State of Illinois

Energy Efficiency

Technical Reference Manual

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TABLES & FIGURES

Acknowledgements

Thank you to the following participants…….

Parties wishing to participate in the SAG process may do so by contacting…..

Table 1.1: Revision History

#	Document Title	Date	Reviewer	Status
1	Illinois_Statewide_TRM_HIM_1st_Draft_012712.doc	1/27/12	VEIC	Original Draft
2	Illinois_Statewide_TRM_HIM_1st_Draft_012712_Ameren Navigant.doc	2/10/12	Ryan Del Balso, Navigant/Ameren	Reviewed
3	Illinois_Statewide_TRM_HIM_1st_Draft_012712 – comments NICOR.doc	2/15/12	Andrew Kotila, NICOR	Reviewed
4	Illinois_Statewide_TRM_HIM_1st_Draft_012712 – comments AG_OEI.doc	2/16/12	Phil Mosenthal, OEI/AG	Reviewed
5	Illinois_Statewide_TRM_HIM_1st_Draft_012712 Navigant for ComEd Bus Prescriptive.doc	2/17/12	Kevin Grabner, Navigant/ComEd	Reviewed
6	Illinois_Statewide_TRM_HIM_1st_Draft_012712_CFL Navigant for ComEd.doc	2/17/12	Jeremy Eddy, Navigant/ComEd	Reviewed
7	Illinois_Statewide_TRM_HIM_1st_Draft_012712 ComEd comments.doc	2/20/12	Roger Baker, ComEd	Reviewed
8	NRDC Comments on Draft Illinois TRM 2012-02-20.doc	2/20/12	Chris Neme, NRDC	Reviewed
9	GDS Comments on Draft_012712.doc	2/23/12	Travis Hink, GDS/Ameren	Reviewed
10	Illinois_Statewide_TRM_HIM_1st_Draft_012712 Peoples Northshore comments.doc	2/24/12	George Roemer, Peoples Northshore	Reviewed
11	ELPC Comments on Draft High Impact TRM Illinois comments feb 26.doc	2/26/12	Geoff Crandall, ELPC	Reviewed
12	GDS Comments_Updated on Draft_012712.doc	3/2/12	Travis Hink, GDS/Ameren	Reviewed
13	Illinois_Statewide_TRM_HIM_1st_Draft_012712 KK.doc	3/3/12	K. Kansfield, Ameren	Reviewed
14	Illinois_Statewide_TRM_HIM_1st_Draft_012712_ICC Staff initial comments.doc	3/3/12	J. Hinman, ICC Staff	Reviewed
15	TRM_Draft_012712_KEMA comments_03 01 12.doc	3/4/12	KEMA	Reviewed
16	Addendum 0322 – Residential Gas Boiler and Furnace Measures Integrys comments.doc	4/16/12	Integrys	Reviewed
17	Addendum 0322 – Residential Gas Boiler and Furnace Measures_Navigant 2012 0412.doc	4/12/12	Navigant	Reviewed
18	Addendum 0403 – Commercial Gas Boiler and Furnace Measures Integrys comments.doc	4/16/12	Integrys	Reviewed
19	Addendum 0403 – Commercial Gas Boiler and Furnace Measures-Navigant 2012 0412.doc	4/12/12	Navigant	Reviewed
20	Addendum 0403 – Commercial Gas Boiler and Furnace Measures Nicor comments.doc	4/13/12	Nicor	Reviewed
21	Consolidated Commends from ComEd.doc	4/13/12	KEMA for ComEd	Reviewed
22	Illinois_Statewide_TRM_Comprehensive_Draft_031612 – comments AG_OEI.doc	4/16/12	AG	Reviewed
23	Illinois_Statewide_TRM_Comprehensive_Draft_031612 – Nicor comments.doc	4/13/12	Nicor	Reviewed
24	Illinois_Statewide_TRM_Comprehensive_Draft_031612 Integrys comments.doc	4/16/12	Integrys	Reviewed
25	Illinois_Statewide_TRM_Comprehensive_Draft_031612_BRANDT.doc	4/13/12	ComEd	Reviewed
26	Illinois_Statewide_TRM_Comprehensive_Draft_031612 – comments_Itron Comments for ComEd EMV.doc	4/12/12	ComEd	Reviewed
27	Illinois_Statewide_TRM_Comprehensive_Draft_031612_Jeremy Eddy ComEd WMV.doc	4/11/12	ComEd	Reviewed
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30	JE feedback on comment threads in Res HIM Measure Tracking.doc	4/11/12	Navigant	Reviewed
31	Navigant Additional supporting docs for Residential Clothes washers.doc	4/12/12	Navigant	Reviewed
32	Navigant Analysis of ComEd Lighting EFLH from EMV 2012-04-04.doc	4/4/12	ComEd	Reviewed
33	KEMA TRM v2 Review 4/2/12.xls	4/13/12	ComEd	Reviewed
34	Navigant Supporting Calculations for Res Clothers Wathers 04-08-12.xls	4/12/12	Navigant	Reviewed
35	PY2 kWh by Facility TRM Comparison kb.xls	4/13/12	ComEd	Reviewed
36	TRM Application Issue Tracking Ameren ComEd MidAmerican_041212_Mtg.xls	4/12/12	Various	Reviewed
37	Illinois_Statewide_TRM_Comprehensive_Draft_031612_Stefano Galiasio on behalf of DCEO (2).doc	5/1/12	DCEO	Reviewed
38	Illinois_Statewide_TRM_Front_Matter_Draft_042712_ODC.docx	4/30/12	Opinion Dynamics	Reviewed
39	OAG Comments on Stipulation and TRM front chapters.docx	5/8/12	Attorney General	Reviewed
40	IL TRM front matter draft_CUB Comments_051112_excerpts.doc	5/11/12	CUB	Reviewed
41	Illinois_Statewide_TRM_Front_Matter_Draft_042712 (Nicor Comments).doc	5/11/12	Nicor	Reviewed
42	Illinois_Statewide_TRM_Front_Matter_Draft_042712_ODC_Staff_Comments.docx	5/11/12	ICC Staff	Reviewed
43	Illinois_Statewide_TRM_Front_Matter_Draft_GDS Comment.doc	5/11/12	GDS	Reviewed
44	Navigant edits to TRM front matter.txt	5/11/12	Navigant	Reviewed
45	RE EE SAG Update IL TRM Policy and Process Issues; E-Mail list.txt	5/11/12	Annette Beitel	Reviewed
46	TRM Front Matter Comments 2012.05.11 kk.doc	5/11/12	Ameren	Reviewed

1 Purpose of the TRM

The purpose of this Technical Reference Manual (TRM) is to provide a transparent basis for calculating energy (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] to prepare this TRM for statewide use.

