/were in effect at what times to facilitate evaluation and data accuracy reviews.
- Provide standard protocols for determining energy savings for some common custom projects, as appropriate.[5]"
- "…[S]~~s~~upport coincident peak capacity (for electric) savings estimates and calculations for electric ~~Program Administrator~~utilities in a manner consistent with the methodologies employed by the ~~Program Administrator~~utility's Regional Transmission Organization ("RTO"), as well as those necessary for statewide Illinois tracking of coincident peak capacity impacts."[6][7]

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1 Specifically, this TRM has been developed to help determine compliance with the energy efficiency requirements of the Illinois Public Utilities Act (220 ILCS 5), Sections 8-103 and 8-104 (http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=1277&ChapterID=23)

2 In addition to DCEO, the ~~utilities~~ Program Administrators include~~;~~ : Ameren Illinois, ComEd, Peoples Gas, ~~Peoples~~ North Shore Gas, and NICOR.

~~3 The Illinois Utilities subject to this TRM include: Ameren Illinois Company d/b/a Ameren Illinois (Ameren), Commonwealth Edison Company (ComEd), The Peoples Gas Light and Coke Company and North Shore Gas Company (Integrys), and Northern Illinois Gas Company d/b/a Nicor Gas (Nicor).~~

4 The Illinois TRC test is defined in 220 ILCS 5/8-104(b) and 20 ILCS 3855/1-10.

~~5 Illinois Statewide Technical Reference Manual Request for Proposals, August 22nd, 2011, pages 3-4, "TRM_RFP_Final_part_1.230214520.pdf"~~

6 Illinois Statewide Technical Reference Manual Request for Proposals, August 22, 2011, pages 3-4, http://ilsag.org/yahoo_site_admin/assets/docs/TRM_RFP_Final_part_1.230214520.pdf

~~7 Ibid.~~

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- Provide a standardized, statewide methodology for calculating prescriptive energy and capacity savings, which gives independent evaluators a consistent framework from which to evaluate the savings achieved for the Illinois energy efficiency portfolios.

## 1.1 Enabling ICC Policy

This Illinois Statewide Technical Reference Manual (TRM) was developed to comply with the Illinois Commerce Commission (ICC or Commission) Final Orders from the electric and gas Utilities'[8] Energy Efficiency Plan dockets. In the Final Orders, the ICC required the utilities to work with DCEO and the SAG to develop a statewide TRM. *See, e.g.,* ComEd's Final Order *(Docket No. 10-0570, Final Order[9] at 59-60, December 21, 2010);* Ameren's Final Order *(Docket No. 10-0568, Order on Rehearing[10] at 19, May 24, 2011);* Peoples Gas/North Shore Gas' Final Order *(Docket No. 10-0564, Final Order[11] ~~on Rehearing~~[12] at 76~~19~~, May 24, 2011),* and Nicor's Final Order *(Docket No. 10-0562, Final Order[13] at 30, May 24, 2011).*

As directed in the Utilities' Efficiency Plan Orders, the SAG had the opportunity to, and also participated in, every aspect of the development of the TRM. Interested members of the SAG participated in weekly teleconferences to review, comment, and participate in the development of the TRM. The active participants in the TRM were designated as the "Technical Advisory Committee" (TAC). The TAC participants were representatives from the following organizations: the utilities (ComEd, Ameren IL, NICOR, Peoples Gas/North Shore Gas), DCEO, the Illinois Attorney General's Office (AG), Natural Resources Defense Council (NRDC), the Environmental Law and Policy Center (ELPC), the Citizen's Utility Board, CNT Energy, the independent evaluators (Navigant and Opinion Dynamics Corporation), The University of Illinois at Chicago, and ICC Staff.

## 1.2 Development Process

The measure characterizations in this TRM are the result of a quantitative and qualitative analysis. The quantitative analysis took the form of a dynamic spreadsheet model of the engineering algorithms for measure level savings. These models were used to perform a sensitivity analysis on all of the algorithms' parameters, and have been reviewed weekly with the TAC during the December 2011 through May 2012 timeframe. VEIC has also presented status updates of the TRM at monthly large-group SAG meetings. The qualitative analysis includes the results of the quantitative analysis, and the result is the written measure characterizations in this document which are supported by referencing source documents for each of the parameters within the savings algorithm.

This document is a result of an ongoing review process involving the Illinois Commerce Commission ~~(ICC)~~ Staff (Staff or ICC Staff), the Utilities, DCEO, the Evaluators, the SAG TAC, and the SAG. VEIC met with the SAG and/or the TRM TAC weekly beginning in December 2011 through May 2012 to create a high level of transparency and vetting in the development of this TRM. The purpose of the weekly reviews was to maximize the level of collaboration and visibility into the measure characterization process. Where consensus did not emerge on specific measures or issues, this TRM contains VEIC's recommended approach along with source documentation and rationale. In keeping with the goal of transparency, a summary of the comments and their status to-date has been compiled under a separate cover.

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[8] The Illinois Utilities subject to this TRM include: Ameren Illinois Company d/b/a Ameren Illinois (Ameren), Commonwealth Edison Company (ComEd), The Peoples Gas Light and Coke Company and North Shore Gas Company (Integrys), and Northern Illinois Gas Company d/b/a Nicor Gas (Nicor).
[9] http://www.icc.illinois.gov/docket/files.aspx?no=10-0570&docId=159809
[10] http://www.icc.illinois.gov/docket/files.aspx?no=10-0568&docId=167031
[11] http://www.icc.illinois.gov/docket/files.aspx?no=10-0564&docId=167023
[12] ~~http://www.icc.illinois.gov/docket/files.aspx?no=10-0568&docId=167031~~
[13] http://www.icc.illinois.gov/docket/files.aspx?no=10-0562&docId=167027

The VEIC analytical team noticed that many of the existing measures in Illinois represent discrete cases within a range of measure possibilities across Market Sectors, End Uses, Measures & Technologies, Programs and Fuels. This document has consolidated these measures in such a way that discrete measures can be captured within a more generalized format where only individual parameters in the savings algorithm need to be changed to arrive at the savings claim for a discrete case. Finally, the measure titles used in this TRM may not match exactly the titles that the Utilities or DCEO efficiency programs use. However, in future filings at the ICC, the Program Administrators will use the Measure Codes described in Table 2.2 to allow for easy review and transparency across programs and portfolios. An organizational structure, described in the next section, gives details about how measures are grouped, categorized, and described.

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# 2 Using the TRM

For each measure characterization, this TRM includes engineering algorithm(s) and a value(s) for each parameter in the equation(s)[14]. These parameters have values that fall into one of three categories: a single deemed value, a lookup table of deemed values or an actual value such as the capacity of the equipment. The TRM makes extensive use of lookup tables because they allow for an appropriate level of measure streamlining and customization within the context of an otherwise prescriptive measure.

Accuracy is the overarching principle that governs what value to use for each parameter. When it is explicitly allowed within the text of the measure characterization, the preferred value is the actual or on-site value for the individual measure being implemented. The *deemed values*[15] in the lookup tables are the next most accurate choice, and in the absence of either an actual value or an appropriate value in a lookup table, the single, *deemed value* should be used. As a result, this single, *deemed value* can be thought of as a default value for that particular input to the algorithm.

A single *deemed savings estimate* is produced by any given combination of an algorithm and the allowable input values for each of its parameters. In cases where lookup tables are provided, there is a range of deemed savings estimates that are possible, depending on site-specific factors such as equipment capacity, location and building type.

Algorithms and their parameter values are included for calculating estimated:

- Gross annual electric energy savings (kWh)
- Gross annual ~~fossil fuel~~natural gas energy savings (therms)
- Gross electric summer coincident peak demand savings (kW)

To support cost-effectiveness calculations, parameter values are also included for:

- Incremental costs ($)
- Measure life (years)
- Operation and maintenance costs ($)
- Water (gal) and other resource savings where appropriate.

To facilitate the use of the TRM as measures are revised, updated, and removed, a unique code is provided for each measure that identifies the measure and the applicable installed program year.

[14] As noted in the RFP, the net-to-gross ratios are provided by the evaluators and are listed in the appendices.

[15] Emphasis has been added to denote the difference between a "deemed value" and a "deemed savings estimate". A deemed value refers to a single input value to an algorithm, while a deemed savings estimate is the result of calculating the end result of all of the values in the savings algorithm.

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## 2.1 Organizational Structure

The organization of this document follows a three-level format, each of which is a major heading in the Table of Contents. These levels are designed to define and clarify what the measure is and where it is applied.

1. **Market Sectors**[16]
   - This level of organization specifies the type of customer the measure applies to, either Commercial and Industrial or Residential.
   - Answers the question, "What category best describes the customer?"

2. **End-use Category**
   - This level of organization represents most of the major end-use categories for which an efficient alternative exists. The following table lists all of the end-use categories in this version of the TRM.
   - Answers the question, "To what end-use category does the measure apply?"

**Table 2.1: End-Use Categories in the TRM**[17]

| Residential Market Sector | Commercial and Industrial Market Sector |
|---|---|
| Appliances | Agricultural Equipment |
| Consumer Electronics | Food Service Equipment |
| Hot Water | Hot Water |
| HVAC | HVAC |
| Lighting | Lighting |
| Shell | Miscellaneous |
| | Refrigeration |

3. **Measure & Technology**
   - This level of organization represents individual efficient measures such as CFL lighting and LED lighting, both of which are individual technologies within the Lighting end-use category.
   - Answers the question, "What technology defines the measure?"

This organizational structure is silent on which fuel the measure is designed to save; electricity or natural gas. By organizing the TRM this way, measures that save on both fuels do not need to be repeated. As a result, the TRM will be easier to use and to maintain.

[16] Note that the Public sector ~~Building~~ buildings and low income measures that DCEO administers are not listed as a separate Market Sector. ~~This~~ The Public building type is one of a series of building types that are included in the appropriate measures in the ~~Non-Residential~~Commercial and Industrial Market Sector.

[17] Please note that this is not an exhaustive list of end-uses and that others may be included in future versions of the TRM.

## 2.2 Measure Code Specification

In order to uniquely identify each measure in the TRM, abbreviations for the major organizational elements of the TRM have been established. When these abbreviations are combined and delimited by a dash ('-') a unique, 18-character alphanumeric code is formed that can be used for tracking the measures and their associated savings estimates. Measure codes appear at the end of each measure and are structured using five parts.

**Code Structure = Market + End-use Category + Measure + Version # + Effective Date**

For example, the commercial boiler measure is coded: "CI-HVC-BLR_-V01-120601"

**Table 2.2: Measure Code Specification Key**

| Market (@@) | End-use (@@@) | Measure (@@@@) | Version (V##) | Effective Date |
|---|---|---|---|---|
| CU (Custom) | AGE (Agricultural Equipment) | BLR_ | V01 | YYMMDD |
| CI (C&I) | APL (Appliances) | T5F_ | V02 | YYMMDD |
| RS (Residential) | CEL (Consumer Electronics) | T8F_ | V03 | YYMMDD |
| | FSE (Food Service Equipment) | ~~Etc~~... | … | … |
| | HVC (HVAC) | | | |
| | HW_ (Hot Water) | | | |
| | LTG (Lighting) | | | |
| | MSC (Miscellaneous) | | | |
| | RFG (Refrigeration) | | | |
| | SHL (Shell) | | | |

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**Comment [Jen6]:** 7/30/12 Delete? Is this used when TRM measure implemented on custom or customized input basis?

## 2.3 Components of TRM Measure Characterizations

Each measure characterization uses a standardized format that includes at least the following components. Measures that have a higher level of complexity may have additional components, but also follow the same format, flow and function.

**DESCRIPTION**

**DEFINITION OF EFFICIENT EQUIPMENT**

**DEFINITION OF BASELINE EQUIPMENT**

**DEEMED LIFETIME OF EFFICIENT EQUIPMENT**

**DEEMED MEASURE COST**

**DEEMED O&M COST ADJUSTMENTS**

**LOADSHAPE**

**COINCIDENCE FACTOR**

**Algorithm**

**CALCULATION OF ENERGY SAVINGS**

**ELECTRIC ENERGY SAVINGS**

**SUMMER COINCIDENT PEAK DEMAND SAVINGS**

**NATURAL GAS SAVINGS**

**WATER IMPACT DESCRIPTIONS AND CALCULATION**

**DEEMED O&M COST ADJUSTMENT CALCULATION**

**MEASURE CODE**

## 2.4 Applying Deemed Incremental Costs to Measure Screening

~~Each~~ Most measure~~s~~ include~~s~~ at least one deemed incremental cost(s) ~~for each measure~~ as a default value(s). However, Direct Install programs may have better information on the true incremental cost of their measures. In instances like this, program administrators may use their own, custom incremental cost value for the purposes of measure screening subject to the requirement that it document the decision in its reporting, bring the results to the SAG for its review and submit the change to the TRM Update Procedure during the next update cycle.

## 2.5 Parameter Input Tables

Many of the measures in this TRM require the user to select the appropriate input value from a list of inputs for a given parameter in the savings algorithm. Where the TRM asks the user to select the input, look~~-~~up tables of allowable values are provided. For example, a set of input parameters may depend on building type; while a range of values may be given for each parameter, only one value is appropriate for any specific building type. If no table of alternative inputs is provided for a particular parameter, then the single deemed value will be used, unless the entire measure is implemented on a custom basis.

## 2.6 Measure Expansion Protocol for Custom Application of TRM Measures

A TRM measure may be treated as a "Custom" rather than a "Prescriptive" measure as long as the measure is treated as a custom measure on a consistent basis within the program in question. In such cases where otherwise prescriptive measures within the TRM are implemented on a custom basis, the Measure Expansion Protocol must be applied as described in detail in Section 8.

## 2.7 Program Delivery & Baseline Definitions

The measure characterizations in this TRM are not grouped by program delivery type~~, which is a common approach in other states~~. As a result, the measure characterizations provided include information and assumptions to support savings calculations for the range of program delivery options commonly used for the measure. The organizational significance of this approach is that multiple baselines, incremental costs, O&M costs, measure lives and in-service rates are included in the measure characterization(s) that are delivered under two or more different program designs. Values appropriate for each given program delivery type are clearly specified in the algorithms or in look~~-~~up tables within the characterization.

Care has been taken to clearly define in the measure's description the types of program delivery that the measure characterization is designed to support. However, there are no universally accepted definitions for a particular program type, and the description of the program type(s) may differ by measure. Nevertheless, program delivery types can be generally defined according to the following table. These are the definitions used in the measure descriptions, and, when necessary, individual measure descriptions may further refine and clarify these definitions of program delivery type.

**Table 2.3: Program Delivery Types**

| Program | Attributes |
|---|---|
| Time of Sale (TOS) | Definition: A program in which the customer is incented to purchase or install higher efficiency equipment than if the program had not existed. This may include retail rebate (coupon) programs, upstream buydown programs, online store programs, contractor based programs, or CFL giveaways as examples.<br>Baseline = New equipment.<br>Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice.<br>Example: CFL rebate |
| New Construction (NC) | Definition: A program that intervenes during building design to support the use of more-efficient equipment and construction practices.<br>Baseline = Building code or federal standards.<br>Efficient Case = The program's level of building specification<br>Example: Building shell and mechanical measures |
| Retrofit (RF) | Definition: A program that *upgrades* existing equipment before the end of its useful life.<br>Baseline = Existing equipment or the existing condition of the building or equipment. A single baseline applies over the measure's life.<br>Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice.<br>Example: Air sealing and insulation. |
| Early Replacement (EREP) | Definition: A program that *replaces* existing equipment before the end of its expected life.<br>Baseline = Dual; it begins as the existing equipment and shifts to new baseline equipment after the expected life of the existing equipment is over.<br>Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice.<br>Example: Refrigerators, fFreezers |
| Early Retirement (ERET) | Definition: A program that *retires* duplicative equipment before its expected life is over.<br>Baseline = The existing equipment, which is retired and not replaced.<br>Efficient Case = Zero because the unit is retired.<br>Example: Appliance recycling |
| Direct Install (DI) | Definition: A program where measures are installed during a site visit.<br>Baseline = Existing equipment.<br>Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice.<br>Example: Lighting and low-flow hot water measures |

The concept and definition of the baseline is a key element of every measure characterization and is directly related to the program delivery type. Without a clear definition of the baseline, the savings algorithms cannot be adequately specified and subsequent evaluation efforts would be hampered. As a result, each measure has a detailed description (and in many cases, specification) of the specific baseline that should be used to calculate savings. Baselines in this TRM fall into one of the following five categories, and are organized within each measure characterization by the program delivery type to which it applies.

