2019 Illinois Statewide Technical Reference Manual for Energy Efficiency

Version 7.0

Volume 1: Overview and User Guide

FINAL

September 13th, 2018

Effective:

January 1st, 2019

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1 Purpose of the TRM

The purpose of the Illinois Statewide Technical Reference Manual (TRM) is to provide a transparent and consistent basis for calculating energy (electric kilowatt-hours (kWh) and natural gas therms) and capacity (electric kilowatts (kW)) savings generated by the State of Illinois' energy efficiency programs[1] which are administered by the state's largest electric and gas Utilities[2] (collectively, Program Administrators or the Utilities).

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

- "Serve as a common reference document for all… stakeholders, [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[3] ("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.
- [Provide] 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.
- …[S]upport coincident peak capacity (for electric) savings estimates and calculations for electric utilities in a manner consistent with the methodologies employed by the utility's Regional Transmission Organization ("RTO"), as well as those necessary for statewide Illinois tracking of coincident peak capacity impacts."[4]

1.1 Acknowledgments

This document was created through collaboration amongst the members of the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). The SAG is an open forum where interested parties may participate in the evolution of Illinois' energy efficiency programs. Parties wishing to participate in the SAG process may do so by visiting http://www.ilsag.info/questions.html and contacting the Independent Facilitator at Annette.Beitel@FutEE.biz. Parties wishing to participate in the Technical Advisory Committee (TAC), a subcommittee of the SAG, may do so by contacting the TRM Administrator at iltrmadministrator@veic.org.

SAG Stakeholders[5]
Ameren Illinois Company (Ameren)
Citizen's Utility Board (CUB)
City of Chicago
Commonwealth Edison Company (ComEd)
Elevate Energy
Energy Resources Center at the University of Illinois, Chicago (ERC)
Environment IL
Environmental Law and Policy Center (ELPC)
Future Energy Enterprises LLC
Illinois Attorney General's Office (AG)
Illinois Commerce Commission Staff (ICC Staff)

[1] 220 ILCS 5/8-103B and 220 ILCS 5/8-104.
[2] The Program Administrators include: Ameren Illinois, ComEd, Peoples Gas, North Shore Gas, and Nicor Gas (collectively, the Utilities).
[3] The Illinois TRC test is defined in 220 ILCS 5/8-104(b) and 20 ILCS 3855/1-10.
[4] Illinois Statewide Technical Reference Manual Request for Proposals, August 22, 2011, pages 3-4, http://ilsag.org/yahoo_site_admin/assets/docs/TRM_RFP_Final_part_1.230214520.pdf
[5] Being an open forum, this list of SAG stakeholders and participants may change at any time.

SAG Stakeholders[5]
Illinois Department of Commerce and Economic Opportunity (DCEO)
Independent Evaluators (ADM, Cadmus, Itron, Navigant)
Metropolitan Mayor's Caucus (MMC)
Midwest Energy Efficiency Association (MEEA)
Natural Resources Defense Council (NRDC)
Nicor Gas
Peoples Gas and North Shore Gas

Table 1.1: Document Revision History

Document Title	Applicable to PY Beginning
Illinois_Statewide_TRM_Effective_060112_Version_1.0_091412_Clean.doc	6/1/12
Illinois_Statewide_TRM_Effective_060113_Version_2.0_060713_Clean.docx	6/1/13
Illinois_Statewide_TRM_Effective_060114_Version_3.0_022414_Clean.docx	6/1/14
Illinois_Statewide_TRM_Effective_060115_Final_022415_Clean.docx	6/1/15
IL-TRM_Effective_060116_v5.0_Vol_1_Overview_021116_Final IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final IL-TRM_Effective_060116_v5.0_Vol_3_Res_021116_Final IL-TRM_Effective_060116_v5.0_Vol_4_X-Cutting_Measures_and_Attach._021116_Final	6/1/16
IL-TRM_Effective_010118_v6.0_Vol_1_Overview_020817_Final IL-TRM_Effective_010118_v6.0_Vol_2_C_and_I_020817_Final IL-TRM_Effective_010118_v6.0_Vol_3_Res_020817_Final IL-TRM_Effective_010118_v6.0_Vol_4_X-Cutting_Measures_and_Attach_020817_Final	1/1/18
IL-TRM_Effective_010119_v7.0_Vol_1_Overview_091318_Final IL-TRM_Effective_010119_v7.0_Vol_2_C_and_I_091318_Final IL-TRM_Effective_010119_v7.0_Vol_3_Res_091318_Final IL-TRM_Effective_010119_v7.0_Vol_4_X-Cutting_Measures_and_Attach_091318_Final	1/1/19