This document represents Illinois' first statewide TRM. The TRM is a policy document that is filed with the ICC for approval, and is intended to fulfill a series of objectives, including:

- "Serve as a common reference document for all stakeholders, Utilities / Program Administrators, 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 (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. Recommend 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. [3]"

- "…support coincident peak capacity (for electric) savings estimates and calculations for electric Program Administrators in a manner consistent with the methodologies employed by the Program Administrator's Regional Transmission Organization ("RTO"), as well as those necessary for statewide Illinois tracking of coincident peak capacity impacts."[4]

- 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 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 include; Ameren Illinois, ComEd, Peoples Gas, Peoples North Shore and NICOR.
3 Illinois Statewide Technical Reference Manual Request for Proposals, August 22nd, 2011, pages 3-4, "TRM_RFP_Final_part_1.230214520.pdf"
4 Ibid.

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'[5] energy efficiency Plan dockets quoted below.

"We further recognize and appreciate that ComEd is developing a TRM. We agree that a TRM can provide substantial benefits to the EEP going forward, and the Commission directs that ComEd will work with other utilities subject to the requirements of Section 8-103 and 8-104 of the PUA[6] and the SAG to develop a statewide TRM in the future. This will allow a consistent format to be developed for a TRM. , We decline to adopt intervenors' proposal granting the SAG oversight of the EM&V process or ordering procedural changes." Docket No. 10-0570, Final Order[7] at 59-60, December 21, 2010.

"Generally, the parties agree that the development of a TRM is appropriate. While some parties believe it is appropriate to develop a statewide TRM, others believe, at a minimum, it is premature to develop a statewide TRM. ELPC witness Crandall, for example, recommends that the SAG should take primary responsibility for developing one statewide TRM... The Commission directs that Ameren will work with other utilities subject to the requirements of Section 8-103 and 8-104 of the PUA and the SAG to develop a statewide TRM… for use in the upcoming energy efficiency three-year plan cycle. This will allow a consistent format to be developed for a TRM. The Commission also accepts Ameren's recommendation that Ameren, as well as ComEd, and the independent evaluators strive to understand differences in evaluation results and to reconcile differences not driven by differences in weather, market and customers." Docket No. 10-0568, Order on Rehearing[8] at 19, May 24, 2011.

"Also consistent with our rulings in other recent dockets, the Commission agrees that the development of a TRM will be valuable. We direct the Utilities to coordinate with other utilities, DCEO and SAG participants to develop a statewide manual." Docket No. 10-0564, Final Order[9] at 76, May 24, 2011.

"The Commission ordered that Ameren and ComEd work together and with other Illinois utilities to develop a statewide TRM in the future. (ICC Docket 10-0568 Final Order at 70; ICC Docket 10-0570 Final Order at 59-60). Consistent with those Orders, the Commission requires Nicor to participate in the statewide TRM development. The Commission also recommends that the newly-created natural gas SAG participate in developing a statewide TRM." Docket No. 10-0562, Final Order[10] at 30, May 24, 2011.

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."[11] 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.

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[5] 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).
[6] The Illinois Public Utilities Act (PUA or Act), 220 ILCS 5/1-101 *et seq.*
[7] http://www.icc.illinois.gov/docket/files.aspx?no=10-0570&docId=159809
[8] http://www.icc.illinois.gov/docket/files.aspx?no=10-0568&docId=167031
[9] http://www.icc.illinois.gov/docket/files.aspx?no=10-0564&docId=167023
[10] http://www.icc.illinois.gov/docket/files.aspx?no=10-0562&docId=167027
[11] Docket No. 07-0540, Final Order at 32-33, February 6, 2008.
http://www.icc.illinois.gov/downloads/public/edocket/215193.pdf

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 Illinois TRM Technical Advisory Committee (TAC) during the December 2011 through May 2012 timeframe. VEIC has also presented the TRM at Stakeholder Advisory 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 TRM Technical Advisory Committee (TRM 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 separate cover.

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. An organizational structure, described in the next section, gives details about how measures are grouped, categorized, and described.

2 Using the TRM

For each measure characterization, this TRM includes engineering algorithm(s) and a value(s) for each parameter in the equations[12]. 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*[13] 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 value 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 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.

[12] As noted in the RFP, the net-to-gross ratios are provided by the evaluators and are listed in the appendices.
[13] 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.

2.1 Organizational Structure

The organization of this document follows a three-level format, each level 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**[14]
   - 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[15]

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.

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

[15] 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 period (or dot), a unique, 18-character alphanumeric code is formed that can be used for tracking the measures and their associated savings estimates.

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	BLR_	V01	YYMMDD
CI (C&I)	APL (Appliances)	T5F_	V02	YYMMDD
RS (Residential)	CEL (Consumer	T8F_	V03	YYMMDD
	FSE (Food Service	Etc	…	…
	HVC (HVAC)			
	HW_ (Hot Water)			
	LTG (Lighting)			
	MSC (Miscellaneous)			
	RFG (Refrigeration)			
	SHL (Shell)			

Table 2.3: Measure Code List (all 90)

To be inserted once the flat file is completed and all measure codes are final.

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

VERSION DATE & REVISION HISTORY

Measure Code: Unique 18 digit code
Effective date: Date TRM will become effective
End date: Date TRM will cease to be effective (or TBD)

2.4 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 (Program Administrators 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 in the TRM, subject to the following two 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 or perhaps even develop a non-standard savings algorithm. 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.

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. The results will be subject to the usual evaluation and ICC review requirements, and the new measure must be submitted to the SAG and 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, it must submit its case to the SAG 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.

2.5 Applying Deemed Incremental Costs to Measure Screening

Each measure includes 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.