1. **Building Code:** As defined by the minimum specifications required under state energy code or applicable federal standards.

2. **Existing Equipment**: As determined by the most representative (or average) example of equipment that is in the existing stock. Existing equipment baselines apply over the equipment's remaining useful life.

3. **New Equipment**: As determined by the equipment that represents standard practice in the current market environment. New equipment baselines apply over the effective useful life of the measure.

4. **Dual Baseline**: A baseline that begins as the eExisting eEquipment and shifts to nNew eEquipment after the expected life of the existing equipment is over.

5. **Zero Baseline**: A baseline that is applicable to early retirement measures where the existing equipment is no longer in service.

**Comment [Jen7]:** 7/30/12 There is no zero baseline in previous table (2.3)

## 2.8 High Impact Measures

Measures that are expected to collectively account for at least 80% of statewide energy savings are considered high impact measures. The following tables list these measures and show the section in which they may be found.

**Table 2.4: Commercial and Industrial High Impact Measures**

| Section | End-use | Technology / Measure |
|---|---|---|
| 6.2.3 | Food Service | Commercial Steam Cooker |
| 6.2.11 | Food Service | High Efficiency Pre-Rinse Spray Valve |
| 6.4.3 | HVAC | Process Boiler Tune-up |
| 6.4.4 | HVAC | Boiler Lockout/Reset Controls |
| 6.4.10 | HVAC | High Efficiency Boilers |
| 6.4.11 | HVAC | High Efficiency Furnace |
| 6.4.15 | HVAC | Steam Trap Replacement or Repair |
| 6.4.16 | HVAC | Variable Speed Drives for HVAC |
| 6.5.1 | Lighting | CFL |
| 6.5.2 | Lighting | ILED |
| 6.5.3 | Lighting | High Performance T8 Fixtures and Lamps |
| 6.5.4 | Lighting | T5 |
| 6.5.5 | Lighting | Lighting Controls |
| 6.6.6 | Lighting | Lighting Power Density Reduction |
| 6.5.7 | Lighting | LED Traffic and Pedestrian Signals |
| 6.3.4 | Hot Water | Tankless Water Heater |

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**Table 2.5: Residential High Impact Measures**

| Section | End-use | Technology / Measure |
|---|---|---|
| 7.1.2 | Appliances | Clothes Washer |
| 7.1.8 | Appliances | Refrigerator & Freezer Recy. |
| 7.4.2 | Hot Water | Gas Water Heater |
| 7.4.3 | Hot Water | Heat Pump Water Heater |
| 7.4.4 | Hot Water | Low Flow Faucet Aerator |
| 7.4.5 | Hot Water | Low Flow Showerhead |
| 7.3.1 | HVAC | Air Source Heat Pump |
| 7.3.2 | HVAC | Central Air Conditioning |
| 7.3.4 | HVAC | Furnace Blower Motor |
| 7.3.5 | HVAC | Gas High Efficiency Boiler |
| 7.3.6 | HVAC | Gas High Efficiency Furnace |
| 7.3.10 | HVAC | Programmable Thermostats |
| 7.5.5 | Lighting | LED Downlights |
| 7.5.2 | Lighting | Specialty CFL |
| 7.5.1 | Lighting | Standard CFL |
| 7.6.1 | Shell | Air Sealing |
| 7.6.2 | Shell | Basement Sidewall Insulation |
| 7.6.4 | Shell | Wall and Ceiling Insulation |
| ~~7.6.4~~ | ~~Shell~~ | ~~Wall and Ceiling Insulation~~ |

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# 3 Policies for Applying the TRM to Energy Efficiency Programs

This section defines the policies various stakeholders will follow to apply the TRM in the implementation, evaluation, and planning of Illinois Energy Efficiency programs.

## 3.1 Submitting the TRM to the ICC

The TRM will be submitted to the ICC annually and may take the form of a joint filing on the part of DCEO, the Utilities and participating members of the SAG.

## 3.2 SAG Consensus on TRM Development

Each Utility's Order enables it to implement energy efficiency programs and also provides guidance concerning the TRM. Generally speaking, these Orders describe the TRM's creation and maintenance as being a collaborative process between the Utilities (who in this context are also efficiency Program Administrators[18]), DCEO and the SAG.

As a result and as a document that applies statewide, the TRM has been and will continue to be developed through a collaborative consensus using the SAG process[19]. In practice, this means that the TAC will work toward consensus on the issue first, and then bring the result to the larger SAG for its review and comment. Once consensus develops at the SAG level, the TRM Administrator will include the changes in the next version of the TRM[20].

In cases where consensus does not emerge out of the SAG process, the TRM Administrator will include its recommended resolution to the issue in the next filed TRM, and until the ICC resolves the issue, the Program Administrators may proceed with their preferred program and measure implementation. In addition, the document filed with the ICC will include a "Comparison Exhibit" that clearly lays out the different positions on non-consensus issues, and, to the extent possible, identify the parties who support each position.

## 3.3 Applicability of the TRM

Consistent with Commission policy, the Program Administrators have the flexibility to add or retire measures from their programs unilaterally as markets, technology and evaluation results change. Therefore, Program Administrators are free to implement prescriptive measures that are not included in the TRM as long as such measures are submitted to the TRM update procedure. Similarly, Program Administrators are not required to implement every measure that is included in the TRM.

## 3.4 Using the TRM to Calculate Savings

The TRM is intended to bring a high level of standardization to the measure savings that each Program Administrator (Utilities and DCEO) uses across the state. To accomplish the goal of statewide standardization, Program Administrators are required to use the prescriptive savings algorithms and input values that are provided

[18] Note that DCEO is also a Program Administrator who was enabled to operate programs by the energy efficiency legislation.

[19] As with all aspects of the TRM, this is true unless the Commission determines otherwise.

20 The TRM Administrator's role has not been firmly established, but its role as described herein has been reviewed and accepted by the SAG and Staff.

in the TRM, subject to the following three exceptions.

1. The measure savings are being calculated on a custom basis.

A Program Administrator can choose to implement a TRM measure as a custom measure. Just because a measure is in the TRM does not mean that a Program Administrator must calculate savings for that measure prescriptively. The Program Administrator may choose to implement a measure through its own custom program, calculate savings using actual or on-site parameter values. However, once a measure is implemented on a custom basis within a particular program, all instances of the measure within that program must be implemented on a custom basis. Also, prior to treating a TRM measure as a custom measure in a particular program, the Program Administrators will notify the TAC, and the treatment of the measure as a custom versus a prescriptive measure will be discussed during the TRM Update Procedure during the next update cycle.

2. The measure does not yet exist in the TRM.

In this case, the Program Administrator is free to use algorithms and/or input values that do not yet appear in the TRM after discussing the new measure with the TAC. The Program Administrator shall provide to the TAC and TRM Administrator the Components of the TRM Measure Characterization contained in Section 2.3, and also work papers in the approved format. The results will be subject to the usual evaluation and ICC review requirements, and the new measure must be submitted to the TRM Update Procedure during the next update cycle.

3. The TRM measure definition or prescriptive savings inputs do not correctly characterize a measure that is already implemented in an existing program.

Through the TRM development process, the TAC attempted to identify all of the measures that are currently being implemented in programs. The TAC also worked to ensure that the prescriptive savings inputs describe how the measure is being implemented in all of the current programs. However, the measures or prescriptive savings inputs in the TRM may differ from how the measure is actually being implemented in a particular program, especially over time as programs and markets evolve. If the TRM measure or prescriptive savings inputs do not match how a measure~~s~~ is implemented in an existing program, the utilities and DCEO may modify savings inputs as long as the TAC is notified of the change prior to the utility using the modified savings inputs, and the measure definition change and/or modified prescriptive inputs are submitted to the TRM Update Procedure during the next update cycle.

In cases where the Program Administrator feels that it has a strong and documented case for calculating the prescriptive measure savings based on its own prescriptive savings inputs and algorithms that differs from prescriptive savings inputs and algorithms contained in the TRM, it must first submit its case to the TAC with the measure characterization and work papers and to the TRM Update Procedure for possible inclusion in a subsequent version of the TRM. For example, the Program Administrator may have undertaken a new evaluation study that provides a new parameter value that is better supported or more applicable to the local conditions.

For Cases 1 – 3 above, the utilities will present for comment to the TAC prior to using a value that is not in the TRM, and also submit the alternate value to the TRM Update Procedure during the next update cycle. At least ten (10) business days prior to presenting Cases 1 – 3 to the TAC, the Program Administrator shall submit to the TRM Administrator and the SAG Facilitator the measure characterization and work papers in the approved work paper format so that the TAC has adequate time to meaningfully review and comment on the proposed variation to the TRM applicability. Furthermore, utilities bear retrospective risk if the ICC does not agree with measure values, including prescriptive savings inputs, used by the utilities that differ from what is in the TRM.

### 3.4.1 TRM Mistakes

If a significant mistake is found in the TRM that results in an unreasonable savings estimate, the Program

Administrator(s), Evaluators, TRM Administrator, and SAG will strive to reach consensus on a solution that will result in a reasonable savings estimate. For example, an unreasonable savings estimate may result from an error or omission in the TRM, or an assumption in the TRM that is found to differ significantly from actual program findings. In only these limited cases where there is consensus that the TRM contains a significant mistake will TRM updates occur within a program year and outside of the TRM update schedule defined in Section 4.

In these limited cases, Evaluators will use corrected TRM algorithms and inputs to calculate energy and capacity savings. Otherwise, errors found in the TRM will be officially corrected through the annual TRM Update Process. Program Administrators should provide sufficient justification for using the alternate solution within a memo to the SAG/TAC for comment prior to using the alternate measure or prescriptive savings assumption. This documentation will also be used for the TRM update process.

## 3.5 The TRM's Relationship to Portfolio Evaluation

Program Administrators will update their tracking systems and other program delivery systems to collect and track appropriate data needed to support TRM application. Program Administrators, with input from the TAC, will collaborate with Evaluators prior to the start of each program year to define data collection to support TRM application and updating, while minimizing unnecessary cost and burden on Program Administrators, Evaluators and customers. However, Evaluators are not obligated to support TRM updating if such work is not within the Evaluator's budget or would compromise their primary goal of measuring portfolio and program savings verification.

Evaluators shall perform *savings verification* (see glossary section) and present savings estimates based on TRM values within the evaluation reports of the Utilities' and DCEO's energy efficiency portfolios. Evaluators shall perform net-to-gross research consistent with utility orders. Additionally, where possible based on available budgets, the Evaluators may also perform *measure* and/or *program level research* (see glossary section). Savings verification values and, where present, measure or program level research shall be provided in the annual independent evaluation report required pursuant to 220 ILCS 5/8-103(f)(7) and 220 ILCS 5/8-104(f)(8), although each will be presented in separate sections of the report. Evaluation results for each Utility will be applied in accordance with the ICC Orders approving that Utility's energy efficiency plan.

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For savings verification, evaluators will estimate energy and capacity savings for prescriptive measures as the product of participants, quantities, net-to-gross ratios, and unit savings.

- Evaluators will verify participants and installed quantities, consistent with approaches defined in Evaluator work plans.
- Evaluators will apply net-to-gross ratios consistent with the net-to-gross policies defined in ICC Orders approving Utility Energy Efficiency Plans.
- Evaluators will calculate unit savings for prescriptive measures included in the TRM using applicable TRM algorithms, deemed values, and default values, using the following approach and schedule:
    - For savings achieved in EPY4/GPY1, Evaluators will apply unit savings included in Utilities' approved Energy Efficiency Plans.
    - For savings achieved in EPY5/GPY2, Evaluators will ~~apply~~ verify savings based on the initial TRM approved by the ICC; and
    - For savings achieved in future Program Years, Evaluators will ~~apply~~ verify savings values based on the TRM Update finalized by March ~~3~~1st prior to the start of the Program Year.

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For any measures not included in the TRM, including custom measures, prescriptive measures not yet incorporated into the TRM, and prescriptive measures Program Administrators choose to implement using custom savings calculations, Evaluators will develop appropriate savings calculations, consistent with policy direction provided in ICC Orders and Evaluator Work Plans.

## 3.6 The TRM's Relationship to Portfolio Planning

The most current TRM that is filed with the Commission each program year shall be used in the preparation of the Utilities' and DCEO's energy efficiency plans. The Utilities and DCEO are permitted to use additional assumptions other than those contained within the TRM in their Plan filings, provided they include a description of why they believe deviation from the TRM is appropriate (e.g., a particular measure may be in the process of getting updated in the TRM at that time).

Program Administrators adding new prescriptive measures to their portfolios must submit these measures for possible inclusion in future TRM updates. The TRM Administrator and SAG will identify appropriate measures to include in future TRM Updates, using the process identified in Section 45.

There are no specific requirements for Program Administrators to complete annual or other shorter term plans. Because Evaluators will apply TRM algorithms to calculate prescriptive measure savings and cost effectiveness, Program Administrators will use TRM algorithms and savings values when preparing any shorter term plans to manage their Energy Efficiency portfolios.

# 4 TRM Update Process & Timeline

Because technology is constantly improving, and markets are constantly changing, a TRM must be a living document to keep pace with change. Otherwise, the TRM will quickly become obsolete and the savings estimates will become inaccurate. The need to update the TRM can be driven by a number of events, including but not limited to, the following:

- Addition of new measure algorithms perceived to be reliable for TRM inclusion
- Impact of code or legislative changes to specific measures
- Introduction of new technologies
- Discovery of errors in existing TRM measure characterizations
- Changes to industry standard practice

The following sections outline the annual TRM Update Process, including roles and responsibilities for stakeholders in the TRM Update Process and a timeline for updating the TRM that is in sequence with the regulatory milestones that have already been set for future efficiency Plan filings. In addition, the TAC will continue to meet on a monthly basis, with additional meetings, if needed, to discuss the applicability of the TRM, any situations where a utility or any other party believes the TRM value should not apply as a condition set forth in Section ~~3~~4.4, above, exists, any TRM mistakes, and any other matters relating to the TRM.

## 4.1 Stakeholder Roles and Responsibilities

Formal recommendations for TRM changes should be submitted along with all supporting work papers consistent with the approved Work Paper format to the SAG Technical Advisory Committee (TAC) and TRM Administrator, concurrently. Although any party is free to recommend changes to the TRM, there are a set of stakeholders for which responsibilities can be specified (as shown below), and these responsibilities are officially adopted by the Commission upon approval of this TRM.

1. **Evaluators** (Evaluation Teams, Independent Consultants) – The Evaluators have primary responsibility pursuant to 220 ILCS 5/8-103(f)(7) and 220 ILCS 5/8-104(f)(8) to provide independent evaluations of the performance of the Utilities' and DCEO's energy efficiency portfolios. To support this responsibility in the context of the TRM, Evaluators will perform savings verification to calculate savings for prescriptive measures covered by the TRM, and, where budget allows, conduct measure and program level research to inform future TRM updates. The Evaluators shall collaborate with the Utilities, the SAG TAC, and DCEO to determine appropriate data collection and analysis that supports TRM savings verification updates, where available budget exists, while considering the administrative cost and participant burden associated with such data collection.

2. **ICC Staff** – ~~Whose~~ ICC Staff's primary responsibility is to make recommendations to the Commission, participate in the development of~~in~~ the annual TRM ~~compliance~~ filing and participate in the SAG's TRM Technical Advisory Committee (TAC).

3. **Illinois Commerce Commission** (ICC or Commission or Regulator) – ~~Who~~ The Commission receives the TRM annually as a joint filing from the Program Administrators, and may at its own discretion, approve, modify, or deny proposed input or algorithmic changes to the TRM.

4. **Illinois Energy Efficiency Stakeholder Advisory Group**[21] (SAG) – The Illinois Energy Efficiency Stakeholder Advisory Group is advised of and given the opportunity to comment on the TRM Administrator's recommended TRM Updates prior to the revised (redlined) TRM being filed with the ICC. However, technical issues regarding the TRM are usually addressed substantively through the TAC, which is open to any SAG participant.

5. **Program Administrator** (Utilities and DCEO) – The Utilities and DCEO have primary responsibility to cost effectively meet the energy savings targets defined by Illinois statute by implementing energy efficiency programs. The Utilities and DCEO are also responsible for tracking program participation, reporting estimates of energy savings using TRM values, where such values exist, estimating cost effectiveness, and implementing the TRM savings values through their tracking systems. The Utilities, the TAC and DCEO collaborate with the Evaluators prior to the start of each program year to determine an appropriate balance of data collection necessary to update the TRM in the upcoming program year while considering the administrative cost and participant burden associated with such data collection. The Utilities, DCEO, and the TAC make recommendations for TRM Updates.