1.2 Summary of Measure Revisions

The following tables summarize the evolution of measures that are new, revised or errata. This version of the TRM contains 143 measure-level changes as described in the following table.

Table 1.2: Summary of Measure Level Changes

Change Type	# Changes
Errata	13
Revision	113
New Measure	17
Total Changes	143

The 'Change Type' column indicates what kind of change each measure has gone through. Specifically, when a measure error was identified and the TAC process resulted in a consensus, the measure is identified here as an 'Errata'. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the measure dates back to January 1st, 2018. Measures that are identified as 'Revised' were included in the sixth edition of the TRM, and have been updated for this edition of the TRM. Both 'Revised' and 'New Measure(s)' have an effective date of January 1st, 2019.

The following table provides an overview of the 143 measure-level changes that are included in this version of the TRM.

Table 1.3: Summary of Measure Revisions

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
Volume 1: Overview	N/A	N/A	N/A	Revision	Edits to 1.4 Development Process – docket information Section 3.4 – Addition of mobile home Section 3.5 – Addition of loadshapes from primary research studies. Edits or additions of the following loadshape values: Residential Indoor Lighting Residential Holiday String Lighting Commercial Indoor Lighting Grocery/Conv. Store Indoor Lighting Health Indoor Lighting Office Indoor Lighting Retail Indoor Lighting Warehouse Indoor Lighting Education Indoor Lighting Commercial Outdoor Lighting Commercial Clothes Washer Reference to new Excel file mapping Illinois zip codes to Heating and Cooling Degree-day zones.	N/A
Volume 2: C&I	4,1 Agricultural	4.1.1 Engine Block Timer for Agricultural Equipment	CI-AGE-EBLT-V02-190101	Revision	Assumptions adjusted from Vermont basis to Illinois climate. Variables defined.	N/A
		4.1.2 High Volume Low Speed Fans	CI-AGE-HVSF-V02-190101	Revision	Minor typo fixes	N/A
		4.1.3 High Speed Fans	CI-AGE-HSF_-V02-190101	Revision	Minor typo fixes	N/A
		4.1.4 Livestock Waterer	CI-AGE-LSW1-V02-190101	Revision	Minor typo fixes. Additions to measure and coincidence factor description.	N/A
	4.2 Food Service Equipment	4.2.2 Commercial Solid and Glass Door Refrigerators and Freezers	CI-FSE-CSDO-V02-190101	Revision	Updated based on new ENERGY STAR and Federal Standard Updated measure cost.	Dependent on inputs
		4.2.3 Commercial Steam Cooker	CI-FSE-STMC-V05-190101	Revision	Addition of secondary kWh savings for water supply	Increase
		4.2.6 ENERGY STAR Dishwasher	CI-FSE-ESDW-V04-190101	Revision	Addition of secondary kWh savings for water supply and waste water treatment Update to conversion factor	Increase
		4.2.7 ENERGY STAR	CI-FSE-ESFR-V02-190101	Revision	Updated based on new ENERGY STAR spec.	Dependent