2.6 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 measures 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 2.4: 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. Baseline = New equipment Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice. 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. Baseline = Building code or federal standards. Efficient Case = The program's level of building specification Example: Building shell and mechanical measures
Retrofit (RF)	Definition: A program that *upgrades* existing equipment before the end of its useful life. Baseline = Existing equipment or the existing condition of the building or equipment. A single baseline applies over the measure's life. Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice. Example: Air sealing and insulation.
Early Replacement (EREP)	Definition: A program that *replaces* existing equipment before the end of its expected life. Baseline = Dual; it begins as the existing equipment and shifts to new baseline equipment after the expected life of the existing equipment is over. Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice. Example: Refrigerators, Freezers
Early Retirement (ERET)	Definition: A program that *retires* duplicative equipment before its expected life is over. Baseline = The existing equipment, which is retired and not replaced. Efficient Case = Zero because the unit is retired. Example: Appliance recycling
Direct Install (DI)	Definition: A program where measures are installed during a site visit. Baseline = Existing equipment Efficient Case = New, premium efficiency equipment above federal and state codes and standard industry practice. 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 Existing Equipment and shifts to New Equipment 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.

2.7 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. In any case, if site-specific information is available, it is permissible to use it in the algorithm subject to the requirement that all future instances of the measure in question be implemented on a custom basis within the program in question until such a time that the TRM is updated to permit a custom input for an otherwise prescriptive measure. If site-specific information is not commonly available, then the deemed (or look up) value is more appropriate.

2.8 Measure Expansion Protocol

When 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 9. [See Sharepoint for the final draft of these protocols, which will be compiled into the final TRM along with the Residential and C&I measures by June 1.]

2.9 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 2.5: Commercial High Impact Measures

Section	End-use	Technology / Measure
5.1.3	Food Service	Commercial Steam Cooker
5.1.8	Food Service	High Efficiency Pre-Rinse Spray Valve
5.2.2	HVAC	Boiler Tune-up
5.2.3	HVAC	Boiler Lockout/Reset Controls
5.2.9	HVAC	High Efficiency Boilers
5.2.10	HVAC	High Efficiency Furnace
5.2.14	HVAC	Steam Trap Replacement or Repair
5.2.15	HVAC	Variable Speed Drives for HVAC
5.4.1	Lighting	CFL
5.4.2	Lighting	ILED
5.4.3	Lighting	High Performance T8 Fixtures and Lamps
5.4.4	Lighting	T5
5.4.5	Lighting	Lighting Controls
5.5.6	Lighting	Lighting Power Density Reduction
5.4.7	Lighting	LED Traffic and Pedestrian Signals
5.7.6	Hot Water	Tankless Water Heater

Table 2.6: Residential High Impact Measures

Section	End-use	Technology / Measure
6.1.2	Appliances	Clothes Washer
6.1.8	Appliances	Refrigerator & Freezer Recy.
6.3.2	Hot Water	High Efficiency Water Heater
6.3.3	Hot Water	Heat Pump Water Heater
6.3.4	Hot Water	Faucet Aerator
6.3.5	Hot Water	Low Flow Showerhead
6.4.1	HVAC	Air Source Heat Pump
6.4.2	HVAC	Central Air Conditioning
6.4.4	HVAC	Furnace Blower Motor
6.4.5	HVAC	High Efficiency Boiler
6.4.6	HVAC	High Efficiency Furnace
6.4.10	HVAC	Programmable Thermostat
6.5.1	Lighting	Standard CFL
6.5.2	Lighting	Specialty CFL
6.5.5	Lighting	LED
6.6.1	Shell	Air Sealing
6.6.4	Shell	Wall and Ceiling Insulation
6.6.2	Shell	Basement Sidewall Insulation

3 Policies for Applying the TRM to Illinois 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 Filing the TRM with the ICC

The TRM will be filed with the ICC annually as part of a docketed proceeding and will be 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[16]) 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 . (As with all aspects of the TRM, this is true unless the Commission determines otherwise.) As consensus develops, the TRM Administrator will include the changes in the next version of the TRM[17]. 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.

3.3 Applicability and Use 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 measures not included in the TRM as long as such measures are brought to the SAG for its consideration and are submitted to the TRM update procedure. Similarly, Program Administrators are not required to implement every measure included in the TRM.

This does not mean that a Program Administrator can make unilateral changes to the existing measures in TRM, however. Only the TRM Administrator, working through the SAG, can make changes to the measures that are already published in the TRM. In practice, this requires DCEO and the Utilities to use the TRM values in all Commission and stakeholder reporting and to make exclusive use of the TRM values in their tracking systems until the values are updated through the TRM update procedure.

3.3.1 TRM Mistakes

OPTION 1 (VEIC's preferred option):

At any time, if there needs to be a change in the TRM due to its impact on an unreasonable savings estimate (such as there exists an error or omission in the TRM, or there is an assumption in the TRM which differs significantly

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

17 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.

from actual program findings) the utilities and their evaluator can provide a reasonable savings estimate. The evaluation teams may use this alternative solution to estimate verified energy savings during the program evaluation of the year being evaluated. They should provide sufficient justification for using the alternate solution within a memo to the SAG/TAC. This documentation will also be used for the TRM update process.

If a significant mistake is found in the TRM that results in an unreasonable savings estimate, the Program Administrator, Evaluator, TRM Administrator, and SAG will strive to reach consensus on a solution that will result in a reasonable savings estimate. 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 to calculate energy and capacity savings.

OPTION 2

If an error, omission, or assumption which differs significantly from actual program findings is found in the TRM that results in an unreasonable savings estimate, the Evaluators for the Utilities and DCEO should work together to agree upon a solution that will result in a reasonable savings estimate for presenting in the evaluation reports. The Evaluators shall use this solution when estimating TRM-verified energy savings during the annual program evaluation, but must also show the Commission-adopted TRM estimates, if feasible. The Evaluators should provide sufficient justification for using the solution within the evaluation report (perhaps as an appendix). The error in the TRM will be officially fixed through the annual TRM Update Process.