6. **SAG Technical Advisory Committee** (TAC) – The TAC is a subcommittee of the SAG whose primary responsibility is to provide a forum to allow all interested parties to recommend TRM updates, additions, and changes and facilitate consensus for TRM changes among the Evaluators, ICC Staff, Utilities, DCEO, portfolio administrators, program implementers, interested stakeholders (e.g., SAG participants), and the TRM Administrator prior to the annual TRM Update proceeding. All recommendations for TRM changes shall be submitted to the TRM Technical Advisory Committee and TRM Administrator concurrently. Where consensus does not emerge in the SAG TAC regarding a particular TRM change, the SAG provides a forum where experts on all sides of the contested issue can present their expert opinions in an effort to inform parties of the contested issue and to also facilitate consensus. Any documents filed with the ICC will reflect any areas where consensus is not reached through a "Comparison Exhibit" that sets forth the different expert opinions on a particular issue or matter.

7. **TRM Administrator** (Independent Consultant) – The TRM Administrator has primary responsibilities to manage changes to the TRM document, present to the SAG_TAC, coordinate with the SAG, serve as an independent technical resource, and if desired by the SAG, manage a publicly accessible TRM website that contains TRM-related documents such as references, recommendations, responses, and versions of the TRM. The TRM Administrator reviews and responds[22] to all formal TRM recommendations by a date specified in advance by the TRM Administrator, when updating the TRM for a specific program year. The TRM Administrator prepares the revised TRM document (redlined) each year for filing with the ICC based on recommended TRM changes vetted through the SAG TAC and the large-group SAG. The TRM Administrator shall make any necessary revisions to the TRM to reflect the Commission Order from the annual TRM Update proceeding.

[21] The Commission defined the SAG to include "… the Utility, DCEO, Staff, the Attorney General, BOMA and CUB and representation from a variety of interests, including residential consumers, business consumers, environmental and energy advocacy organizations, trades and local government... [and] a representative from the ARES (alternative retail electric supplier) community should be included." http://www.ilsag.org/home

[22] The TRM Administrator's "response" to a formal recommendation for a TRM change shall explain whether the TRM Administrator agrees with the formal recommendation (either in its entirety or as modified by the TRM Administrator) and the justification for the TRM Administrator's recommendation.

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**Table 4.1: Specific Responsibilities of Each Stakeholder in the TRM Update Procedure**

| Role | Change Existing Measure (1)[23] | Create New Measures (2) |
|---|---|---|
| **Evaluator** (Consultant) | • Provides reviews of savings algorithms, inputs and program designs.<br>• Offers an opinion on other parties' recommendation, including potential modifications.<br>• Identifies and recommends changes as part of the annual evaluations.<br>• Provides recommendations to the SAG Technical Advisory Committee and TRM Administrator.<br>• Identifies and recommends changes based on ongoing reviews of measures and markets.<br>• Coordinates with other Program Administrators' evaluation teams. | • Offers annm opinion on other parties' recommendations, including potential modificatitons.<br>• Provides recommendations to the SAG Technical Advisory Committee and TRM Administrator.<br>• Coordinates with other Program Administrators' evaluation teams. |
| **ICC** (Regulator) | • At its discretion, the ICC may approve, modify or deny requests for changes to TRM input and algorithm assumptions or how the TRM is applied. | • At its discretion, the ICC may approve, modify or deny requests for new TRM input and algorithm assumptions or how the TRM is applied. |
| **ICC Staff** | • Make recommendations to approve, modify or deny requests for changes to TRM input and algorithm assumptions or how the TRM is applied. | • Make recommendations to approve, modify or deny requests for new TRM input and algorithm assumptions or how the TRM is applied. |
| **Illinois Energy Efficiency Stakeholder Advisory Group**[24] (SAG) | • Provides an open forum where changes to existing measures may be discussed.<br>• Is informed of all proposed changes to the TRM by the TAC. | • Provides an open forum whereproposals for ~~changes to existing~~new TRM measures may be discussed.<br>• Is informed of all proposed changes to the TRM by the TAC. |

[23] In the event that a measure must be retired, this general change category ~~and are not listed separately as a result~~applies.

[24] The Commission defined the SAG to include "… the Utility, DCEO, Staff, the Attorney General, BOMA and CUB and representation from a variety of interests, including residential consumers, business consumers, environmental and energy advocacy organizations, trades and local government... [and] a representative from the ARES (alternative retail electric supplier) community should be included." http://www.ilsag.org/home

| Role | Change Existing Measure (1)[23] | Create New Measures (2) |
|---|---|---|
| **Program Administrator** (Utilities & DCEO) | • Updates its tracking systems and modifies its measure calculations, and provides measure update recommendations.<br>• Provides recommendations to the SAG Technical Advisory Committee and TRM Administrator.<br>• Facilitates review process with Evaluator, other Program Administrators and their evaluation teams, if necessary. | • Updates its tracking systems and provides new measure recommendations.<br>• Defines the algorithm and conducts the sensitivity analysis.<br>• Provides recommendations to the SAG Technical Advisory Committee and TRM Administrator.<br>• Facilitates review process with Evaluator, other Program Administrators and their evaluation teams, if necessary. |
| **TRM Administrator** (Independent Consultant) | • Manages the TRM.<br>• Facilitates and reviews recommendations from other parties as part of the TRM Technical Advisory Committee forum.<br>• Acts as an independent technical resource to the SAG/TAC. | • Manages the TRM.<br>• Facilitates and reviews recommendations from other parties as part of the TRM Technical Advisory Committee forum.<br>• Acts as an independent technical resource to the SAG/TAC. |
| **SAG Technical Advisory Committee** (TAC) | • May recommend changes, updates, removals or additions to the TRM.<br>• Coordinates with utilities, DCEO and Evaluators on data collection through evaluation that would be useful in updating the TRM, while being mindful of resource constraints and customer burden.<br>• Provides a forum to facilitate consensus for the recommended changes. | • May recommend changes, updates or additions to the TRM.<br>• Coordinates with utilities, DCEO and Evaluators on data collection through evaluation that would be useful in updating the TRM, while being mindful of resource constraints and customer burden.<br>• Provides a forum to facilitate consensus for the new measure. |

## 4.2 The Regulatory Schedule for Energy Efficiency Programs

Because technology and markets are so dynamic, a structured and ongoing update process for the TRM is necessary. Because the update process needs to be aligned with Illinois' existing program planning and implementation cycles, these cycles are summarized in the following two tables.

**Table 4.2: Efficiency Plan Periods**

| Cycle | Plan Filing Date | Electric Plan Approval | Applicable Electric Program Year (EPY) | Applicable Gas Program Year[25] (GPY) |
|---|---|---|---|---|
| 1 | Nov-07 | Feb-08 | PY1 – PY3 | |
| 2 | Oct-10 | Dec-10 | PY4 – PY6 | PY1 – PY3 |
| 3 | Sep-13 | Feb-14 | PY7 – PY9 | PY4 – PY6 |

**Table 4.3: TRM Implementation Cycle[26]**

| Cycle | EPY | GPY | Begins | Ends | Application in Evaluation | Application in 3-Year Plans |
|---|---|---|---|---|---|---|
| 1 | 1 | | 6/1/2008 | 5/31/2009 | TRM does not apply to this cycle. | TRM not used in this cycle |
| 1 | 2 | | 6/1/2009 | 5/31/2010 | | |
| 1 | 3 | | 6/1/2010 | 5/31/2011 | | |
| 2 | 4 | 1 | 6/1/2011 | 5/31/2012 | TRM does not apply to this PY | TRM not used in this cycle |
| 2 | 5 | 2 | 6/1/2012 | 5/31/2013 | 1st TRM ~~finalized by 6/1/12~~ | |
| 2 | 6 | 3 | 6/1/2013 | 5/31/2014 | TRM finalized by 3/1/13 applies | |
| 3 | 7 | 4 | 6/1/2014 | 5/31/2015 | TRM finalized by 3/1/14 applies | TRM finalized by 3/1/13 used in filing~~; TRM finalized by 3/1/14.~~ |
| 3 | 8 | 5 | 6/1/2015 | 5/31/2016 | TRM finalized by 3/1/15 applies | |
| 3 | 9 | 6 | 6/1/2016 | 5/31/2017 | TRM finalized by 3/1/16 applies | |

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## 4.3 Update Timeline and Process

The process of incorporating new and better information into the TRM occurs annually. Prior to the start of the program year for which the Updated TRM will be in effect, the Utilities and DCEO will make portfolio adjustments and tracking system updates based in part on changes reflected in the Updated TRM. Thus, efforts will be made to have the Updated TRM approved by the Commission by March 1st of each program year to provide the Utilities and DCEO adequate time for making these pre-program year changes.

The evaluation results from one program year will be put into effect for the first time at the beginning of the next planning year. However, it should be noted that it is appropriate and expected that any completed evaluation be considered and/or incorporated into the TRM as they become available.

[25] Note that there is no statutory deadline for the approval of gas efficiency plans.

[26] It is assumed the prospective application of the March 1 TRM will occur continuously until policy dictates otherwise. In the spirit of collaboration and support of the TRM process and due to the current 2012 transition process of completing the TRM, there will be an exception to the March 1 dating where TRM results ~~that are finalized as of June 1, 2012~~contained in the 1st Commission-approved TRM will be in effect for the evaluation of PY5.

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**Figure 1: Timeline and Milestones of the TRM Update Procedure**

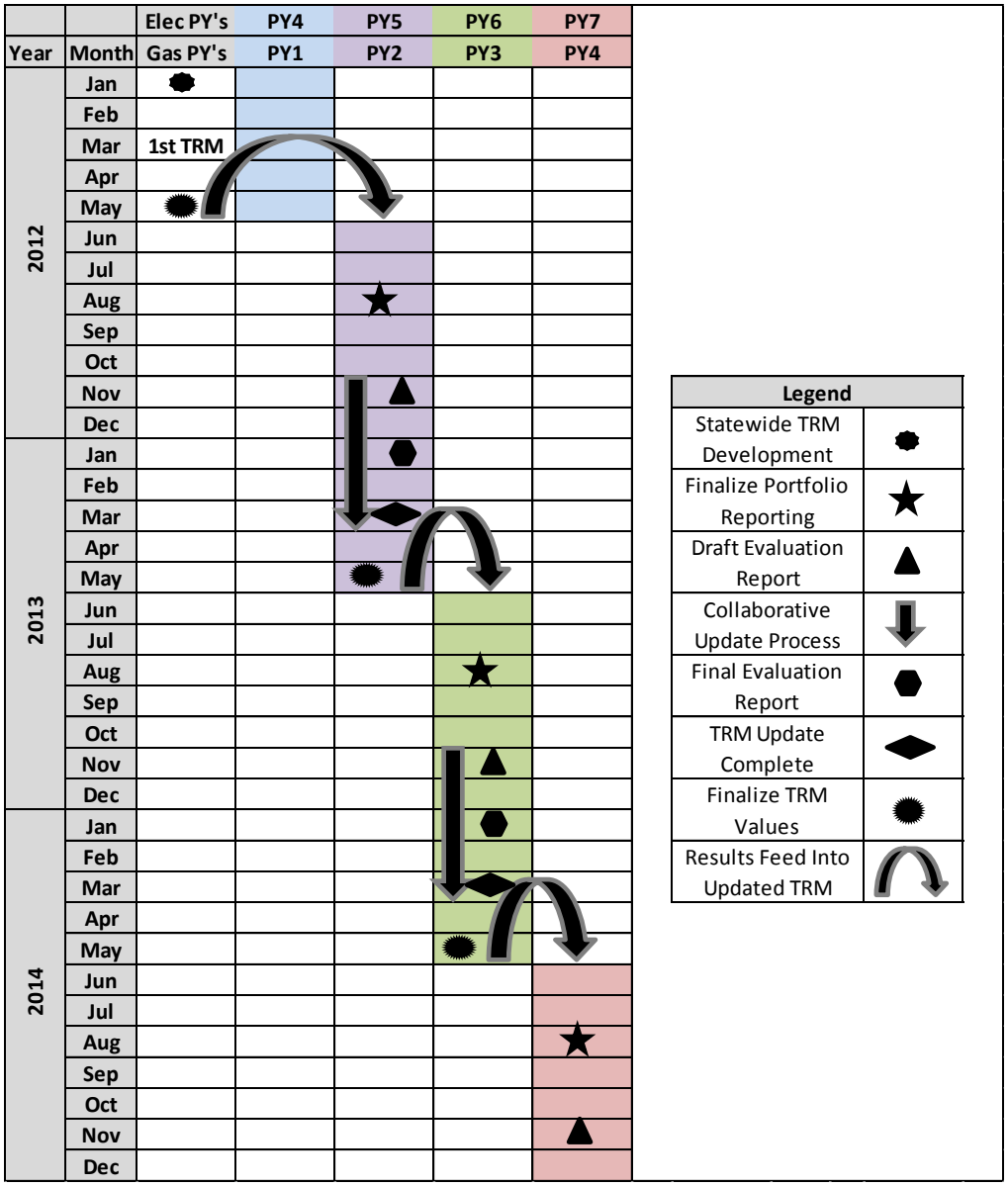
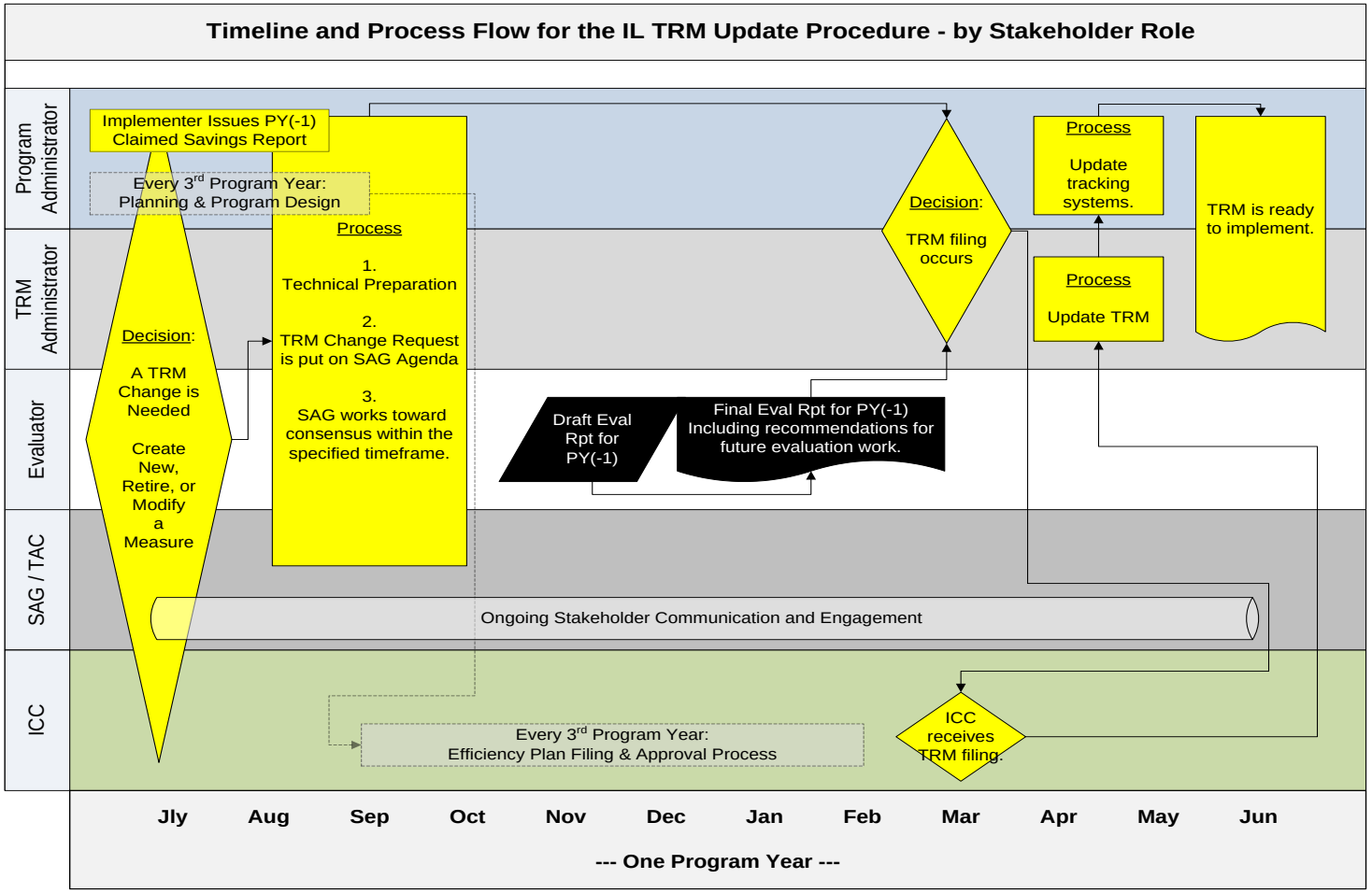


**Figure 2: Timeline & Process Flow of the TRM Update Procedure by Stakeholder**



# 5 Assumptions

The information contained in this TRM contains VEIC's recommendations for the content of the Illinois TRM. Sources that are cited within the TRM have been chosen based on two priorities, geography and age. Whenever possible and appropriate, VEIC has incorporated Illinois-specific information into each measure characterization. The Business TRM documents from Ameren and ComEd were reviewed, as well as program and measure specific data from evaluations, efficiency plans, and working documents.