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
		Fryer			Updated Measure Life	on inputs
		4.2.8 ENERGY STAR Griddle	CI-FSE-ESGR-V03-190101	Revision	Coincident factor fix	kW Increase dependent on inputs
		4.2.9 ENERGY STAR Hot Food Holding Cabinets	CI-FSE-ESHH-V03-190101	Revision	Coincident factor fix	kW Increase dependent on inputs
		4.2.10 ENERGY STAR Ice Maker	CI-FSE-ESIM-V02-190101	Revision	Measure Life Update. Update to Federal Standard and ENERGY STAR specifications effective January 2018.	Dependent on inputs
		4.2.11 High Efficiency Pre-Rinse Spray Valve	CI-FSE-SPRY-V05-190101	Revision	Addition of secondary kWh savings for water supply and waste water treatment	Increase
		4.2.19 ENERGY STAR Electric Convection Oven	CI-FSE-ECON-V02-190101	Revision	Coincident factor fix	kW Increase dependent on inputs
	4.3 Hot Water	4.3.1 Storage Water Heater	CI-HWE-STWH-V03-190101	Revision	Standard change to Uniform Energy Factor. Reference to upcoming IECC 2018 code for New Construction.	Dependent on inputs
		4.3.2 Low Flow Faucet Aerators	CI-HWE-LFFA-V08-190101	Revision	Measure Life Update. Addition of secondary kWh savings for water supply and waste water treatment	Increases
		4.3.3 Low Flow Showerheads	CI-HWE-LFSH-V05-190101	Revision	Addition of secondary kWh savings for water supply and waste water treatment	Increases
		4.3.4 Commercial Pool Covers	CI-HWE-PLCV-V02-190101	Revision	Addition of secondary kWh savings for water supply	Increases
		4.3.5 Tankless Water Heater	CI-HWE-TKWH-V04-190101	Revision	Gas storage baseline definition made consistent with Storage Water Heater. Added IECC 2018 new construction code baseline assumptions.	Unknown
		4.3.6 Ozone Laundry	CI-HWE-OZLD-V02-190101	Revision	Addition of secondary kWh savings for water supply and waste water treatment	Increases
		4.3.7 Multifamily Central Domestic Hot Water Plants	CI-HWE-MDHW-V03-190101	Revision	Reference to upcoming IECC 2018 code for New Construction.	N/A
	4.4 HVAC	4.4 HVAC End Use	N/A	Revision	Update to select building type heating and cooling EFLH assumptions that have been transitioned and	Dependent on inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					calibrated to OpenStudio by the Modeling Subcommittee. Model Source provided in table	
		4.4.1 Air Conditioner Tune-Up	CI-HVC-ACTU-V05-180101	Errata	Correction of error in algorithm for deemed approach.	Decrease
		4.4.6 Electric Chiller	CI-HVC-CHIL-V06-190101	Revision	Measure Life Update. Added IECC 2018 new construction code baseline assumptions.	Increase lifetime savings
		4.4.7 ENERGY STAR and CEE Super-Efficient Room Conditioner	CI-HVC-ESRA-V02-190101	Revision	Update to Federal Standard and Efficient specifications.	Dependent on inputs
		4.4.9 Heat Pump Systems	CI-HVC-HPSY-V06-190101	Revision	Update to Federal Standard. Added IECC 2018 new construction code baseline assumptions.	Dependent on Inputs
		4.4.10 High Efficiency Boiler	CI-HVC-BOIL-V06-190101	Revision	Addition of new federal standard notice	N/A
		4.4.11 High Efficiency Furnace	CI-HVC-FRNC-V08-190101	Revision	Update to select building type cooling run hours assumptions that have been transitioned and calibrated to OpenStudio by the Modeling Subcommittee. Model Source provided in table	N/A
		4.4.13 Package Terminal Air Conditioner (PTAC) and Package Terminal Heat Pump (PTHP)	CI-HVC-PTAC-V09-190101	Revision	Measure Life Update. Update to Federal Standard	Decrease
		4.4.14 Pipe Insulation	CI-HVC-PINS-V05-190101	Revision	Assumptions for larger pipe sizes added.	N/A
		4.4.15 Single-Package and Split System Unitary Air Conditioners	CI-HVC-SPUA-V06-190101	Revision	Update to Federal Standard. Added IECC 2018 new construction code baseline assumptions. Clarification of use of EER for older units.	Dependent on Inputs
		4.4.17 Variable Speed Drives for HVAC Pumps and Cooling Tower Fans	CI-HVC-VSDHP-V05-190101	Revision	Update to measure life. Reference to upcoming IECC 2018 code for New Construction. Update to select building type heating and cooling run hours assumptions that have been transitioned and calibrated to OpenStudio by the Modeling Subcommittee.	Increase in lifetime savings