In the event that agreement cannot be reached among the Evaluators on a single solution, the Evaluators will indicate which solution they ultimately recommend for use in the TRM-verified energy savings estimates and will include sufficient justification for the solution within the evaluation report. Within the evaluation report, the Evaluators should include a discussion of why they believe their recommended solution provides more reasonable estimates of energy savings in comparison to the solutions recommended/adopted by the other Evaluators (i.e., they should point out the flaws in all of the solutions adopted by Illinois Evaluators). To provide transparency and encourage consistent application of the TRM in the presentation of TRM-verified savings estimates within the evaluation reports, it is necessary for the Evaluators to present the TRM-verified energy savings estimates using their recommended solution, the other Illinois Evaluators' recommended/adopted solution(s), and the Commission-adopted TRM estimates (if feasible), within the evaluation report. The error in the TRM will be officially fixed through the annual TRM Update Process.

Errors found in the TRM will be officially corrected through the annual TRM Update Process.

3.4 The TRM's Relationship to Portfolio Implementation

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 will collaborate with Evaluators prior to the start of each program year to define data collection to support TRM application, while minimizing unnecessary cost and burden on Program Administrators, Evaluators and customers.

3.5 The TRM's Relationship to Portfolio Evaluation (Nicor Material)

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

- Evaluators will verify participants, consistent with approaches defined in Evaluator work plans (which take into consideration input from Program Administrators and the SAG).

- 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 appropriate TRM algorithms, deemed values, and default values, using the following approach and schedule:
  - For savings achieved in EPY2/GPY5, Evaluators will apply the initial TRM approved by the ICC;
  - For savings achieved in future PYs, Evaluators will apply the TRM Update finalized by March 31 prior to the start of the PY;
  - For savings achieved in EPY4/GPY1, Evaluators will apply unit savings included in Utilities' approved Energy Efficiency Plans.

- 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. In some cases, these savings calculations may include retrospective savings adjustments.

To the extent allowed within evaluation budget limits defined by 220 ILCS 5/8-103(f)(7) and 220 ILCS 5/8-104(f)(8), Evaluators may also make recommendations to improve the TRM in future TRM updates, using experience gained from applying the TRM in previous evaluations, or information gained from new primary research. Evaluator recommendations for improving the TRM, if approved by the SAG and TRM Administrator, will only be applied prospectively through the TRM update process described in Section 4, and will not be used to retrospectively adjust TRM savings calculations for previous years.

3.5.1 Prospective versus Retrospective Evaluation of TRM Measures

[Awaiting input from ODC, Navigant, et. al.]

3.6 The TRM's Relationship to Portfolio Planning

To estimate prescriptive measure savings and cost-effectiveness in the 3-year Energy Efficiency Plans required by 220 ILCS 5/8-103 and 220 ILCS 5/8-104, Program Administrators will apply the TRM algorithms finalized by the March 1 prior to the Energy Efficiency Plan filings, Utilities will adjust plan savings goals in final compliance filings to the ICC to reflect changes incorporated into the TRM update finalized by the March 31 after the Energy Efficiency Plan filing.

While there are no specific requirements for Program Administrators to complete annual or other shorter term plans, since Evaluators will apply TRM algorithms to calculate prescriptive measure savings and cost effectiveness, Program Administrators will benefit from incorporating TRM algorithms into any shorter term plans developed to manage Energy Efficiency portfolios. Program Administrators have the flexibility to adjust program plans to add and retire (but not change) measures, regardless of whether or not measures are included in the TRM.

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 4.

4 TRM Update Process & Timeline

Because technology is constantly improving, 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 reasons listed below. 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
- Updates to the glossary and other front matter included in the TRM
- Updates to net-to-gross (NTG) ratios and other TRM appendices
- Updates to existing TRM measures due to changes in baseline equipment or practices, changes in efficient equipment or practices, changes to assumptions for algorithm parameter values (e.g., due to evaluation studies perceived to be more reliable and representative of Illinois conditions or new market research), and other changes

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.

4.1 Stakeholder Roles and Responsibilities

Formal recommendations for TRM changes should be submitted in a standardized format (Appendix #) (along with all supporting workpapers) to the TRM 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. **Evaluator** (Independent Consultant) – Whose primary responsibility pursuant to 220 ILCS 5/8-103(f)(7) and 220 ILCS 5/8-104(f)(8) is to provide independent evaluations of the performance and cost effectiveness of the Program Administrators' energy efficiency portfolios. In support of this responsibility, evaluators will make recommendations for TRM improvements and conduct primary research to help improve TRM values as needed. Evaluators will collaborate with Program Administrators prior to the start of each program year to define data collection needed to support TRM application, while minimizing unnecessary administrative cost and burden on Program Administrators, Evaluators and customers.

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

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

4. **Program Administrator** (Utilities and DCEO) – The Utilities[18] and DCEO have primary responsibility to cost effectively meet the energy savings targets defined by Illinois statute by implementing energy efficiency

[18] The Illinois Utilities subject to this TRM include: Ameren Illinois Company d/b/a Ameren Illinois (Ameren),

programs. The Utilities and DCEO are also responsible for tracking program participation, reporting estimates of energy savings, estimating cost effectiveness, and implementing the TRM through their tracking systems. The Utilities and DCEO shall collaborate with the Evaluators prior to the start of each program year to determine an appropriate balance of data collection necessary to implement the TRM in the upcoming program year while considering the administrative cost and participant burden associated with such data collection. The Utilities and DCEO make recommendations for TRM Updates. The Utilities and DCEO shall present to the SAG, in addition to filing comments with the ICC in the annual TRM Update proceeding, information explaining how the TRM changes impact their energy efficiency portfolios.

5. **TRM Administrator** (Independent Consultant) – The TRM Administrator has primary responsibilities to manage changes to the TRM document, facilitate the TRM Technical Advisory Committee (TAC), coordinate with the SAG, serve as an independent technical resource, and manage a publicly accessible TRM website that contains TRM-related documents such as references, recommendations, responses, and versions of the TRM. The TRM Administrator shall review and respond[19] to all formal TRM recommendations submitted in the standardized format found in Appendix # (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 TRM TAC and the SAG. The TRM Administrator shall make any necessary revisions to the TRM to reflect the Commission Order from the annual TRM Update proceeding.