The assumptions for these characterizations rest on our understanding of the information available. In each case, the available Illinois and Midwest-specific information was reviewed, including evaluations and support material provided by the Illinois Utilities.

When Illinois or region-specific evaluations or data were not available, best practice research and data from other jurisdictions was used, often from west and east-coast states that have allocated large amounts of funding to evaluation work and to refining their measure characterization parameters. As a result, much of the most-defensible information originates from these regions. In every case, VEIC used the most recent, well-designed, and best-supported studies and only if it was appropriate to generalize their conclusions to the Illinois programs.

## 5.1 Footnotes & Documentation of Sources

Each measure characterization uses footnotes to document the references that have been used to characterize the technology. The reference documents are too numerous to include in an Appendix and have instead been posted in *.zip files on the TRM's Sharepoint website. These zip files can be found in the 'Sources and Reference Documents' folder in the main directory, and will also be posted to the SAG's public web-site (www.ilsag.org) as well.

**Comment [Jen8]:** 7/30/12 If this is not true then it should be removed.

## 5.2 General Savings Assumptions

The TRM savings estimates are expected to serve as average, representative values, or ways to calculate savings based on program-specific information. All information is presented on a per-measure basis. In using the measure-specific information in the TRM, it is helpful to keep the following notes in mind.

- All estimates of energy (kWh or therms) and peak (kW) savings are for first-year savings, not lifetime savings.
- Unless otherwise noted, measure life is defined to be the life of an energy consuming measure, including its equipment life and measure persistence.
- Where deemed values for savings are provided, they represent the average energy (kWh or therms) or peak (kW) savings that could be expected from the average of all measures that might be installed in Illinois in the program year.
- In general, the baselines included in the TRM are intended to represent average conditions in Illinois. Some are based on data from the state, such as household consumption characteristics provided by the Energy Information Administration. Some are extrapolated from other areas, when Illinois data are not available.

## 5.3 Shifting Baseline Assumptions

The TRM anticipates the effects of changes in efficiency codes and standards on affected measures. When these changes take effect, a shift in the baseline is usually required. This complicates the measure savings estimation

somewhat, and will be handled in future versions of the TRM by describing the choice of and reasoning behind a shifting baseline assumption. In this version of the TRM, this applies to CFLs and T5/T8~~12~~ Linear Fluorescents.

### 5.3.1 CFL and T5/T8 Linear Fluorescents

Specific reductions in savings have been incorporated for CFL measures that relate to the shift in appropriate baseline due to changes in Federal Standards for lighting products. Federal legislation (stemming from the Energy Independence and Security Act of 2007) mandates a phase-in process beginning in 2012 for all general-purpose light bulbs between 40W and 100W to be approximately 30% more energy efficient than current incandescent bulbs, in essence beginning the phase-out of the current style, or "standard", incandescent bulbs. In 2012, standard 100W incandescent bulbs will no longer be manufactured, followed by restrictions on standard 75W bulbs in 2013 and 60W and 40W bulbs in 2014. The baseline for the CFL measure in the corresponding program years starting June 1 each year will therefore become bulbs (improved or "efficient" incandescent, or halogen) that meet the new standard and have the same lumen equivalency. Those products can take several different forms we can envision now and perhaps others we do not yet know about. Halogens are one of those possibilities and have been chosen to represent a baseline at that time. To account for this shifting baseline, annual savings are reduced within the lifetime of the measure.

Other lighting measures will also have baseline shifts (for example screw based LED and CFL fixtures) that will result in significant impacts to annual estimated savings in later years. Finally, as of July 14, 2012, Federal Standards will require that practically all linear fluorescents meet strict performance requirements essentially requiring all T12 users, when they need to purchase new bulbs, to upgrade to high performance T8 lamps and ballasts[27]. We have assumed that this standard will become fully effective in 2016. To account for this, we have included a methodology to address the shifting baseline in the high performance T8 measure and T5 measure which is defined specifically in each measure characterization.

[27] At the time of this draft, we understand that some standard T8 lamps may meet the federal standard, and in that event, some T12 retrofits may end up being completed with standard T8s instead of high performance T8s.

## 5.4 Glossary

**Baseline Efficiency:** The assumed standard efficiency of equipment, absent an efficiency program.

**Building Types**[28]**:**

| Building Type | Definition |
|---|---|
| College/University | Applies to facility space used for higher education. Relevant buildings include administrative headquarters, residence halls, athletic and recreation facilities, laboratories, etc. The total gross floor area should include all supporting functions such as kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc. |
| Exterior | Applies to unconditioned spaces that are outside of the building envelope. |
| Garage | Applies to unconditioned spaces either attached or detached from the primary building envelope that are not used for living space. |
| Grocery | Applies to facility space used for the retail sale of food and beverage products. It should not be used by restaurants~~, which are not eligible for a rating at this time~~. The total gross floor area should include all supporting functions such as kitchens and break rooms used by staff, storage areas (refrigerated and non-refrigerated), administrative areas, stairwells, atria, lobbies, etc. |
| Heavy and Light Industry | Applies to buildings that are ~~decidated~~ dedicated to manufac~~u~~turing activities. Light industry buildings are characterized by consumer product and component manufacturing while Heavy industry buildings are characterized by products that require full assumbly under closely regulated conditions. These building types may be distinguished by categorizing NIACS (SIC) codes according to the needs of the Program Administrator, but are generally similar in terms of their energy performance and operating characteristics. |
| Hotel/Motel | Applies to buildings that rent overnight accommodations on a room/suite basis, typically including a bath/shower and other facilities in guest rooms. The total gross floor area should include all interior space, including guestrooms, halls, lobbies, atria, food preparation and restaurant space, conference and banquet space, health clubs/spas, indoor pool areas, and laundry facilities, as well as all space used for supporting functions such as elevator shafts, stairways, mechanical rooms, storage areas, employee break rooms, back-of-house offices, etc. Hotel does not apply to fractional ownership properties such as condominiums or vacation timeshares. Hotel properties should be owned by a single entity and have rooms available on a nightly basis. |
| K-12 School | Applies to facility space used as a school building for Kindergarten through 12th grade students. This does not include college or university classroom facilities and laboratories, vocational, technical, or trade schools. The total gross floor area should include all supporting functions such as administrative space, conference rooms, kitchens used by staff, lobbies, cafeterias, gymnasiums, auditoria, laboratory classrooms, portable classrooms, greenhouses, stairways, atria, elevator shafts, small landscaping sheds, storage areas, etc. The K-12 school model does not apply to preschool or day care buildings; in order to classify as K-12 school, more than 75% of the students must be in kindergarten or older. |
| Medical | Applies to a general medical and surgical hospital (including critical access hospitals and children's hospitals) that is either a stand-alone building or a campus of buildings. |

[28] Source: US EPA, www.energystar.gov, Space Type Definitions

**Comment [Jen9]:** 7/30/12 this is missing a number of building types necessary to use the TRM, See, e.g., Measure 6.3.1 Storage Water Heater, (p. 128), 6.4.2 (p. 155), 6.5 Lighting (pp.217-218), 6.4.16 VSD HVAC (p. 214), 6.2..3 (p. 70), 6.2.11 (p. 110)

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| Building Type | Definition |
|---|---|
| | The definition of Hospital accounts for all space types that are located within the Hospital building/campus, such as medical offices, administrative offices, and skilled nursing. The total floor area should include the aggregate floor area of all buildings on the campus as well as all supporting functions such as: stairways, connecting corridors between buildings, medical offices, exam rooms, laboratories, lobbies, atria, cafeterias, storage areas, elevator shafts, and any space affiliated with emergency medical care, or diagnostic care. |
| Miscellaneous | Applies to spaces that do not fit clearly within any available categories should be designated as "miscellaneous". |
| Multifamily | Applies to residential buildings of three of more units, including all public and multiuse spaces within the building envelope. |
| Office | Applies to facility spaces used for general office, professional, and administrative purposes. The total gross floor area should include all supporting functions such as kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc. |
| Restaurant | Applies to a subcategory of Retail/Service space that is used to provide commercial food services to individual customers, and includes kitchen, dining, and common areas. |
| Retail/Service | Applies to facility space used to conduct the retail sale of consumer product goods. Stores must be at least 5,000 square feet and have an exterior entrance to the public. The total gross floor area should include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, etc. Retail segments typically included under this definition are: Department Stores, Discount Stores, Supercenters, Warehouse Clubs, Drug Stores, Dollar Stores, Home Center/Hardware Stores, and Apparel/Hard Line Specialty Stores (e.g., books, clothing, office products, toys, home goods, electronics). Retail segments excluded under this definition are: Supermarkets (eligible to be benchmarked as Supermarket space), Convenience Stores, Automobile Dealerships, and Restaurants. |
| Warehouse | Applies to unrefrigerated or refrigerated buildings that are used to store goods, manufactured products, merchandise or raw materials. The total gross floor area of Refrigerated Warehouses should include all temperature controlled area designed to store perishable goods or merchandise under refrigeration at temperatures below 50 degrees Fahrenheit. The total gross floor area of Unrefrigerated Warehouses should include space designed to store non-perishable goods and merchandise. Unrefrigerated warehouses also include distribution centers. The total gross floor area of refrigerated and unrefrigerated warehouses should include all supporting functions such as offices, lobbies, stairways, rest rooms, equipment storage areas, elevator shafts, etc. Existing atriums or areas with high ceilings should only include the base floor area that they occupy. The total gross floor area of refrigerated or unrefrigerated warehouse should not include outside loading bays or docks. Self-storage facilities, or facilities that rent individual storage units, are not eligible for a rating using the warehouse model. |

**Coincidence Factor** (CF): Coincidence factors represent the fraction of connected load expected to be coincident with a particular system peak period, on a diversified basis. Coincidence factors are provided for summer peak periods.

**Commercial & Industrial:** The market sector that includes measures that apply to any of the building types defined

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in this TRM, which includes multifamily common areas and public housing[29].

**Connected Load**: The maximum wattage of the equipment, under normal operating conditions.

**Deemed Value:** A value that has been assumed to be representative of the average condition of an input parameter. ~~This term may also refer to the calculated result of a prescriptive savings algorithm.~~

**Comment [Jen10]:** This is a "deemed savings estimate" as defined on page 12. " A single *deemed savings estimate* is produced by any given combination of an algorithm and the allowable input values for each of its parameters. In cases where lookup tables are provided, there is a range of deemed savings estimates that are possible, depending on site-specific factors such as equipment capacity, location and building type." 7/30/12

**Default Value**: When a measure indicates that an input to a prescriptive saving algorithm may take on a range of values, an average value is also provided in many cases. This value is considered the default input to the algorithm, and should be used when the other alternatives listed in the measure are not applicable.

**End-use Category:** A general term used to describe the categories of equipment that provide a service to an individual or building. See Table 2.1 for a list of the end-use categories that are incorporated in this TRM.

**EM&V –** Evaluation, Measurement and Verification. An ongoing annual process that Program Administrators must complete for the ICC.

**Evaluation:** Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

**Full Load Hours** (FLH): The equivalent hours that equipment would need to operate at its peak capacity in order to consume its estimated annual kWh consumption (annual kWh/connected kW).

**High Efficiency**: General term for technologies and processes that require less energy, water, or other inputs to operate.

**Lifetime**: The number of years (or hours) that the new high efficiency equipment is expected to function. These are generally based on engineering lives, but sometimes adjusted based on expectations about frequency of removal, remodeling or demolition. Two important distinctions fall under this definition; Effective Useful Life (EUL) and Remaining Useful Life (RUL).

> **EUL** – EUL is based on the manufacturers rating of the effective useful life; how long the equipment will last. For example, a CFL that operates x hours per year will typically have an EUL of y. A house boiler may have a lifetime of 20 years but the EUL is only 15 years since after that time it may be operating at a non-efficient point. An estimate of the median number of years that the measures installed under a program are still in place and operable.
>
> **RUL** – Applies to retrofit or replacement measures. For example, if an existing working refrigerator is replaced with a high efficiency unit, the RUL is an assumption of how many more years the existing unit would have lasted. As a general rule the RUL is usually assumed to be 1/3 of the EUL.

**Load Factor** (LF): The fraction of full load (wattage) for which the equipment is typically run.

[29] Measures that apply to the multifamily and public housing building types describe how to handle tenant versus master metered buildings.

**Measure Cost**: The incremental (for time of sale measures) or full cost (both capital and labor for retrofit measures) of implementing the High Efficiency equipment.

**Measure Description**: A detailed description of the technology and the criteria it must meet to be eligible ~~for~~ as an energy efficient measure.

**Measure Type:** Measures are categorized into two subcategories; prescriptive and custom.

> **Custom:** Measures that use an energy savings algorithm and/or inputs, or metering results that apply only to the individual customer who is implementing them.
>
> **Prescriptive:** Measures whose energy savings algorithm and inputs are fixed within the TRM and may not be changed by the Program Administrator. Prescriptive measures make up most of the measures in the Residential market sector. Two subcategories of prescriptive measures include:
>
> > **Fully Deemed:** A measure whose inputs are completely specified and are not subject to change or choice on the part of the Program Administrator.
> >
> > **Partially Deemed:** A measure whose inputs may be selected to some degree by the Program Administrator.

**Measure:** An efficient technology or procedure that results in energy savings as compared to the baseline efficiency.

**Measure Level Research**: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within ~~utility~~ Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

**Program Level Research**: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

**Residential:** The market sector that includes measures that apply only to detached, residential buildings or duplexes.

**Operation and Maintenance (O&M) Cost Adjustments:** The dollar impact resulting from differences between baseline and efficient case Operation and Maintenance costs.

**Operating Hours** (HOURS): The annual hours that equipment is expected to operate.

**Program:** The mode of delivering a particular measure or set of measures to customers. See Table 2.4 for a list of program descriptions that are presently operating in Illinois.

**Rating Period Factor** (RPF): Percentages for defined times of the year that describe when energy savings will be realized for a specific measure.

**Savings Verification**: An evaluation process that independently verifies program savings achieved through Prescriptive Measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures

claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / claimed ex ante savings). Savings verification may also result in recommendations for further evaluation and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

**Stakeholder Advisory Group (SAG):** The Illinois Energy Efficiency Stakeholder Advisory Group (SAG) was first defined in the electric utilities' first energy efficiency Plan Orders to include "… the Utility, DCEO, Staff, the Attorney General, BOMA and CUB and representation from a variety of interests, including residential consumers, business consumers, environmental and energy advocacy organizations, trades and local government... [and] a representative from the ARES (alternative retail electric supplier) community should be included."[30] A group of stakeholders who have an interest in Illinois' energy efficiency programs and who meet regularly to share information and work toward consensus on various energy efficiency issues. The Utilities in Illinois have been directed by the ~~Illinois Commerce Commission (~~ICC~~)~~ to work with the SAG on the development of a statewide TRM. A list of current SAG participants appears in the following table.