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					Model Source provided in table	
		4.4.18 Small Commercial Programmable Thermostats	CI-HVC-PROG-V02-190101	Revision	Update to measure life.	Increase in lifetime savings
		4.4.19 Demand Controlled Ventilation	CI-HVC-DCV-V05-190101	Revision	Addition of assumptions for adding DCV controls to exhaust fans in enclosed parking garages. Adjustments to analysis resulting in new savings factors.	Dependent on Inputs
		4.4.25 Small Commercial Programmable Thermostat Adjustments	CI-HVC-PRGA-V02-180101	Errata	Correction of error in the Natural Gas Climate Zone Coefficients for Assembly building type.	Dependent on Inputs
			CI-HVC-PRGA-V03-190101	Revision	Measure Life update	N/A
		4.4.26 Variable Speed Drives for HVAC Supply and Return Fans	CI-HVC-VSDF-V03-190101	Revision	Measure cost update. Reference to upcoming IECC 2018 code for New Construction. Update to select building type fan run hours assumptions that have been transitioned and calibrated to OpenStudio by the Modeling Subcommittee. Model Source provided in table	N/A
		4.4.27 Energy Recovery Ventilator	CI-HVC-ERVE-V03-190101	Revision	Addition of cooling savings. Reference to upcoming IECC 2018 code for New Construction.	Increase
		4.4.30 Notched V Belts for HVAC Systems	CI-HVC-NVBE-V04-190101	Revision	Update to select building type fan run hours assumptions that have been transitioned and calibrated to OpenStudio by the Modeling Subcommittee. Model Source provided in table	N/A
		4.4.32 Combined Heat and Power	CI-HVC-CHAP-V03-190101	Revision	Update to Heat Rate base on eGrid 2016	Dependent on Inputs
		4.4.33 Industrial air Curtain	CI-HVC-AIRC-V02-190601	Revision	Reference to upcoming IECC 2018 code for New Construction.	N/A
		4.4.34 Destratification Fan	CI-HVC-DSFN-V03-190101	Revision	Change to assumptions in thermal resistance through roof	Decrease
		4.4.35 Economizer Repair and Optimization	CI-HVC-ECRP-V03-180101	Errata	Correction of error in Integrated Economizer Operation (EL) variable and example calculation.	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
		4.4.36 Multi-Family Space Heating Steam Boiler Averaging Controls	CI-HVC-SBAC-V02-190101	Revision	Change to qualification criteria. Measure cost update. Change to Savings Factor	Increase
		4.4.40 Gas High Efficiency Single Package Vertical Air Conditioner	CI-HVC -SPVA-V01-190101	New	New Measure	N/A
		4.4.41 Advanced Rooftop Controls	CI-HVC-ARTC-V01-190101	New	New Measure	N/A
		4.4.42 Advanced Thermostats for Small Commercial	CI-HVC-ADTH-V01-190101	New	New Measure	N/A
		4.4.43 Packaged RTU Sealing	CI-HVC-PRTU-V01-190101	New	New Measure	N/A
		4.4.44 Commercial Ground Source Heat Pump	CI-HVC-GSHP-V01-190101	New	New Measures	N/A
		4.4.45 Adsorbant Air Cleaning	CI-HVC-ADAC-V01-190101	New	New Measures	N/A
	4.5 Lighting	4.5 Lighting End Use Table	N/A	Revision	Update to select building type assumptions that have been transitioned and calibrated to OpenStudio by the Modeling Subcommittee. Change to Exterior dusk to dawn hours assumption. Change to Refrigerator and Freezer Coincidence Factor.	Dependent on Inputs
		4.5.1 Commercial Compact Fluorescent Lamp	CI-LTG-CCFL-V08-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		4.5.3 High Performance and Reduced Wattage T8 Fixtures and Lamps	CI-LTG-T8FX-V07-190101	Revision	Measure Life Update. Update to C&I v RES split and ISR. Additional year of T12 as viable retrofit baseline.	Decrease
		4.5.4 LED Bulbs and Fixtures	CI-LTG-LEDB-V07-180101	Errata	Correction of year that the mid-life adjustment applies to account for T12 replacement, from 2018 to 2019. Addition of mid-life adjustment assumptions for omnidirectional screw based lamps.	N/A
			CI-LTG-LEDB-V08-190101	Revision	Update to Lamp lumen bins. Decorative and Directional Lamp EISA backstop	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					adjustments added. Update to C&I v RES split and ISR. Clarification on calculation of 3-way lamps.	
		4.5.5 Commercial LED Exit Signs	CI-LTG-LEDE-V03-190101	Revision	Update to lifetime. Update to measure cost. Update to WattsBase and WattsEE assumptions	Dependent on Inputs
		4.5.7 Lighting Power Density	CI-LTG-LPDE-V04-190101	Revision	Added IECC 2018 new construction code baseline assumptions.	Dependent on Inputs
		4.5.8 Miscellaneous Commercial/ Industrial Lighting	CI-LTG-MSCI-V03-190101	Revision	Measure Life Update.	N/A
		4.5.9 Multi-Level Lighting Switch	CI-LTG-MLLC-V04-190101	Revision	Reference to upcoming IECC 2018 code for New Construction.	N/A
		4.5.10 Lighting Controls	CI-LTG-OSLC-V05-190101	Revision	Combining occupancy, daylighting and integrated controls in to one measure. Updating watts controlled and % savings factors. Updated costs.	Decrease
		4.5.12 T5 Fixtures and Lamps	CI-LTG-T5FX-V06-190101	Revision	Measure Life Update. Additional year of T12 as viable retrofit baseline.	N/A
		4.5.13 Occupancy Controlled Bi-Level Lighting Fixtures	CI-LTG-OCBL-V03-190101	Revision	Reference to upcoming IECC 2018 code for New Construction.	N/A
		4.5.14 Commercial Specialty Compact Fluorescent Lamp	CI-LTG-SCFL-V04-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		4.5.16 LED Streetlighting	CI-LTG-STRT-V01-190101	New	New Measure	N/A
	4.6 Refrigeration	4.6.1 Automatic Door Closer for Walk-In Coolers and Freezers	CI-RFG-ATDC-V02-190101	Revision	Reference update	N/A
		4.6.3 Door Heater Controls for Cooler or Freezer	CI-RFG-DHCT-V02-190101	Revision	Measure Life Update.	Decrease in lifetime savings
		4.6.6 Evaporator Fan Control for Electrically Commutated Motors	CI-RFG-EVPF-V04-190101	Revision	Measure Life Update.	Decrease in lifetime savings
		4.6.10 High Speed Roll Up Doors	CI-RFG-HSRD-V02-190101	Revision	Measure Life Update.	Increase in lifetime savings