6. **TRM 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 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.

7. **Illinois Energy Efficiency Stakeholder Advisory Group**[20] (SAG) – The Illinois Energy Efficiency Stakeholder Advisory Group reviews the TRM Administrator's recommended TRM Updates prior to the revised (redlined) TRM being filed with the ICC. Where consensus does not emerge in the TRM TAC regarding a particular TRM change, the SAG should provide a forum where experts on all sides of the contested issue should present their expert opinions in an effort to inform parties of the contested issue and to also facilitate consensus. 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."[21]

   For more information about the SAG, please visit http://ilsag.org/home, and for parties interested in participating in the SAG, please contact the SAG Facilitator.

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).

[19] The TRM Administrator's "response" to a formal recommendation for a TRM change shall explain whether the TRM Administrator has chosen to adopt/reject the formal recommendation (either in its entirety or as modified by the TRM Administrator) and the justification for the TRM Administrator's decision.

[20] http://www.ilsag.org/home

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

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Annette.beitel@futureenergyenterprises.biz.

4.1.1 Stakeholder Roles in the context of Updating the TRM (Nicor would delete)

The TRM will need to be updated to reflect ongoing changes in Illinois' energy efficiency market; specifically, whenever a new measure or technology is being proposed and anytime an existing measure changes or is retired. The need to update a measure within the TRM can be driven by a number of events, including but not limited to:

- Results of program evaluations
- Impact of code or legislative changes to specific measures
- Introduction of new technologies
- Discovery of errors in existing measures

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

Role	Change Existing Measure (1)[22]	Create New Measures (2)
Evaluator (Consultant)	• Provides rigorous reviews of savings algorithms, inputs and program designs. • Offers a professional opinion on other parties' recommendation. • Reviews and suggests changes to the recommendation. • Identifies and recommends changes as part of the annual evaluations. • Provides recommendations to the TRM Technical Advisory Committee and TRM Administrator. • Identifies and recommends changes based on ongoing reviews of measures and markets. • Coordinates with other Program Administrators' evaluation teams.	• Offers a professional opinion on other parties' recommendations. • Reviews and suggests changes to the recommendation. • Provides recommendations to the TRM Technical Advisory Committee and TRM Administrator. • Coordinates with other Program Administrators' evaluation teams.
ICC (Regulator)	• At its discretion, the ICC may approve, modify or deny requests for TRM input and algorithm assumptions or how the TRM is applied.	• At its discretion, the ICC may approve, modify or deny requests for TRM input and algorithm assumptions or how the TRM is applied.
ICC Staff	• Make recommendations to approve, modify or deny requests for TRM input and algorithm assumptions or how the TRM is applied.	• Make recommendations to approve, modify or deny requests for TRM input and algorithm assumptions or how the TRM is applied.
Program Administrator (Utilities & DCEO)	• Updates its tracking systems and modifies its measure calculations, and provides measure update recommendations. • Documents recommendation, analysis and justification. • Provides recommendation in a standardized format agreed to by parties along with supporting workpapers. • Facilitates review process with Evaluator. • Facilitates review process with other Illinois Program Administrators and their evaluation teams.	• Updates its tracking systems and provides new measure recommendations. • Defines the algorithm and conducts the sensitivity analysis. • Documents recommendation, analysis and justification. • Provides recommendation in a standardized format agreed to by parties along with supporting workpapers. • Facilitates review process with Evaluator. • Facilitates review process with other Illinois Program Administrators and their evaluation teams.

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

Role	Change Existing Measure (1)[22]	Create New Measures (2)
TRM Administrator (Independent Consultant)	• Manages the TRM. • Facilitates and reviews recommendations from other parties as part of the TRM Technical Advisory Committee forum. • Acts as an independent technical resource to the SAG/TAC.	• Manages the TRM. • Facilitates and reviews recommendations from other parties as part of the TRM Technical Advisory Committee forum. • Acts as an independent technical resource to the SAG/TAC.
TRM Technical Advisory Committee (TAC)	• Provides a forum to facilitate consensus for the recommended changes.	• 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 (PY)	Applicable Gas Program Year[23] (PY)
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[24]

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	TRM finalized by 6/1/12 applies	
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 used in compliance filing.
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	

OPTION 1:

The Commission-approved TRM as of June 1st, 2013 shall be used in preparation of the Utilities' and DCEO's energy efficiency Plans filed with the Commission in 2013 (for measures that fall under the TRM measure characterizations). 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); however, they must also show planning estimates from using the TRM assumptions for comparison purposes.

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

[24] 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 will be in effect for the evaluation of PY5.

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.

OPTION 2:

In recognition of portfolio adjustments that need to be made due to TRM updates, TRM changes that are finalized by March 1 of any program year will be applied by Evaluators to calculate savings and cost effectiveness for the following program year. As part of the SAG and the SAG technical committee, ICC Staff will also have the opportunity to review the TRM prior to it being in effect for the following program year. Whenever there is dissension regarding the TRM, a party can petition the Commission for a ruling or ask that it be addressed in a docketed proceeding.

Program Administrators will use TRM updates finalized by the March 1 prior to 3-year Energy Efficiency Plan filings to calculate prescriptive measure savings and cost effectiveness in their plan filings, Utilities will adjust plan savings goals and cost-effectiveness results in final compliance filings to the ICC to reflect changes incorporated into the TRM update finalized by the March 31 following the Energy Efficiency Plan filing.

4.3 Update Timeline and Process

The TRM update procedure occurs annually. 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.