**Table 5.1: SAG Stakeholder List**

| SAG Stakeholder |
|---|
| Ameren Illinois Company (Ameren) |
| Center for Neighborhood Technology (CNT) |
| Citizen's Utility Board (CUB) |
| City of Chicago |
| Commonwealth Edison Company (ComEd) |
| Environment IL |
| Environmental Law and Policy Center (ELPC) |
| Future Energy Enterprises LLC |
| Illinois Commerce Commission Staff (ICC Staff) |
| Illinois Department of Commerce and Economic Opportunity (DCEO) |
| Illinois Attorney General's Office (AG) |
| Independent Evaluators (Navigant and Opinion Dynamics Corporation) |
| Integrys (Peoples Gas and North Shore Gas) |
| Metropolitan Mayor's Caucus (MMC) |
| Midwest Energy Efficiency Association (MEEA) |
| ~~National~~ Natural Resources Defense Council (NRDC) |
| Nicor Gas |
| Shaw Environmental |
| Energy Resources Center at the University of Illinois, Chicago (ERC) |

**Comment [Jen11]:** 7/30/12, do you want to make tables consistent with each other? Page 8 contains the other table.

SAG Stakeholders

[30] Docket No. 07-0540, Final Order at 32-33, February 6, 2008.
http://www.icc.illinois.gov/downloads/public/edocket/215193.pdf

## 5.5 Electrical Loadshapes (kWh)

Loadshapes are an integral part of the measure characterization and are used to divide energy savings into appropriate periods using Rating Period Factors (RPFs) such that each have variable avoided cost values allocated to them for the purpose of estimating cost effectiveness.

For the purposes of assigning energy savings (kWh) periods, the TRM TAC has agreed to use the industry standards for wholesale power market transactions as shown in the following table.

**Table 2.4: On and Off Peak Energy Definitions**

| Period Category | Period Definition (Central Prevailing Time) |
|---|---|
| Winter On-Peak Energy | 8AM - 11PM, weekdays, Oct – Apr, No NERC holidays |
| Winter Off-Peak Energy | All other hours |
| Summer On-Peak Energy | 8AM - 11PM, weekdays, May – Sept, No NERC holidays |
| Summer Off-Peak Energy | All other hours |

Loadshapes have been developed for each end-use by assigning Rating Period Factor percentages to each of the four periods above. Two methodologies were used:

1. Itron eShapes[31] data for Missouri, reconciled to Illinois loads and provided by Ameren, were used to calculate the percentage of load in to the four categories above.

2. Where the Itron eShapes data did not provide a particular end-use or specific measure load profile, loadshapes that have been developed over many years by Efficiency Vermont and that have been reviewed by the Vermont Department of Public Service, were adjusted to match Illinois period definitions. Note – no weather sensitive loadshapes were based on this method. Any of these load profiles that relate to High Impact Measures should be an area of future evaluation.

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The following pages provide the loadshape values for all measures provided in the TRM. To distinguish the source of the loadshape, they are color coded. Rows that are shaded in green are Efficiency Vermont loadshapes adjusted for Illinois periods. Rows that are unshaded and are left in white are Itron eShapes data provided by Ameren.

The Illinois electric utilities use the DSMore™ (Integral Analytics DSMore™ Demand Side Management Option/Risk Evaluator) software to screen the efficiency measures for cost effectiveness. Since this tool requires a loadshape value for weekdays and weekends in each month (i.e., 24 inputs), the percentages for the four period categories above were calculated by weighting the proportion of weekdays/weekends in each month to the total within each period. The results of these calculations are also provided below.

[31] All loadshape information has been posted to the project's Sharepoint site, and may be provided publically through the Stakeholder Advisory Group's web-site at their discretion. http://www.ilsag.org/

**Table 5.2: Loadshapes by Season**

| | | Winter Peak | Winter Off-peak | Summer Peak | Summer Off-peak |
|---|---|---|---|---|---|
| | Loadshape Reference Number | Oct-Apr, M-F, non-holiday, 8AM - 11PM | Oct-Apr, All other time | May--Sept, M-F, non-holiday, 8AM - 11PM | May--Sept, All other time |
| Residential Clothes Washer | R01 | 47.0% | 11.1% | 34.0% | 8.0% |
| Residential Dish Washer | R02 | 49.3% | 8.7% | 35.7% | 6.3% |
| Residential Electric DHW | R03 | 43.2% | 20.6% | 24.5% | 11.7% |
| Residential Freezer | R04 | 38.9% | 16.4% | 31.5% | 13.2% |
| Residential Refrigerator | R05 | 37.0% | 18.1% | 30.1% | 14.7% |
| Residential Indoor Lighting | R06 | 48.1% | 15.5% | 26.0% | 10.5% |
| Residential Outdoor Lighting | R07 | 18.0% | 44.1% | 9.4% | 28.4% |
| Residential Cooling | R08 | 4.1% | 0.7% | 71.3% | 23.9% |
| Residential Electric Space Heat | R09 | 57.8% | 38.8% | 1.7% | 1.7% |
| Residential Electric Heating and Cooling | R10 | 35.2% | 22.8% | 31.0% | 11.0% |
| Residential Ventilation | R11 | 25.8% | 32.3% | 18.9% | 23.0% |
| Residential - Dehumidifier | R12 | 12.9% | 16.2% | 31.7% | 39.2% |
| Residential Standby Losses - Entertainment Center | R13 | 26.0% | 32.5% | 18.9% | 22.6% |
| Residential Standby Losses - Home Office | R14 | 23.9% | 34.6% | 17.0% | 24.5% |
| | | | | | |
| Commercial Electric Cooking | C01 | 40.6% | 18.2% | 28.7% | 12.6% |
| Commercial Electric DHW | C02 | 40.5% | 18.2% | 28.5% | 12.8% |
| Commercial Cooling | C03 | 4.9% | 0.8% | 66.4% | 27.9% |
| Commercial Electric Heating | C04 | 53.5% | 43.2% | 1.9% | 1.4% |
| Commercial Electric Heating and Cooling | C05 | 19.4% | 13.5% | 47.1% | 19.9% |
| Commercial Indoor Lighting | C06 | 40.1% | 18.6% | 28.4% | 12.9% |
| Grocery/Conv. Store Indoor Lighting | C07 | 31.4% | 26.4% | 22.8% | 19.3% |
| Hospital Indoor Lighting | C08 | 29.1% | 29.0% | 21.0% | 20.9% |
| Office Indoor Lighting | C09 | 42.1% | 16.0% | 30.4% | 11.5% |
| Restaurant Indoor Lighting | C10 | 32.1% | 25.7% | 23.4% | 18.8% |

| | | Winter Peak | Winter Off-peak | Summer Peak | Summer Off-peak |
|---|---|---|---|---|---|
| | Loadshape Reference Number | Oct-Apr, M-F, non-holiday, 8AM - 11PM | Oct-Apr, All other time | May-Sept, M-F, non-holiday, 8AM - 11PM | May-Sept, All other time |
| Retail Indoor Lighting | C11 | 35.5% | 22.3% | 25.8% | 16.3% |
| Warehouse Indoor Lighting | C12 | 39.4% | 18.5% | 28.6% | 13.5% |
| K-12 School Indoor Lighting | C13 | 45.8% | 22.6% | 20.2% | 11.4% |
| Indust. 1-shift (8/5) (e.g., comp. air, lights) | C14 | 50.5% | 7.2% | 37.0% | 5.3% |
| Indust. 2-shift (16/5) (e.g., comp. air, lights) | C15 | 47.5% | 10.2% | 34.8% | 7.4% |
| Indust. 3-shift (24/5) (e.g., comp. air, lights) | C16 | 34.8% | 23.2% | 25.5% | 16.6% |
| Indust. 4-shift (24/7) (e.g., comp. air, lights) | C17 | 25.8% | 32.3% | 18.9% | 23.0% |
| Industrial Indoor Lighting | C18 | 44.3% | 13.6% | 32.4% | 9.8% |
| Industrial Outdoor Lighting | C19 | 18.0% | 44.1% | 9.4% | 28.4% |
| Commercial Outdoor Lighting | C20 | 23.4% | 35.3% | 13.0% | 28.3% |
| Commercial Office Equipment | C21 | 37.7% | 20.9% | 26.7% | 14.7% |
| Commercial Refrigeration | C22 | 38.5% | 20.6% | 26.7% | 14.2% |
| Commercial Ventilation | C23 | 38.1% | 20.6% | 29.7% | 11.6% |
| Traffic Signal - Red Balls, always changing or flashing | C24 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - Red Balls, changing day, off night | C25 | 37.0% | 20.9% | 27.1% | 14.9% |
| Traffic Signal - Green Balls, always changing | C26 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - Green Balls, changing day, off night | C27 | 37.0% | 20.9% | 27.1% | 14.9% |
| Traffic Signal - Red Arrows | C28 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - Green Arrows | C29 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - Flashing Yellows | C30 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - “Hand” Don’t Walk Signal | C31 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - “Man” Walk Signal | C32 | 25.8% | 32.3% | 18.9% | 23.0% |
| Traffic Signal - Bi-Modal Walk/Don’t Walk | C33 | 25.8% | 32.3% | 18.9% | 23.0% |
| Industrial Motor | C34 | 47.5% | 10.2% | 34.8% | 7.4% |
| Industrial Process | C35 | 47.5% | 10.2% | 34.8% | 7.4% |
| HVAC Pump Motor (heating) | C36 | 38.7% | 48.6% | 5.9% | 6.8% |
| HVAC Pump Motor (cooling) | C37 | 7.8% | 9.8% | 36.8% | 45.6% |

| | | Winter Peak | Winter Off-peak | Summer Peak | Summer Off-peak |
|---|---|---|---|---|---|
| | Loadshape Reference Number | Oct-Apr, M-F, non-holiday, 8AM - 11PM | Oct-Apr, All other time | May- Sept, M-F, non-holiday, 8AM - 11PM | May - Sept, All other time |
| HVAC Pump Motor (unknown use) | C38 | 23.2% | 29.2% | 21.4% | 26.2% |
| VFD - Supply fans <10 HP | C39 | 38.8% | 16.1% | 28.4% | 16.7% |
| VFD - Return fans <10 HP | C40 | 38.8% | 16.1% | 28.4% | 16.7% |
| VFD - Exhaust fans <10 HP | C41 | 34.8% | 23.2% | 20.3% | 21.7% |
| VFD - Boiler feedwater pumps <10 HP | C42 | 42.9% | 44.2% | 6.6% | 6.3% |
| VFD - Chilled water pumps <10 HP | C43 | 11.2% | 5.5% | 40.7% | 42.6% |
| VFD Boiler circulation pumps <10 HP | C44 | 42.9% | 44.2% | 6.6% | 6.3% |
| Refrigeration Economizer | C45 | 36.3% | 50.8% | 5.6% | 7.3% |
| Evaporator Fan Control | C46 | 24.0% | 35.9% | 16.7% | 23.4% |
| Standby Losses - Commercial Office | C47 | 8.2% | 50.5% | 5.6% | 35.7% |
| VFD Boiler draft fans <10 HP | C48 | 37.3% | 48.9% | 6.4% | 7.3% |
| VFD Cooling Tower Fans <10 HP | C49 | 7.9% | 5.2% | 54.0% | 32.9% |
| Engine Block Heater Timer | C50 | 26.5% | 61.0% | 4.1% | 8.5% |
| Door Heater Control | C51 | 30.4% | 69.6% | 0.0% | 0.0% |
| Beverage and Snack Machine Controls | C52 | 10.0% | 48.3% | 7.4% | 34.3% |
| Flat | C53 | 36.3% | 21.8% | 26.2% | 15.7% |

**Table 5.3: Loadshapes by Month and Day of Week**

| | | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S |
| Residential Clothes Washer | R01 | 7.0% | 1.6% | 6.3% | 1.5% | 6.6% | 1.7% | 6.7% | 1.5% | 6.9% | 1.6% | 6.5% | 1.6% | 7.1% | 1.5% | 6.8% | 1.7% | 6.6% | 1.6% | 7.0% | 1.5% | 6.5% | 1.7% | 6.9% | 1.6% |
| Residential Dish Washer | R02 | 7.3% | 1.2% | 6.6% | 1.2% | 7.0% | 1.4% | 7.1% | 1.2% | 7.3% | 1.2% | 6.9% | 1.3% | 7.4% | 1.2% | 7.1% | 1.3% | 7.0% | 1.2% | 7.4% | 1.2% | 6.8% | 1.3% | 7.2% | 1.3% |
| Residential Electric DHW | R03 | 6.4% | 2.9% | 5.8% | 2.7% | 6.1% | 3.3% | 6.2% | 2.8% | 5.0% | 2.3% | 4.7% | 2.4% | 5.1% | 2.2% | 4.9% | 2.5% | 4.8% | 2.3% | 6.5% | 2.8% | 6.0% | 3.1% | 6.3% | 3.0% |
| Residential Freezer | R04 | 5.8% | 2.3% | 5.2% | 2.2% | 5.5% | 2.6% | 5.6% | 2.2% | 6.4% | 2.6% | 6.1% | 2.7% | 6.6% | 2.5% | 6.3% | 2.8% | 6.1% | 2.6% | 5.8% | 2.2% | 5.4% | 2.4% | 5.7% | 2.4% |
| Residential Refrigerator | R05 | 5.5% | 2.6% | 4.9% | 2.4% | 5.2% | 2.9% | 5.3% | 2.5% | 6.2% | 2.9% | 5.8% | 3.0% | 6.3% | 2.8% | 6.0% | 3.1% | 5.9% | 2.9% | 5.5% | 2.5% | 5.1% | 2.7% | 5.4% | 2.6% |
| Residential Indoor Lighting | R06 | 7.1% | 2.2% | 6.4% | 2.1% | 6.8% | 2.4% | 6.9% | 2.1% | 5.3% | 2.1% | 5.0% | 2.2% | 5.4% | 2.0% | 5.2% | 2.2% | 5.1% | 2.1% | 7.2% | 2.1% | 6.6% | 2.3% | 7.0% | 2.2% |
| Residential Outdoor Lighting | R07 | 2.7% | 6.2% | 2.4% | 5.9% | 2.6% | 7.0% | 2.6% | 6.0% | 1.9% | 5.7% | 1.8% | 5.8% | 2.0% | 5.3% | 1.9% | 6.0% | 1.8% | 5.7% | 2.7% | 6.0% | 2.5% | 6.6% | 2.6% | 6.4% |
| Residential Cooling | R08 | 0.6% | 0.1% | 0.5% | 0.1% | 0.6% | 0.1% | 0.6% | 0.1% | 14.6% | 4.8% | 13.7% | 4.9% | 14.9% | 4.5% | 14.2% | 5.0% | 13.9% | 4.8% | 0.6% | 0.1% | 0.6% | 0.1% | 0.6% | 0.1% |
| Residential Electric Space Heat | R09 | 8.6% | 5.5% | 7.7% | 5.1% | 8.2% | 6.1% | 8.3% | 5.3% | 0.3% | 0.3% | 0.3% | 0.3% | 0.4% | 0.3% | 0.3% | 0.4% | 0.3% | 0.3% | 8.7% | 5.3% | 8.0% | 5.8% | 8.5% | 5.6% |
| Residential Electric Heating and Cooling | R10 | 5.2% | 3.2% | 4.7% | 3.0% | 5.0% | 3.6% | 5.0% | 3.1% | 6.3% | 2.2% | 6.0% | 2.3% | 6.5% | 2.1% | 6.2% | 2.3% | 6.0% | 2.2% | 5.3% | 3.1% | 4.9% | 3.4% | 5.2% | 3.3% |
| Residential Ventilation | R11 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Residential - Dehumidifier | R12 | 1.9% | 2.3% | 1.7% | 2.2% | 1.8% | 2.6% | 1.8% | 2.2% | 6.5% | 7.8% | 6.1% | 8.0% | 6.6% | 7.3% | 6.3% | 8.2% | 6.2% | 7.8% | 1.9% | 2.2% | 1.8% | 2.4% | 1.9% | 2.4% |
| Residential Standby Losses - Entertainment Center | R13 | 3.8% | 4.6% | 3.5% | 4.3% | 3.7% | 5.1% | 3.7% | 4.4% | 3.9% | 4.5% | 3.7% | 4.6% | 4.0% | 4.2% | 3.8% | 4.8% | 3.7% | 4.5% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Residential Standby Losses - Home Office | R14 | 3.5% | 4.9% | 3.2% | 4.6% | 3.4% | 5.5% | 3.4% | 4.7% | 3.5% | 4.9% | 3.3% | 5.0% | 3.5% | 4.6% | 3.4% | 5.2% | 3.3% | 4.9% | 3.6% | 4.7% | 3.3% | 5.2% | 3.5% | 5.0% |

| | | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Commercial Electric Cooking | C01 | 6.0% | 2.6% | 5.4% | 2.4% | 5.7% | 2.9% | 5.8% | 2.5% | 5.9% | 2.5% | 5.5% | 2.6% | 6.0% | 2.4% | 5.7% | 2.6% | 5.6% | 2.5% | 6.1% | 2.5% | 5.6% | 2.7% | 5.9% | 2.6% |
| Commercial Electric DHW | C02 | 6.0% | 2.6% | 5.4% | 2.4% | 5.7% | 2.9% | 5.8% | 2.5% | 5.8% | 2.5% | 5.5% | 2.6% | 6.0% | 2.4% | 5.7% | 2.7% | 5.6% | 2.5% | 6.1% | 2.5% | 5.6% | 2.7% | 5.9% | 2.6% |
| Commercial Cooling | C03 | 0.7% | 0.1% | 0.6% | 0.1% | 0.7% | 0.1% | 0.7% | 0.1% | 13.6% | 5.5% | 12.8% | 5.7% | 13.9% | 5.2% | 13.3% | 5.9% | 13.0% | 5.5% | 0.7% | 0.1% | 0.7% | 0.1% | 0.7% | 0.1% |
| Commercial Electric Heating | C04 | 7.9% | 6.1% | 7.1% | 5.7% | 7.6% | 6.8% | 7.7% | 5.9% | 0.4% | 0.3% | 0.4% | 0.3% | 0.4% | 0.3% | 0.4% | 0.3% | 0.4% | 0.3% | 8.0% | 5.9% | 7.4% | 6.5% | 7.8% | 6.3% |
| Commercial Electric Heating and Cooling | C05 | 2.9% | 1.9% | 2.6% | 1.8% | 2.8% | 2.1% | 2.8% | 1.9% | 9.6% | 4.0% | 9.1% | 4.1% | 9.8% | 3.7% | 9.4% | 4.2% | 9.2% | 4.0% | 2.9% | 1.9% | 2.7% | 2.0% | 2.8% | 2.0% |
| Commercial Indoor Lighting | C06 | 5.9% | 2.6% | 5.3% | 2.5% | 5.7% | 2.9% | 5.7% | 2.6% | 5.8% | 2.6% | 5.5% | 2.6% | 5.9% | 2.4% | 5.7% | 2.7% | 5.5% | 2.6% | 6.0% | 2.6% | 5.5% | 2.8% | 5.9% | 2.7% |
| Grocery/Conv. Store Indoor Lighting | C07 | 4.7% | 3.7% | 4.2% | 3.5% | 4.4% | 4.2% | 4.5% | 3.6% | 4.7% | 3.8% | 4.4% | 3.9% | 4.8% | 3.6% | 4.6% | 4.1% | 4.5% | 3.8% | 4.7% | 3.6% | 4.3% | 3.9% | 4.6% | 3.8% |
| Hospital Indoor Lighting | C08 | 4.3% | 4.1% | 3.9% | 3.8% | 4.1% | 4.6% | 4.2% | 4.0% | 4.3% | 4.2% | 4.0% | 4.3% | 4.4% | 3.9% | 4.2% | 4.4% | 4.1% | 4.2% | 4.4% | 4.0% | 4.0% | 4.3% | 4.3% | 4.2% |
| Office Indoor Lighting | C09 | 6.2% | 2.3% | 5.6% | 2.1% | 6.0% | 2.5% | 6.0% | 2.2% | 6.2% | 2.3% | 5.9% | 2.4% | 6.4% | 2.2% | 6.1% | 2.4% | 5.9% | 2.3% | 6.3% | 2.2% | 5.8% | 2.4% | 6.2% | 2.3% |
| Restaurant Indoor Lighting | C10 | 4.8% | 3.6% | 4.3% | 3.4% | 4.5% | 4.1% | 4.6% | 3.5% | 4.8% | 3.7% | 4.5% | 3.8% | 4.9% | 3.5% | 4.7% | 4.0% | 4.6% | 3.7% | 4.8% | 3.5% | 4.4% | 3.8% | 4.7% | 3.7% |
| Retail Indoor Lighting | C11 | 5.3% | 3.1% | 4.7% | 3.0% | 5.0% | 3.5% | 5.1% | 3.1% | 5.3% | 3.2% | 5.0% | 3.3% | 5.4% | 3.1% | 5.2% | 3.4% | 5.0% | 3.2% | 5.3% | 3.1% | 4.9% | 3.3% | 5.2% | 3.2% |
| Warehouse Indoor Lighting | C12 | 5.8% | 2.6% | 5.2% | 2.5% | 5.6% | 2.9% | 5.6% | 2.5% | 5.8% | 2.7% | 5.5% | 2.8% | 6.0% | 2.5% | 5.7% | 2.8% | 5.6% | 2.7% | 5.9% | 2.5% | 5.4% | 2.8% | 5.8% | 2.7% |
| K-12 School Indoor Lighting | C13 | 6.8% | 3.2% | 6.1% | 3.0% | 6.5% | 3.6% | 6.6% | 3.1% | 4.1% | 2.3% | 3.9% | 2.3% | 4.2% | 2.1% | 4.0% | 2.4% | 3.9% | 2.3% | 6.9% | 3.1% | 6.3% | 3.4% | 6.7% | 3.3% |
| Indust. 1-shift (8/5) (e.g., comp. air, lights) | C14 | 7.5% | 1.0% | 6.7% | 1.0% | 7.1% | 1.1% | 7.2% | 1.0% | 7.5% | 1.1% | 7.1% | 1.1% | 7.7% | 1.0% | 7.4% | 1.1% | 7.2% | 1.1% | 7.6% | 1.0% | 7.0% | 1.1% | 7.4% | 1.0% |

| | | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S |
| Indust. 2-shift (16/5) (e.g., comp. air, lights) | C15 | 7.0% | 1.4% | 6.3% | 1.4% | 6.7% | 1.6% | 6.8% | 1.4% | 7.1% | 1.5% | 6.7% | 1.5% | 7.3% | 1.4% | 6.9% | 1.6% | 6.8% | 1.5% | 7.1% | 1.4% | 6.6% | 1.5% | 7.0% | 1.5% |
| Indust. 3-shift (24/5) (e.g., comp. air, lights) | C16 | 5.1% | 3.3% | 4.6% | 3.1% | 4.9% | 3.7% | 5.0% | 3.2% | 5.2% | 3.3% | 4.9% | 3.4% | 5.3% | 3.1% | 5.1% | 3.5% | 5.0% | 3.3% | 5.2% | 3.2% | 4.8% | 3.5% | 5.1% | 3.4% |
| Indust. 4-shift (24/7) (e.g., comp. air, lights) | C17 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Industrial Indoor Lighting | C18 | 6.6% | 1.9% | 5.9% | 1.8% | 6.3% | 2.1% | 6.3% | 1.9% | 6.6% | 1.9% | 6.2% | 2.0% | 6.8% | 1.8% | 6.5% | 2.0% | 6.3% | 1.9% | 6.6% | 1.9% | 6.1% | 2.0% | 6.5% | 2.0% |
| Industrial Outdoor Lighting | C19 | 2.7% | 6.2% | 2.4% | 5.9% | 2.6% | 7.0% | 2.6% | 6.0% | 1.9% | 5.7% | 1.8% | 5.8% | 2.0% | 5.3% | 1.9% | 6.0% | 1.8% | 5.7% | 2.7% | 6.0% | 2.5% | 6.6% | 2.6% | 6.4% |
| Commercial Outdoor Lighting | C20 | 3.5% | 5.0% | 3.1% | 4.7% | 3.3% | 5.6% | 3.3% | 4.8% | 2.7% | 5.6% | 2.5% | 5.8% | 2.7% | 5.3% | 2.6% | 5.9% | 2.5% | 5.6% | 3.5% | 4.8% | 3.2% | 5.3% | 3.4% | 5.1% |
| Commercial Office Equipment | C21 | 5.6% | 3.0% | 5.0% | 2.8% | 5.3% | 3.3% | 5.4% | 2.9% | 5.4% | 2.9% | 5.1% | 3.0% | 5.6% | 2.7% | 5.3% | 3.1% | 5.2% | 2.9% | 5.6% | 2.9% | 5.2% | 3.1% | 5.5% | 3.0% |
| Commercial Refrigeration | C22 | 5.7% | 2.9% | 5.1% | 2.7% | 5.4% | 3.2% | 5.5% | 2.8% | 5.5% | 2.8% | 5.1% | 2.9% | 5.6% | 2.7% | 5.3% | 3.0% | 5.2% | 2.8% | 5.8% | 2.8% | 5.3% | 3.1% | 5.6% | 3.0% |
| Commercial Ventilation | C23 | 5.6% | 2.9% | 5.1% | 2.7% | 5.4% | 3.3% | 5.4% | 2.8% | 6.1% | 2.3% | 5.7% | 2.4% | 6.2% | 2.2% | 5.9% | 2.4% | 5.8% | 2.3% | 5.7% | 2.8% | 5.3% | 3.1% | 5.6% | 3.0% |
| Traffic Signal - Red Balls, always changing or flashing | C24 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - Red Balls, changing day, off night | C25 | 5.5% | 2.9% | 4.9% | 2.8% | 5.2% | 3.3% | 5.3% | 2.9% | 5.5% | 3.0% | 5.2% | 3.1% | 5.7% | 2.8% | 5.4% | 3.1% | 5.3% | 3.0% | 5.5% | 2.9% | 5.1% | 3.1% | 5.4% | 3.0% |
| Traffic Signal - Green Balls, always changing | C26 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |

| | | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S |
| Traffic Signal - Green Balls, changing day, off night | C27 | 5.5% | 2.9% | 4.9% | 2.8% | 5.2% | 3.3% | 5.3% | 2.9% | 5.5% | 3.0% | 5.2% | 3.1% | 5.7% | 2.8% | 5.4% | 3.1% | 5.3% | 3.0% | 5.5% | 2.9% | 5.1% | 3.1% | 5.4% | 3.0% |
| Traffic Signal - Red Arrows | C28 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - Green Arrows | C29 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - Flashing Yellows | C30 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - “Hand” Don’t Walk Signal | C31 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - “Man” Walk Signal | C32 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Traffic Signal - Bi-Modal Walk/Don’t Walk | C33 | 3.8% | 4.6% | 3.4% | 4.3% | 3.6% | 5.1% | 3.7% | 4.4% | 3.8% | 4.6% | 3.6% | 4.7% | 3.9% | 4.3% | 3.8% | 4.8% | 3.7% | 4.6% | 3.9% | 4.4% | 3.6% | 4.8% | 3.8% | 4.7% |
| Industrial Motor | C34 | 7.0% | 1.4% | 6.3% | 1.4% | 6.7% | 1.6% | 6.8% | 1.4% | 7.1% | 1.5% | 6.7% | 1.5% | 7.3% | 1.4% | 6.9% | 1.6% | 6.8% | 1.5% | 7.1% | 1.4% | 6.6% | 1.5% | 7.0% | 1.5% |
| Industrial Process | C35 | 7.0% | 1.4% | 6.3% | 1.4% | 6.7% | 1.6% | 6.8% | 1.4% | 7.1% | 1.5% | 6.7% | 1.5% | 7.3% | 1.4% | 6.9% | 1.6% | 6.8% | 1.5% | 7.1% | 1.4% | 6.6% | 1.5% | 7.0% | 1.5% |
| HVAC Pump Motor (heating) | C36 | 5.7% | 6.9% | 5.2% | 6.4% | 5.5% | 7.7% | 5.5% | 6.6% | 1.2% | 1.4% | 1.1% | 1.4% | 1.2% | 1.3% | 1.2% | 1.4% | 1.2% | 1.4% | 5.8% | 6.6% | 5.3% | 7.3% | 5.7% | 7.1% |
| HVAC Pump Motor (cooling) | C37 | 1.2% | 1.4% | 1.0% | 1.3% | 1.1% | 1.5% | 1.1% | 1.3% | 7.5% | 9.1% | 7.1% | 9.3% | 7.7% | 8.5% | 7.3% | 9.6% | 7.2% | 9.1% | 1.2% | 1.3% | 1.1% | 1.5% | 1.1% | 1.4% |
| HVAC Pump Motor (unknown use) | C38 | 3.4% | 4.1% | 3.1% | 3.9% | 3.3% | 4.6% | 3.3% | 4.0% | 4.4% | 5.2% | 4.1% | 5.4% | 4.5% | 4.9% | 4.3% | 5.5% | 4.2% | 5.2% | 3.5% | 4.0% | 3.2% | 4.4% | 3.4% | 4.2% |
| VFD - Supply fans <10 HP | C39 | 5.7% | 2.3% | 5.2% | 2.1% | 5.5% | 2.5% | 5.6% | 2.2% | 5.8% | 3.3% | 5.5% | 3.4% | 5.9% | 3.1% | 5.7% | 3.5% | 5.5% | 3.3% | 5.8% | 2.2% | 5.4% | 2.4% | 5.7% | 2.3% |
| VFD - Return fans <10 HP | C40 | 5.7% | 2.3% | 5.2% | 2.1% | 5.5% | 2.5% | 5.6% | 2.2% | 5.8% | 3.3% | 5.5% | 3.4% | 5.9% | 3.1% | 5.7% | 3.5% | 5.5% | 3.3% | 5.8% | 2.2% | 5.4% | 2.4% | 5.7% | 2.3% |
| VFD - Exhaust fans <10 HP | C41 | 5.1% | 3.3% | 4.6% | 3.1% | 4.9% | 3.7% | 5.0% | 3.2% | 4.1% | 4.3% | 3.9% | 4.4% | 4.2% | 4.1% | 4.1% | 4.6% | 4.0% | 4.3% | 5.2% | 3.2% | 4.8% | 3.5% | 5.1% | 3.4% |

| | | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S | M-F | S-S |
| VFD - Boiler feedwater pumps <10 HP | C42 | 6.4% | 6.2% | 5.7% | 5.9% | 6.1% | 7.0% | 6.1% | 6.0% | 1.3% | 1.3% | 1.3% | 1.3% | 1.4% | 1.2% | 1.3% | 1.3% | 1.3% | 1.3% | 6.4% | 6.0% | 5.9% | 6.6% | 6.3% | 6.4% |
| VFD - Chilled water pumps <10 HP | C43 | 1.7% | 0.8% | 1.5% | 0.7% | 1.6% | 0.9% | 1.6% | 0.8% | 8.3% | 8.5% | 7.8% | 8.7% | 8.5% | 8.0% | 8.1% | 8.9% | 7.9% | 8.5% | 1.7% | 0.8% | 1.6% | 0.8% | 1.6% | 0.8% |
| VFD Boiler circulation pumps <10 HP | C44 | 6.4% | 6.2% | 5.7% | 5.9% | 6.1% | 7.0% | 6.1% | 6.0% | 1.3% | 1.3% | 1.3% | 1.3% | 1.4% | 1.2% | 1.3% | 1.3% | 1.3% | 1.3% | 6.4% | 6.0% | 5.9% | 6.6% | 6.3% | 6.4% |
| Refrigeration Economizer | C45 | 5.4% | 7.2% | 4.8% | 6.7% | 5.1% | 8.0% | 5.2% | 7.0% | 1.1% | 1.5% | 1.1% | 1.5% | 1.2% | 1.4% | 1.1% | 1.5% | 1.1% | 1.5% | 5.4% | 7.0% | 5.0% | 7.6% | 5.3% | 7.4% |
| Evaporator Fan Control | C46 | 3.6% | 5.1% | 3.2% | 4.8% | 3.4% | 5.7% | 3.4% | 4.9% | 3.4% | 4.7% | 3.2% | 4.8% | 3.5% | 4.4% | 3.3% | 4.9% | 3.3% | 4.7% | 3.6% | 4.9% | 3.3% | 5.4% | 3.5% | 5.2% |
| Standby Losses - Commercial Office | C47 | 1.2% | 7.1% | 1.1% | 6.7% | 1.2% | 8.0% | 1.2% | 6.9% | 1.1% | 7.1% | 1.1% | 7.3% | 1.2% | 6.7% | 1.1% | 7.5% | 1.1% | 7.1% | 1.2% | 6.9% | 1.1% | 7.5% | 1.2% | 7.3% |
| VFD Boiler draft fans <10 HP | C48 | 5.5% | 6.9% | 5.0% | 6.5% | 5.3% | 7.7% | 5.3% | 6.7% | 1.3% | 1.5% | 1.2% | 1.5% | 1.3% | 1.4% | 1.3% | 1.5% | 1.2% | 1.5% | 5.6% | 6.7% | 5.2% | 7.3% | 5.5% | 7.1% |
| VFD Cooling Tower Fans <10 HP | C49 | 1.2% | 0.7% | 1.1% | 0.7% | 1.1% | 0.8% | 1.1% | 0.7% | 11.0% | 6.5% | 10.4% | 6.7% | 11.3% | 6.2% | 10.8% | 6.9% | 10.5% | 6.5% | 1.2% | 0.7% | 1.1% | 0.8% | 1.2% | 0.8% |
| Engine Block Heater Timer | C50 | 3.9% | 8.6% | 3.5% | 8.1% | 3.7% | 9.6% | 3.8% | 8.3% | 0.8% | 1.7% | 0.8% | 1.7% | 0.8% | 1.6% | 0.8% | 1.8% | 0.8% | 1.7% | 4.0% | 8.3% | 3.7% | 9.1% | 3.9% | 8.9% |
| Door Heater Control | C51 | 4.5% | 9.8% | 4.0% | 9.2% | 4.3% | 11.0% | 4.3% | 9.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 4.5% | 9.5% | 4.2% | 10.4% | 4.4% | 10.1 % |
| Beverage and Snack Machine Controls | C52 | 1.5% | 6.8% | 1.3% | 6.4% | 1.4% | 7.6% | 1.4% | 6.6% | 1.5% | 6.8% | 1.4% | 7.0% | 1.5% | 6.4% | 1.5% | 7.2% | 1.4% | 6.8% | 1.5% | 6.6% | 1.4% | 7.2% | 1.5% | 7.0% |
| Flat | C53 | 5.4% | 3.1% | 4.8% | 2.9% | 5.1% | 3.4% | 5.2% | 3.0% | 5.3% | 3.1% | 5.0% | 3.2% | 5.5% | 2.9% | 5.2% | 3.3% | 5.1% | 3.1% | 5.4% | 3.0% | 5.0% | 3.3% | 5.3% | 3.2% |

## 5.6 Summer Peak Period Definition (kW)

To estimate the impact that an efficiency measure has on a utility's system peak, the peak itself needs to be defined. Illinois spans two different electrical control areas, the Pennsylvania – Jersey – Maryland (PJM) and the Midwest Independent System Operators (MISO). As a result, there is some disparity in the peak definition across the state. However, only PJM has a forward capacity market where an efficiency program can potentially participate. Because ComEd is part of the PJM control area, their definition of summer peak is being applied statewide in this TRM.