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
		4.6.11 Q-Sync Motors for Reach-in Coolers/Freezers	CI-RFG-QMF-V01-190101	New	New measure	N/A
		4.6.12 Variable Frequency Drive for Condenser Fans	CI-RFG-VSC-V01-190101	New	New measure	N/A
	4.7 Compressed Air	4.7.1 VSD Air Compressor	CI-CPA-VSDA-V02-190101	Revision	Clarification on measure eligibility. Additional baseline characterized. CF for varying shift lengths. Measure Life Update.	Dependent on Inputs
		4.7.2 Compressed Air Low Pressure Drop Filters	CI-CPA-LPDF-V02-190101	Revision	Measure Life Update. CF and hours for varying shift lengths.	Dependent on Inputs
		4.7.3 Compressed Air No-Loss Condensate Drains	CI-CPA-NCLD-V02-190101	Revision	Added CF assumption.	N/A
		4.7.4 Efficient Compressed Air Nozzles	CI-CPA-CNOZ-V02-190101	Revision	CF for varying shift lengths.	N/A
		4.7.5 Efficient Refrigerated Compressed Air Dryer	CI-CPA-CADR-V02-190101	Revision	Measure Life Update. CF for varying shift lengths. Removal of default 50% CFM factor.	Increases
	4.8 Miscellaneous	4.8.1 Pump Optimization	CI-MSC-PMPO-V02-190101	Revision	Measure Life Update.	Decrease in lifetime savings
		4.8.2 Roof Insulation for C&I Facilities	CI-MSC-RINS-V03-190101	Revision	Reference to upcoming IECC 2018 code for New Construction.	N/A
		4.8.7 Advanced Power Strip – Tier 1 Commercial	CI-MSC-APSC-V02-190101	Revision	Algorithm typo fixed	N/A
		4.8.10 Commercial Clothes Dryer Moisture Sensor	CI-MSC-CDMS-V01-190101	New	New Measure	N/A
		4.8.11 Efficient Thermal Oxidizers	CI-MSC-ETOX-V01-190101	New	New Measure	N/A
Volume 3: Residential	5.1 Appliances	5.1.2 ENERGY STAR Clothes Washer	RS-APL-ESCL-V05-180101	Errata	Update to Federal Standard.	Decrease
			RS-APL-ESCL-V06-190101	Revision	Addition of CEE Tier 3. Measure cost update.	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					Update to assumptions based on current available product and updated RECS information. Addition of secondary kWh savings for water supply and waste water treatment	
		5.1.3 ENERGY STAR Dehumidifier	RS-APL-ESDH-V04-180101	Errata	Update to ENERGY STAR specification.	Increase
			RS-APL-ESDH-V05-190101	Revision	Notes for upcoming Federal Standard change. Update to measure cost.	N/A
		5.1.4 ENERGY STAR Dishwasher	RS-APL-ESDI-V04-190101	Revision	Update to measure cost. Update to measure life. Update to operating hours assumption. Addition of secondary kWh savings for water supply and waste water treatment	Increase in kWh. Decrease in kW savings
		5.1.5 ENERGY STAR Freezer	RS-APL-ESFR-V03-190101	Revision	Measure Life Update.	Increase in lifetime savings
		5.1.6 ENERGY STAR and CEE Tier 2 Refrigerator	RS-APL-ESRE-V06-190101	Revision	Measure Life Update.	Increase in lifetime savings
		5.1.7 ENERGY STAR Room Air Conditioner	RS-APL-ESRA-V07-190101	Revision	Removal of Connected Allowance from ENERGY STAR specification.	Increase
		5.1.8 Refrigerator and Freezer Recycling	RS-APL-RFRC-V07-190101	Revision	Removal of NTG discussion and reference to section 4.2. Measure Life Update.	Decrease in lifetime savings