Figure 1: Timeline and Milestones of the TRM Update Procedure

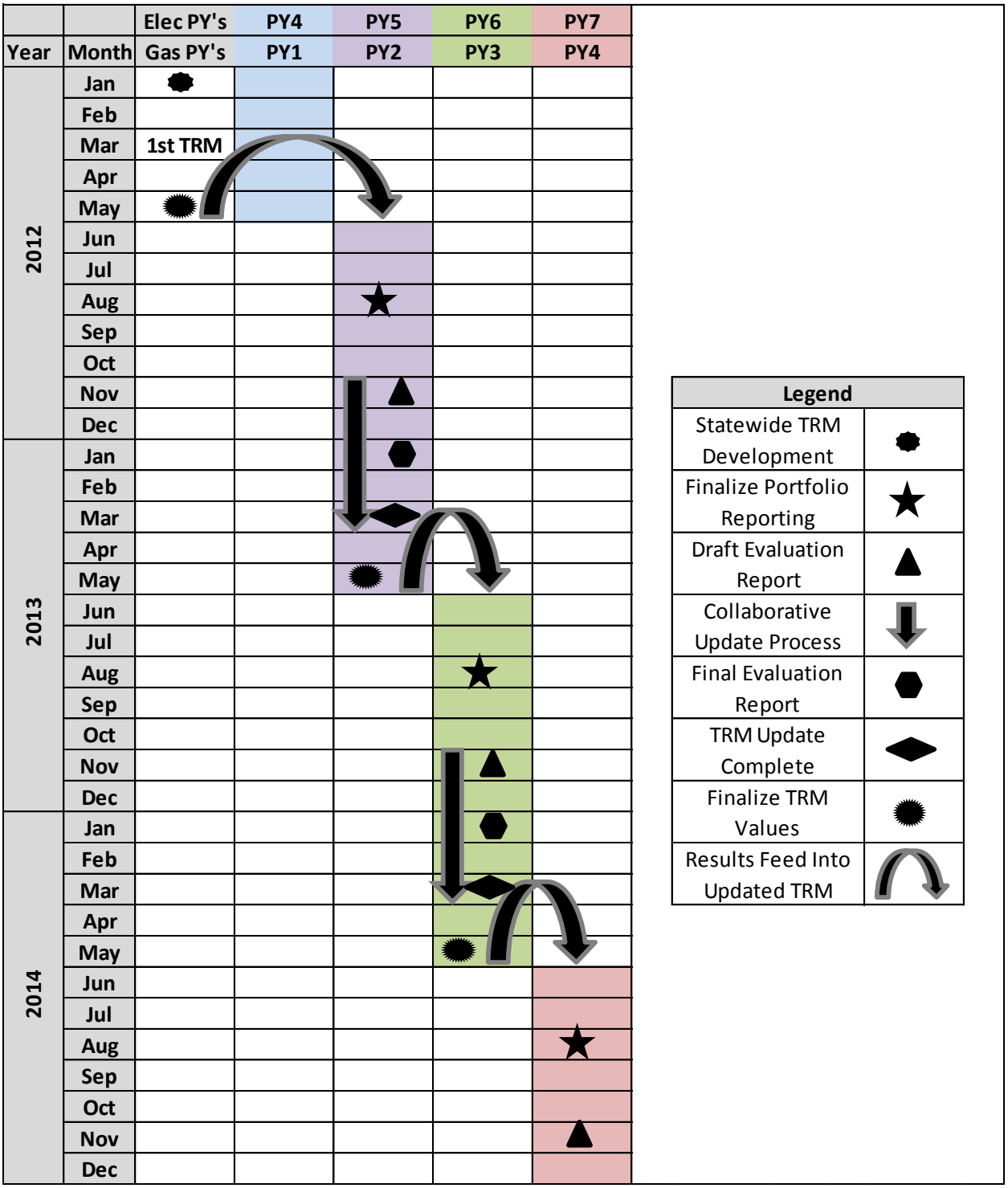
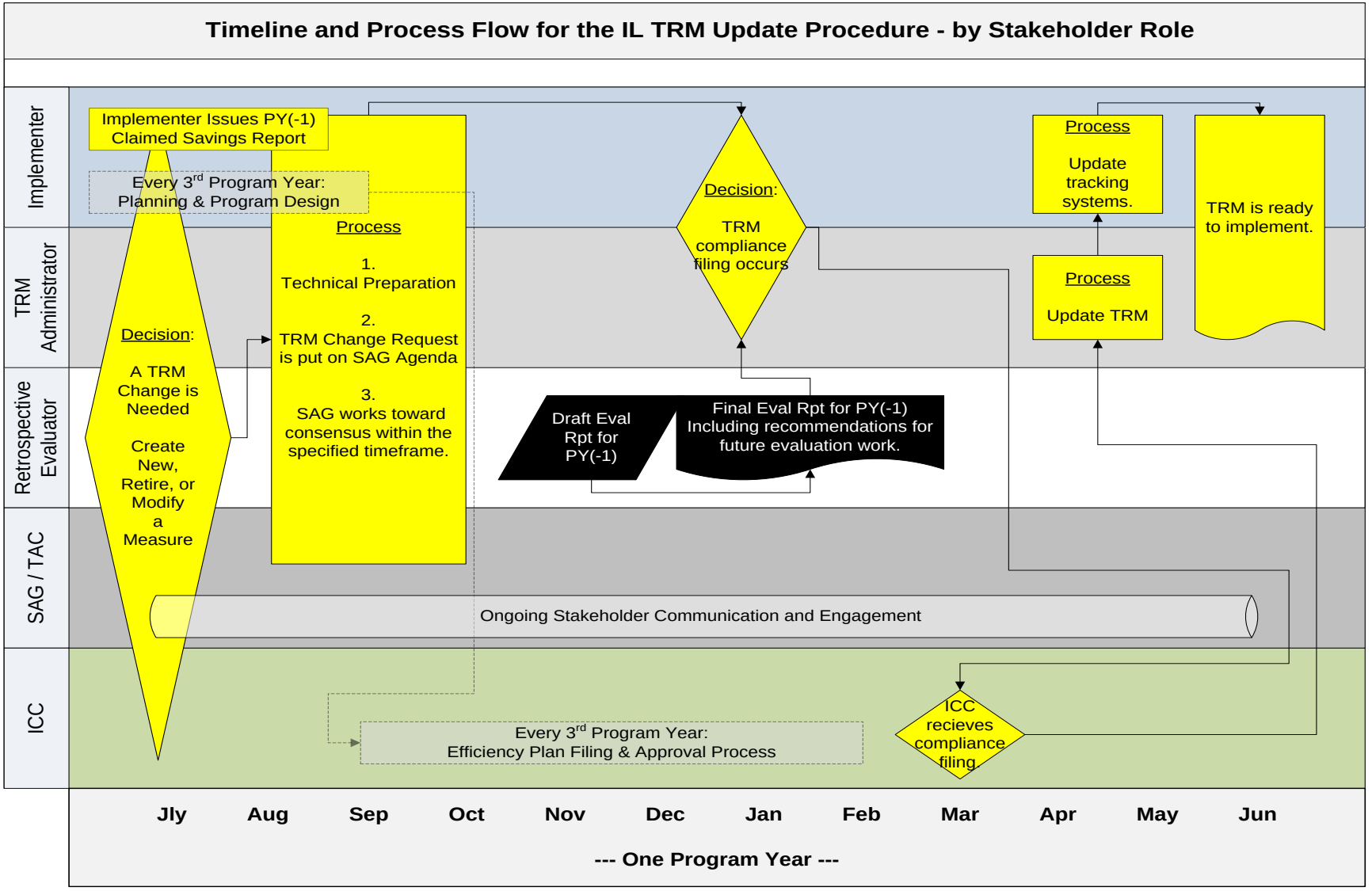