Because Illinois is a summer peaking state, only the summer peak period is defined for the purpose of this TRM. The coincident summer peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June through August.

Summer peak coincidence factors can be found within each measure characterization. The source is provided and is based upon evaluation results, analysis of load shape data (e.g., the Itron eShapes data provided by Ameren), or through a calculation using stated assumptions.

For measures that are not weather-sensitive, the summer peak coincidence factor is estimated whenever possible as the average of savings within the peak period defined above. For weather sensitive measures such as cooling, the summer peak coincidence factor is provided in two different ways. The first method is to estimate demand savings during the utility's peak hour (as provided by Ameren). This is likely to be the most indicative of actual peak benefits. The second way represents the average savings over the summer peak period, consistent with the non-weather sensitive end uses, and is presented so that savings can be bid into PJM's Forward Capacity Market.

## 5.7 Heating and Cooling Degree-Day Data

Many measures are weather sensitive. Because there is a range of climactic conditions across the state, VEIC engaged the Utilities to provide their preferences for what airports and cities are the best proxies for the weather in their service territories. The result of this engagement is in the table below. All of the data represents 30-year normals[32] from the National Climactic Data Center (NCDC). Note that the base temperature for the calculation of heating degree-days in this document does not follow the historical 65F degree base temperature convention. Instead VEIC used several different temperatures in this TRM to more accurately reflect the outdoor temperature when a heating or cooling system turns on.

Residential heating is based on 60F, in accordance with regression analysis of heating fuel use and weather by state by the Pacific Northwest National Laboratory[33]. Residential cooling is based on 65F in agreement with a field study in Wisconsin[34]. These are lower than typical thermostat set points because internal gains such as appliances, lighting, and people provide some heating. In C&I settings, internal gains are often much higher; the base temperatures for both heating and cooling is 55F[35]. Custom degree-days with building specific base temperatures

[32] 30-year normals have been used instead of Typical Meteorological Year (TMY) data due to the fact that few of the measures in the TRM are significantly affected by solar insolation, which is one of the primary benefits of using the TMY approach.

[33] Belzer and Cort, Pacific Northwest National Laboratory in "Statistical Analysis of Historical State-Level Residential Energy Consumption Trends," 2004.

[34] Energy Center of Wisconsin, May 2008 metering study; "Central Air Conditioning in Wisconsin, A Compilation of Recent Field Research", p. 32 (amended in 2010).

[35] This value is based upon experience, and it is preferable to use building-specific base temperatures when available.

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are recommended for large C&I projects.

**Table 5.4: Degree-Day Zones and Values by Market Sector**

| | Residential | | C&I | | |
|---|---|---|---|---|---|
| Zone | HDD | CDD | HDD | CDD | Weather Station / City |
| 1 | 5,352 | 820 | 4,272 | 2,173 | Rockford AP / Rockford |
| 2 | 5,113 | 842 | 4,029 | 3,357 | Chicago O'Hare AP / Chicago |
| 3 | 4,379 | 1,108 | 3,406 | 2,666 | Springfield #2 / Springfield |
| 4 | 3,378 | 1,570 | 2,515 | 3,090 | Belleville SIU RSCH / Belleville |
| 5 | 3,438 | 1,370 | 2,546 | 2,182 | Carbondale Southern IL AP / Marion |
| Average | 4,860 | 947 | 3,812 | 3,051 | Weighted by occupied housing units |
| Base Temp | 60F | 65F | 55F | 55F | 30 year climate normals, 1981-2010 |

**Comment [Jen12]:** 7/30/12

This table assigns each of the proxy cities to one of five climate zones. The following graphics from the Illinois State Water Survey show isobars (lines of equal degree-days) and we have color-coded the counties in each of these graphics using those isobars as a dividing line. Using this approach, the state divides into five cooling degree-day zones and five heating degree-day zones. Note that although the heating and cooling degree-day maps are similar, they are not the same, and the result is that there are a total of 10 climate zones in the state. The counties are listed in the tables following the figures for ease of reference.

**Figure 3: Cooling Degree-Day Zones by County**

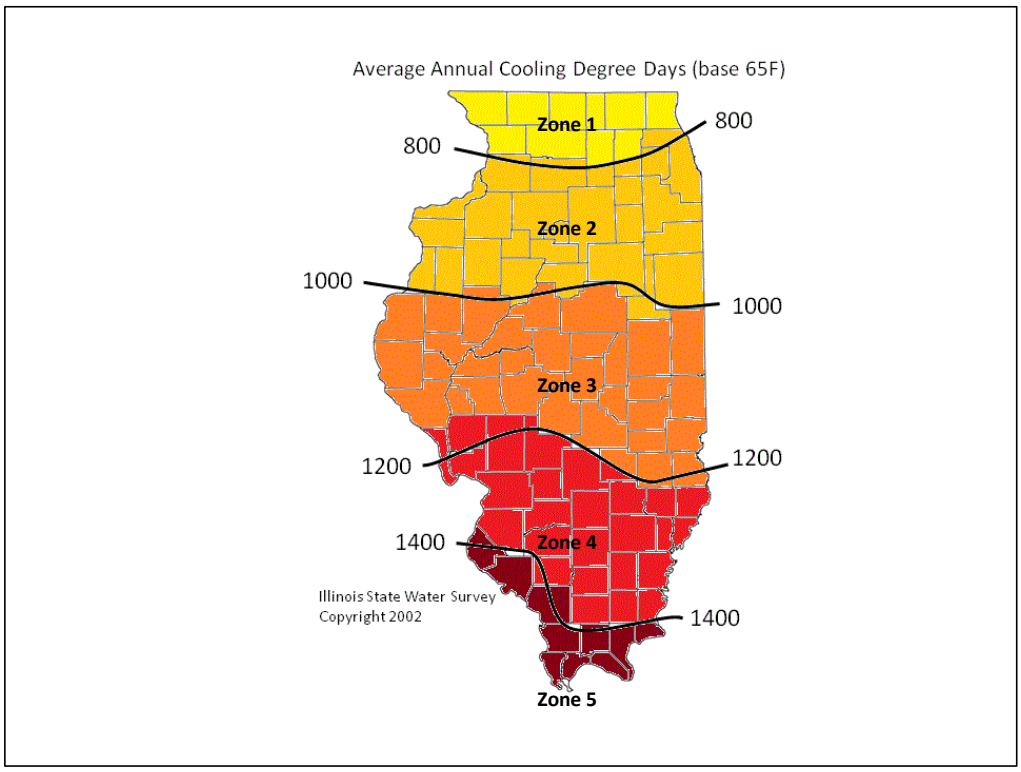

**Figure 4: Heating Degree-Day Zones by County**

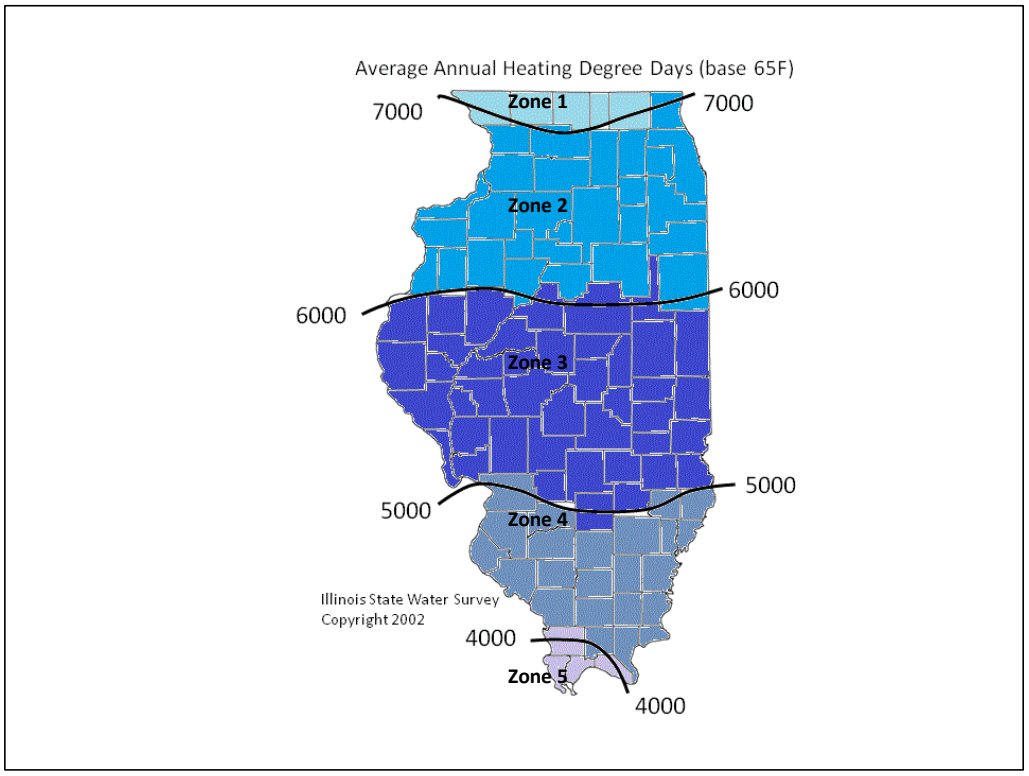

**Table 5.5: Heating Degree-Day Zones by County**

| Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 |
|---|---|---|---|---|
| Boone County | Bureau~~Carroll~~ | Adams County | Clinton County | Alexander County |
| Jo Daviess County | Carroll~~Bureau~~ | Bond County | Edwards County | Massac County |
| Stephenson County | Cook County | Brown County | Franklin County | Pulaski County |
| Winnebago County | DeKalb County | Calhoun County | Gallatin County | Union County |
| | DuPage County | Cass County | Hamilton County | |
| | Grundy County | Champaign County | Hardin County | |
| | Henderson County | Christian County | Jackson County | |
| | Henry County | Clark County | Jefferson County | |
| | Iroquois County | Clay County | Johnson County | |
| | Kane County | Coles County | Lawrence County | |
| | Kankakee County | Crawford County | Madison County | |
| | Kendall County | Cumberland County | Marion County | |
| | Knox County | De Witt County | Monroe County | |
| | Lake County | Douglas County | Perry County | |
| | LaSalle County | Edgar County | Pope County | |
| | Lee County | Effingham County | Randolph County | |
| | Livingston County | Fayette County | Richland County | |
| | Marshall County | Ford County | Saline County | |
| | McHenry County | Fulton County | St. Clair County | |
| | Mercer County | Greene County | Wabash County | |
| | Ogle County | Hancock County | Washington County | |
| | Peoria County | Jasper County | Wayne County | |
| | Putnam County | Jersey County | White County | |
| | Rock Island County | Logan County | Williamson County | |
| | Stark County | Macon County | | |
| | Warren County | Macoupin County | | |
| | Whiteside County | Mason County | | |
| | Will County | McDonough County | | |
| | Woodford County | McLean County | | |
| | | Menard County | | |
| | | Montgomery | | |
| | | Morgan County | | |
| | | Moultrie County | | |
| | | Piatt County | | |
| | | Pike County | | |
| | | Sangamon County | | |
| | | Schuyler County | | |
| | | Scott County | | |
| | | Shelby County | | |
| | | Tazewell County | | |
| | | Vermilion County | | |

**Comment [Jen13]:** 7/30/12

**Table 5.6: Cooling Degree-day Zones by County**

| Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 |
|---|---|---|---|---|
| Boone County | Bureau County | Adams County | Bond County | Alexander County |
| Carroll County | Cook County | Brown County | Clay County | Hardin County |
| DeKalb County | DuPage County | Calhoun County | Clinton County | Johnson County |
| Jo Daviess County | Grundy County | Cass County | Edwards County | Massac County |
| Kane County | Henderson County | Champaign County | Fayette County | Pope County |
| Lake County | Henry County | Christian County | Franklin County | Pulaski County |
| McHenry County | Iroquois County | Clark County | Gallatin County | Randolph County |
| Ogle County | Kankakee County | Coles County | Hamilton County | Union County |
| Stephenson County | Kendall County | Crawford County | Jackson County | |
| Winnebago County | Knox County | Cumberland County | Jefferson County | |
| | LaSalle County | De Witt County | Jersey County | |
| | Lee County | Douglas County | Lawrence County | |
| | Livingston County | Edgar County | Macoupin County | |
| | Marshall County | Effingham County | Madison County | |
| | Mercer County | Ford County | Marion County | |
| | Peoria County | Fulton County | Monroe County | |
| | Putnam County | Greene County | Montgomery | |
| | Rock Island County | Hancock County | Perry County | |
| | Stark County | Jasper County | Richland County | |
| | Warren County | Logan County | Saline County | |
| | Whiteside County | Macon County | St. Clair County | |
| | Will County | Mason County | Wabash County | |
| | Woodford County | McDonough County | Washington County | |
| | | McLean County | Wayne County | |
| | | Menard County | White County | |
| | | Morgan County | Williamson County | |
| | | Moultrie County | | |
| | | Piatt County | | |
| | | Pike County | | |
| | | Sangamon County | | |
| | | Schuyler County | | |
| | | Scott County | | |
| | | Shelby County | | |
| | | Tazewell County | | |
| | | Vermilion County | | |

## 5.8 O&M Costs and the Weighted Average Cost of Capital (WACC)

Some measures specify an operations and maintenance (O&M) parameter that describes the incremental O&M cost savings that can be expected over the measure's lifetime. When estimating the cost effectiveness of these measures, it is necessary to calculate the net present value (NPV) of O&M costs over the life of the measure, which requires an appropriate discount rate. The utility's weighted average cost of capital (WACC) is the most commonly used discount rate that is used in this context.

Each utility has a unique WACC that will vary over time. As a result, the TRM does not specify the NPV of the O&M costs. Instead, the necessary information required to calculate the NPV is included. An example is provided below to demonstrate how to calculate the NPV of O&M costs.

**EXAMPLE**

Baseline Case: O&M costs equal $150 every two years.

Efficient Case: O&M costs equal $50 every five years.

Given this information, the incremental O&M costs can be determined by discounting the cash flows in the Baseline Case and the Efficient Case separately using the applicable WACC. Then the NPV of the incremental O&M costs is calculated by subtracting one NPV from the other. This value is then used in each utility's cost-effectiveness screening process.