		5.1.9 Room Air Conditioner Recycling	RS-APL-RARC-V02-190101	Revision	Update to assumption of retired unit efficiency.	Decrease
		5.1.10 ENERGY STAR Clothes Dryer	RS-APL-ESDR-V02-190101	Revision	Measure Life Update.	Increase in lifetime savings
		5.1.12 Ozone Laundry	RS-APL-OZNE-V01-190101	New	New Measure.	N/A
	5.2 Consumer Electronics	5.2.1 Advanced Power Strip – Tier 1	RS-CEL-SSTR-V04-190101	Revision	Clarification of ISR definitions	N/A
		5.2.2 Advanced Power Strip – Residential Audio Visual	RS-CEL-APS2-V03-190101	Revision	Clarification of ERP	N/A
	5.3 HVAC	5.3.1 Air Source Heat Pump	RS-HVC-ASHP-V08-190101	Revision	Note added that it is not appropriate to claim additional ECM savings. Addition of Quality Install assumptions. Measure Life Update. Updates to existing and in-situ efficient ratings.	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
		5.3.2 Boiler Pipe Insulation	RS-HVC-PINS-V03-190101	Revision	Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Decrease in lifetime savings
		5.3.3 Central Air Conditioning	RS-HVC-CAC1-V08-190101	Revision	Note added that it is not appropriate to claim additional ECM savings. Addition of Quality Install assumptions. Update efficient condition specifications. Updates to existing and in-situ efficient ratings.	Dependent on Inputs
		5.3.4 Duct Insulation and Sealing	RS-HVC-DINS-V07-190101	Revision	Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Decrease in lifetime savings
		5.3.5 Furnace Blower Motor	RS-HVC-FBMT-V04-190101	Revision	Updates to description. Change to savings methodology based on Opinion Dynamics and Cadmus metering study. Measure Life Update.	Dependent on Inputs
		5.3.6 Gas High Efficiency Boiler	RS-HVC-GHEB-V07-190101	Revision	Change to 'EFLH * Capacity' methodology.	Dependent on Inputs
		5.3.7 Gas High Efficiency Furnace	RS-HVC-GHEF-V08-190101	Revision	Change to 'EFLH * Capacity' methodology.	Dependent on Inputs
		5.3.8 Ground Source Heat Pump	RS-HVC-GSHP-V08-190101	Revision	Update to gas water heater Federal standard. Addition of GSHP as an existing option for early replacement. Updates to existing efficient ratings. Update to Heat Rate base on eGrid 2016.	Dependent on Inputs
		5.3.9 High Efficiency Bathroom Exhaust Fan	RS-HVC-BAFA-V02-190101	Revision	Update to include both standard and continuous usage. Addition of ENERGY STAR specifications.	Dependent on Inputs
		5.3.10 HVAC Tune Up (Central Air Conditioning or Air Source Heat Pump)	RS-HVC-TUNE-V04-190101	Revision	Clarification of multifamily definitions	N/A
		5.3.11 Programmable Thermostats	RS-HVC-PROG-V05-190101	Revision	Measure Life Update. Addition of mobile home and unknown household factors	Increase in lifetime savings
		5.3.12 Ductless Heat Pumps	RS-HVC-DHP-V06-190101	Revision	Measure Life Update. Addition of incremental cost from baseline DMSHP. Updates to existing efficient ratings. Update to Heat Rate base on eGrid 2016.	Dependent on Inputs
		5.3.13 Residential	RS-HVC-FTUN-V04-	Revision	Clarification of measure life.	Dependent