Figure 2: Timeline & Process Flow of the TRM Update Procedure by Stakeholder



5 Assumptions

The information contained in this TRM contains VEIC's recommendations for the content of the first edition 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, we reviewed the available Illinois and Midwest-specific information, including evaluations and support material provided by the Illinois Utilities.

When Illinois or region-specific evaluations or data were not available, we turned to best practice research and data from other jurisdictions, 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 Utilities' and DCEO's programs.

The TRM is intended to be a living document. There will be measures that are not characterized here; new measures will be added to programs and new program designs will be implemented; new information will be gathered through evaluations or other market research; and savings for current measures will change as the activity of the programs changes their markets. For instance, savings for CFLs will decrease over time as successful programs result in lamps being installed mostly in lower-use locations. As assumptions and reference material changes, the TRM Update Process described in the previous section allows for frequent review and an annual update to the TRM. Data from reliable impact evaluations would be necessary to support savings claims until the measure has been incorporated into the TRM.

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 Project'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 as well.

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) 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 PY2 / PY5.

- 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 called for. 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 T12 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 40 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[25]. 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.

[25] 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[26]:

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 to manufacuturing 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. 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 tospaces that do not fit clearly within any available categories should be designated

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

Building Type	Definition
	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 in this TRM, which includes multifamily common areas and public housing[27].

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.

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.

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

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:

OPTION 1:

Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Evaluation within the context of this TRM is a backward looking process of determining the appropriate process, algorithm and/or input value for any given measure or measure component. Evaluation results may be applied prospectively or retrospectively in accordance with the approved plans of each utility.

OPTION 2:

A backward looking process of determining the appropriate process, algorithm and/or input value for any given measure or measure component. Evaluation results may be applied prospectively or retrospectively in accordance with the approved plans of each utility. (Nicor wishes to delete this sentence.)

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.

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 measure 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.

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 2.2 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 (DELETE?): The annual process that verifies that the TRM has been applied correctly and consistently during the previous program year and that measures are in place and operating. This process results in a realization rate, which may adjust the claimed savings of an entire program retroactively. Savings verification often results in recommendations for further evaluation and/or field (metering) studies to increase the accuracy of the claimed 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."[28] 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.

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

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)
Integrys (Peoples Gas and North Shore Gas)
Metropolitan Mayor's Caucus (MMC)
Midwest Energy Efficiency Association (MEEA)
National Resources Defense Council (NRDC)
Nicor Gas
Shaw Environmental
Energy Resources Center at the University of Illinois, Chicago (ERC)

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, weekday, 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[29] 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.

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.

[29] 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%

		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 (cooling)	C37	7.8%	9.8%	36.8%	45.6%
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	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
Losses - Home Office																									
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%

		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. 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%
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,	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%

		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
changing day, off night																									
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%
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	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%

		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
(unknown use)																									
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%
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	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%

		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
Machine Controls																									
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 defined 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[30] 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[31]. Residential cooling is based on 65F in agreement with a field study in Wisconsin[32]. 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[33]. Custom degree-days with building specific base temperatures

[30] 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.

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

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

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

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 / Bellville
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

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.

available.