Those measures that include baseline shifts that result in multiple component costs and lifetimes cannot be calculated by this standard method. In only these cases, the O&M costs are presented both as Annual Levelized equivalent cost (i.e., the annual payment that results in an equivalent NPV to the actual stream of O&M costs) and as NPVs using a statewide average real discount rate of 5.23%.

## 5.9 Interactive Effects

The TRM presents engineering equations for most measures. This approach is desirable because it conveys information clearly and transparently, and is widely accepted in the industry. Unlike simulation model results, engineering equations also provide flexibility and the opportunity for users to substitute local, specific information for specific input values. Furthermore, the parameters can be changed in TRM updates to be applied in future years as better information becomes available.

One limitation is that some interactive effects between measures are not automatically captured. Because we cannot know what measures will be implemented at the same time with the same customer, we cannot always capture the interactions between multiple measures within individual measure characterizations. However, interactive effects with different end-uses are included in individual measure characterizations whenever possible.[36] For instance, waste heat factors are included in the lighting characterizations to capture the interaction between more-efficient lighting measures and the amount of heating and/or cooling that is subsequently needed in the building.

By contrast, no effort is made to account for interactive effects between an efficient air conditioning measure and an efficient lighting measure, because it is impossible to know the specifics of the other measure in advance of its installation. For custom measures and projects where a bundle of measures is being implemented at the same time, these kinds of interactive effects should be estimated.

[36] For more information, please refer to the document, "Dealing with Interactive Effects During Measure Characterization" Memo to the Stakeholder Advisory Group dated 12/9/11.

# 6 C&I Custom Value Use in Measure Implementation

~~This section defines the requirements for analyzing and documenting energy efficiency measures.~~

This section defines the requirements for capturing custom variables stated in the commercial and industrial prescriptive measures defined in this statewide TRM. This approach is to be used when a variable in a measure formula can be replaced by a verifiable and documented value that is not presented in the TRM. This approach assumes that the algorithms presented in the measure are used as stated and only allows changes to certain variable values and is not a replacement algorithm for the measure. ~~If a new algorithm is required for the measure in question, a custom measure protocol can be employed, if appropriate, or the measure can be entered into the defined change/update process for further consideration as to the measure change or addition to the next statewide TRM revision. Program Administrators can use custom measures outside of change/update process but they may be at risk for savings values until such time as the measure is approved and incorporated into the TRM.~~

~~This approach is intended to address the energy impacts of the incremental energy efficiency improvements over what would have been installed as per applicable federal/state/local codes or standard industry practice and allow the program administrator some flexibility in entering custom values into defined energy savings algorithms. The approach allows this flexibility only on certain measures and on certain values within those measures.~~

**Comment [Jen14]:** Added and edited the revised intro from 7/18/12

**Comment [Jen15]:** While these are not strictly typos, these items seem irrelevant to this section and may cause confusion by including this discussion in this section.

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## ~~6.1.1~~6.1 Custom Variables

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The following table defines which C&I measures this custom approach can be applied to and further, what variables can be adjusted. This table does not include variables that require actually installed numbers that are collected from the customer, but maps those values where a default value is provided that can be replaced with a custom value. Also indicated is the type of validation required to update a custom figure. Information should be collected and stored based on existing utility procedures.

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.2.3 | Commercial Steam Cooker | $HOURS_{day}$ | Average ~~Dailey~~Daily Operation (hours) | Customer input or ~~M~~measured value | |
| | | F | Food cooked per day (lb) | Customer input or ~~M~~measured value | |
| | | $Days_{Year}$ | Annual Days of Operation (days) | Customer input or ~~M~~measured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.2.5 | ENERGY STAR Convection Oven | HOURSday | Average Dail~~e~~y Operation (hours) | Customer input or ~~M~~measured value | |
| | | Days | Annual Days of Operation (days) | Customer input or ~~M~~measured value | |
| | | LB | Food cooked per day (lb) | Customer input or ~~M~~measured value | |
| | | EffENERGYSTAR | Cooking Efficiency ENERGY STAR | From ENERGY STAR product data | |
| | | EffBase | Cooking Efficiency Baseline | Customer input or ~~M~~measured value | |
| | | PCENERGYSTAR | Production Capacity ENERGY STAR (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PCBase | Production Capacity base (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PPreheatNumberENERGYSTAR | Number of preheat~~e~~s per day ENERGY STAR | From ENERGY STAR product data | |
| | | PreheatNumberbase | Number of preheats per day Base | Customer input or ~~M~~measured value | |
| | | PreheatTimeENERGYSTAR | preheat length ENERGY STAR, min | From ENERGY STAR product data | |
| | | PreheatTimeBase | preheat length base, min | Customer input or ~~M~~measured value | |
| | | PreheatRateENERGYSTAR | preheat energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | PreheatRateBase | preheat energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleENERGYSTAR | Idle energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | IdleBase | Idle energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleBaseTime | BASE Idle Time, hours | Customer input or ~~M~~measured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.2.5 | ENERGY STAR Convection Oven | HOURSday | Average Dail~~e~~y Operation (hours) | Customer input or ~~M~~measured value | |
| | | Days | Annual Days of Operation (days) | Customer input or ~~M~~measured value | |
| | | LB | Food cooked per day (lb) | Customer input or ~~M~~measured value | |
| | | EffENERGYSTAR | Cooking Efficiency ENERGY STAR | From ENERGY STAR product data | |
| | | EffBase | Cooking Efficiency Baseline | Customer input or ~~M~~measured value | |
| | | PCENERGYSTAR | Production Capacity ENERGY STAR (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PCBase | Production Capacity base (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PPreheatNumberENERGYSTAR | Number of preheat~~e~~s per day ENERGY STAR | From ENERGY STAR product data | |
| | | PreheatNumberbase | Number of preheat~~e~~s per day Base | Customer input or ~~M~~measured value | |
| | | PreheatTimeENERGYSTAR | preheat length ENERGY STAR, min | From ENERGY STAR product data | |
| | | PreheatTimeBase | preheat length base, min | Customer input or ~~M~~measured value | |
| | | PreheatRateENERGYSTAR | preheat energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | PreheatRateBase | preheat energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleENERGYSTAR | Idle energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | IdleBase | Idle energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleBaseTime | BASE Idle Time, hours | Customer input or ~~M~~measured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.2.7 | ENERGY STAR Fryer | HOURSday | Average Dail~~e~~y Operation (hours) | Customer input or ~~M~~measured value | |
| | | Days | Annual Days of Operation (days) | Customer input or ~~M~~measured value | |
| | | LB | Food cooked per day (lb) | Customer input or ~~M~~measured value | |
| | | EffENERGYSTAR | Cooking Efficiency ENERGY STAR | From ENERGY STAR product data | |
| | | EffBase | Cooking Efficiency Baseline | Customer input or ~~M~~measured value | |
| | | PCENERGYSTAR | Production Capacity ENERGY STAR (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PCBase | Production Capacity base (lbs/hr) | Customer input or ~~M~~measured value | |
| | | PPreheatNumberENERGYSTAR | Number of preheat~~e~~s per day ENERGY STAR | From ENERGY STAR product data | |
| | | PreheatNumberbase | Number of preheat~~e~~s per day Base | Customer input or ~~M~~measured value | |
| | | PreheatTimeENERGYSTAR | preheat length ENERGY STAR, min | From ENERGY STAR product data | |
| | | PreheatTimeBase | preheat length base, min | Customer input or ~~M~~measured value | |
| | | PreheatRateENERGYSTAR | preheat energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | PreheatRateBase | preheat energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleENERGYSTAR | Idle energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | |
| | | IdleBase | Idle energy rate baseline, ~~btu~~Btu/h | Customer input or ~~M~~measured value | |
| | | IdleBaseTime | BASE Idle Time, hours | Customer input or ~~M~~measured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.2.7 | ENERGY STAR Fryer | HOURSday | Average Dail~~e~~y Operation (hours) | Customer input or m~~M~~easured value | Electric and Gas |
| | | Days | Annual Days of Operation (days) | Customer input or m~~M~~easured value | Electric and Gas |
| | | LB | Food cooked per day (lb) | Customer input or m~~M~~easured value | Electric and Gas |
| | | Width | Griddle Width, ft | Customer input or m~~M~~easured value | Electric and Gas |
| | | Depth | Griddle Depth, ft | Customer input or m~~M~~easured value | Electric and Gas |
| | | EffENERGYSTAR | Cooking Efficiency ENERGY STAR | From ENERGY STAR product data | Electric and Gas |
| | | EffBase | Cooking Efficiency Baseline | Customer input or m~~M~~easured value | Electric and Gas |
| | | PCENERGYSTAR | Production Capacity ENERGY STAR (lbs/hr) | Customer input or m~~M~~easured value | Electric and Gas |
| | | PCBase | Production Capacity base (lbs/hr) | Customer input or m~~M~~easured value | Electric and Gas |
| | | ~~P~~PreheatNumberENERGYSTAR | Number of preheat~~e~~s per day ENERGY STAR | From ENERGY STAR product data | Electric and Gas |
| | | PreheatNumberbase | Number of preheat~~e~~s per day Base | Customer input or m~~M~~easured value | Electric and Gas |
| | | PreheatTimeENERGYSTAR | preheat length ENERGY STAR, min | From ENERGY STAR product data | Electric and Gas |
| | | PreheatTimeBase | preheat length base, min | Customer input or m~~M~~easured value | Electric and Gas |
| | | PreheatRateENERGYSTAR | preheat energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | Electric and Gas |
| | | PreheatRateBase | preheat energy rate baseline, ~~btu~~Btu/h | Customer input or m~~M~~easured value | Electric and Gas |
| | | IdleENERGYSTAR | Idle energy rate ENERGY STAR, ~~btu~~Btu/h | From ENERGY STAR product data | Electric and Gas |
| | | IdleBase | Idle energy rate baseline, ~~btu~~Btu/h | Customer input or m~~M~~easured value | Electric and Gas |
| | | IdleBaseTime | BASE Idle Time, hours | Customer input or m~~M~~easured value | Electric and Gas |
| 6.2.9 ENERGY STAR | ENERGY STAR Hot Food Holding Cabinet | PowerBaseline | Baseline power of cabinet, Watts | | |
| | | PowerENERGYSTAR | cabinet, Watts | From ENERGY STAR product data | |
| | | HOURSday | Average Dail~~e~~y Operation (hours) | Customer input or Measured value | |
| | | Days | Annual Days of Operation (days) | Customer input or Measured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.3.1 | High Efficiency Pre-Rinse Spray Valve | Tout | Outlet Water Temperature | Customer input or m~~M~~easured value | |
| | | Tin | Inlet Water Temperature | Customer input or m~~M~~easured value | |
| | | EFF | Efficiency of water heater supplying hot water | Customer input or m~~M~~easured value or m~~M~~anufacturer specification | ~~This applicable to both the gas efficiency and the electric efficiency~~ Electric and Gas |
| | | FLObase | Base case flow in gallons per minute | Customer input or m~~M~~easured value or m~~M~~anufacturer specification | |
| | | FLOeff | Efficient case flow in gallons per minute | Customer input or m~~M~~easured value or m~~M~~anufacturer specification | |
| | | $HOURS_{day}$ | Hours ~~or~~ of use per day | Customer input or m~~M~~easured value | |
| | | $Days_{Year}$ | Days of use per year | Customer input or m~~M~~easured value | |
| 6.3.2 | Low Flow Faucet Aerators | NOPF | Number of occupants per faucet | Customer input | |
| | | GPM_base | Average flow rate, in gallons per minute, of the baseline faucet "as-used" | Documented value based on study or report | |
| | | GPM_low | Average flow rate, in gallons per minute, of the low-flow faucet aerator "as-used | Documented value based on study or report | |
| | | L_base | Average baseline length faucet use per capita for all faucets in minutes | Documented value based on study or report | |
| | | L_low | Average retrofit length faucet use per capita for all faucets in minutes | Documented value based on study or report | |
| 6.3.3 | Low Flow Showerheads | GPM_base | Average flow rate, in gallons per minute, of the baseline faucet "as-used" | Documented flow rate from installed equipment | |

| | | | | | |
|---|---|---|---|---|---|
| | | NSPF | Number of showers per faucet~~s~~ | Customer input | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.3.4 | Tankless Water Heater | Wgal | Annual Water use for equipment | Customer input or measured value | |
| | | Tout | Outlet Water Temperature | Customer input or measured value | |
| | | Tin | Inlet Water Temperature | Customer input or measured value | |
| | | SL | Stand-by Loss in Base Case Btu/hr | Customer input or measured value | |
| | | Eff_ee | Rated Efficiency of water Heater | Customer input or documented value based on study or report | |
| | | Tank Volume | Tank Volume | Customer input or documented value based on study or report | |
| 6.4.2 | Space Boiler Tune-up | Ngi | Boiler gas input size | Customer input or ~~M~~measured value | |
| | | SF | Savings Factor | Customer input or ~~M~~measured value | |
| | | Effpre | Boiler Efficiency before Tune-up | Customer input or m~~M~~easured value | |
| 6.4.3 | Process Boiler Tune-up | Ngi | Boiler gas input size | Customer input or m~~M~~easured value | |
| | | UF | Utilization Factor | Customer input or m~~M~~easured value | |
| | | Effpre | Boiler Combustion Efficiency before Tune-up | Customer input or m~~M~~easured value | |
| | | $Eff_{measured}$ | Boiler Combustion Efficiency before Tune-up | Customer input or m~~M~~easured value | |
| 6.4.4 | Boiler Lockout/Reset Controls | Binput | Boiler Input Capacity | Customer input or measured value | |
| | | SF | Savings Factor | Customer input or m~~M~~easured value | |
| | | Effpre | Boiler Efficiency | Customer input or m~~M~~easured value | |
| 6.4.11 | High Efficiency Boiler | Capacity | Nominal Heating Capacity Boiler Size | Customer input or m~~M~~easured value | |
| | | AFUE(base) | Efficient Furnace Annual Fuel Utilization Efficiency Rating | Customer input or m~~M~~easured value | |
| | | AFUE(eff) | Efficient Furnace Annual Fuel Utilization Efficiency Rating | Customer input or m~~M~~easured value | |

| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.4.12 | High Efficiency Furnace | Capacity | Nominal Furnace input capacity | Customer input or ~~M~~measured value | |
| | | AFUE(base) | Efficient Furnace Annual Fuel Utilization Efficiency Rating | Customer input or ~~M~~measured value | |
| | | AFUE(eff) | Efficient Furnace Annual Fuel Utilization Efficiency Rating | Customer input or ~~M~~measured value | |
| 6.4.15 | Steam Trap Replacement or Repair | B | Boiler Efficiency | Customer input or measured value | |
| | | L | Leaking and blow-thru percentage | Customer input or documented value based on study or report | |
| 6.4.16 | VSD for HVAC | HP | Motor HP | Customer input or measured value | |
| | | Load Factor | Motor Load Factor | Customer input or measured value | |
| | | Hours | Actual hours for equipment operations | Customer input or ~~M~~measured value | |
| | | ESF | VDS Energy Savings Factors | Custom calculated values | |
| | | CF | Coincidence factor | Custom calculated values | |
| 6.5.3 | HPT8 Lighting | $Watts_{base}$ | Base Wattage | Customer input or measured value | This will allow for reduced wattage applications |
| | | $Watts_{EE}$ | Efficiency Wattage | Customer input or measured value | This will allow for reduced wattage applications |
| | | Hours | Average use hours | Customer input or documented value based on study or report | |

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| Measure Number | Measure Title | Adjustable Variable | Adjustable Variable Description | Documentation | Notes |
|---|---|---|---|---|---|
| 6.5.4 | T5 Lighting | $Watts_{base}$ | Base Wattage | Customer input or measured value | This will allow for reduced wattage applications |
| | | $Watts_{EE}$ | Efficiency Wattage | Customer input or measured value | This will allow for reduced wattage applications |
| | | Hours | Average use hours | Customer input or documented value based on study or report | |
| 6.5.5 | Lighting Controls | $KW_{connected}$ | Total Connected kW load | Customer input or measured value | |
| | | Hours | Hours of use | Customer input or documented value based on study or report | |
| | | ESF | Energy Savings Factor | Customer input or documented value based on study or report | |
| 6.5.6 | Lighting Power Density Reduction | $WSF_{effic}$ | The actual installed lighting watts per square foot or linear foot | Customer input | |
| | | SF | ~~s~~Square footage of the building area applicable to the lighting design | Customer input | |
| | | Hours | Hours of use | Customer input | |