Figure 3: Cooling Degree-Day Zones by County

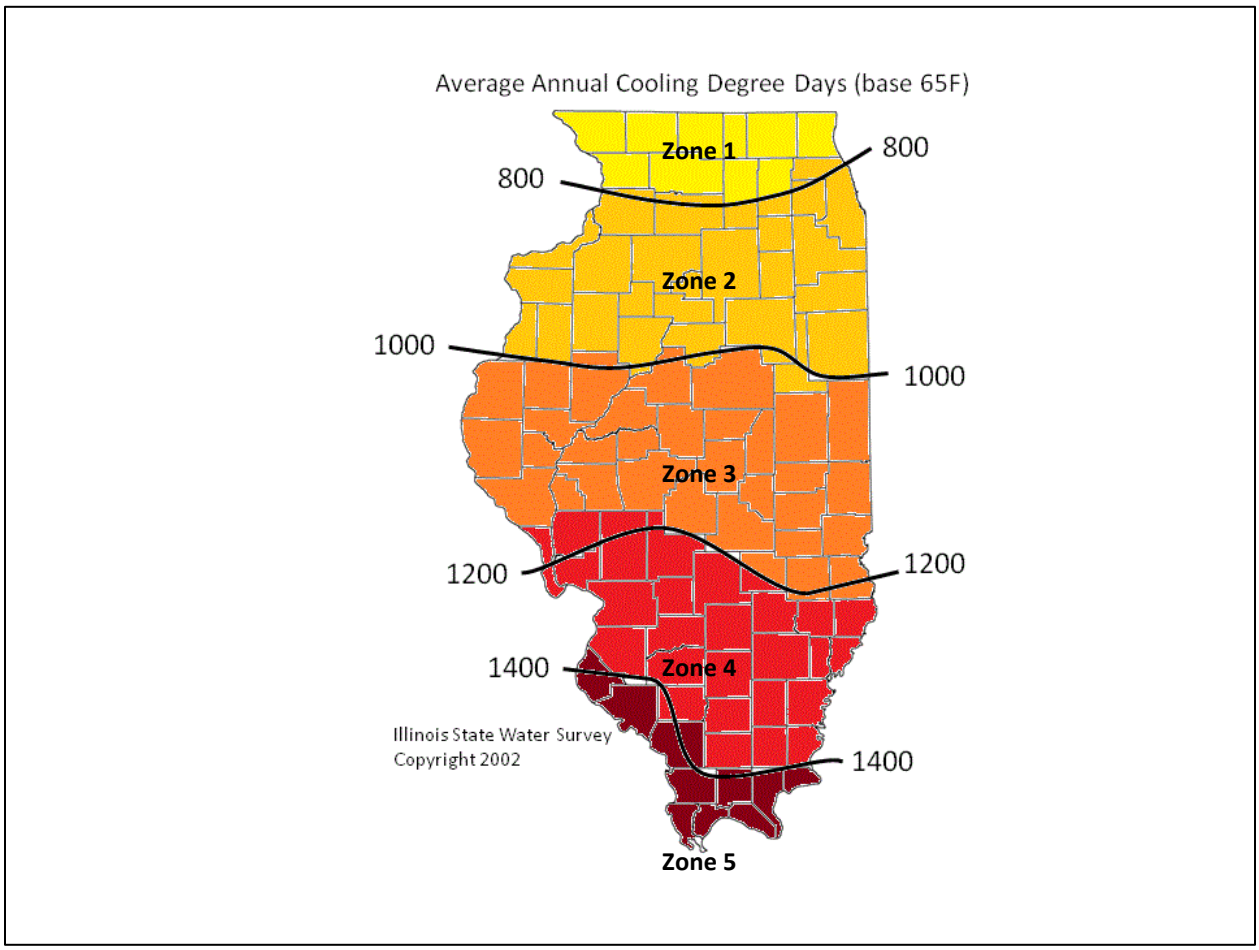


Figure 4: Heating Degree-Day Zones by County

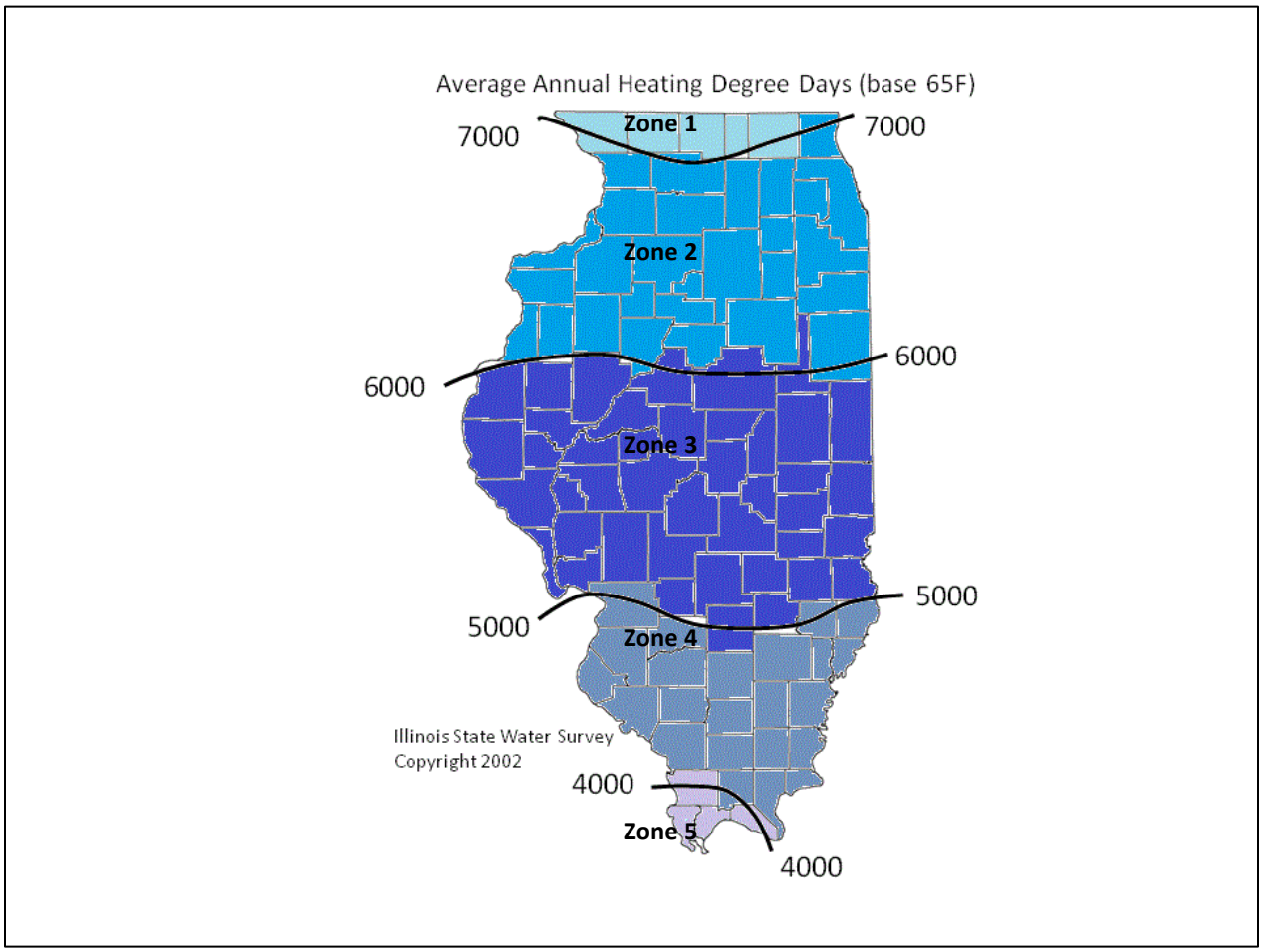


Table 5.5: Heating Degree-Day Zones by County

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Boone County	Carroll County	Adams County	Clinton County	Alexander County
Jo Daviess County	Bureau County	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 County		
		Morgan County		
		Moultrie County		
		Piatt County		
		Pike County		
		Sangamon County		
		Schuyler County		
		Scott County		
		Shelby County		
		Tazewell County		
		Vermilion County		

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 County	
	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.[34] 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

[34] 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.

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.