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
		Furnace Tune-Up	190101		Methodology added to use HVAC SAVE outputs directly. Change to 'EFLH * Capacity' methodology.	on Inputs
		5.3.14 Boiler Reset Controls	RS-HVC-BREC-V02-190101	Revision	Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Decrease in lifetime savings
		5.3.16 Advanced Thermostats	RS-HVC-ADTH-V03-190101	Revision	Measure Life Update. Addition of mobile home and unknown household factors and capacities. Updates to existing efficient ratings. Updates to assumptions based on Navigant program participant evaluation Update to cooling % reduction assumption.	Dependent on Inputs
		5.3.17 Gas High Efficiency Combination Boiler	RS-HVC-COMB-V01-190101	New	New Measure	N/A
	5.4 Hot Water	5.4.1 Domestic Hot Water Pipe Insulation	RS-HWE-PINS-V03-190101	Revision	Addition of circumference factor pre- and post-insulation.	Dependent on Inputs
		5.4.2 Gas Water Heater	RS-HWE-GWHT-V08-190101	Revision	Addition of Uniform Energy Factor. Update to gas water heater Federal standard.	Dependent on Inputs
		5.4.3 Heat Pump Water Heaters	RS-HWE-HPWH-V07-190101	Revision	Addition of Uniform Energy Factor Update to electric water heater Federal Standard. Update to measure costs. Update to COP of cooling estimate. Measure Life Update. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Dependent on Inputs
		5.4.4 Low Flow Faucet Aerators	RS-HWE-LFFA-V07-190101	Revision	Measure Life Update. Updates to eligibility and existing GPM assumptions. Updates to ISR assumptions. Addition of unknown household type size. Addition of secondary kWh savings for water supply and waste water treatment. Update to Gallons per Hour calculation.	Dependent on Inputs
		5.4.5 Low Flow Showerheads	RS-HWE-LFSH-V06-190101	Revision	Updates to eligibility and existing GPM assumptions. Updates to ISR assumptions. Addition of unknown household type size. Addition of secondary kWh savings for water supply and waste water treatment.	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					Update to Gallons per Hour calculation.	
		5.4.6 Water Heater temperature Setback	RS-HWE-TMPS-V06-190101	Revision	Clarification of multifamily definitions	N/A
		5.4.8 Thermostatic Restrictor Shower Valve	RS-HWE-TRVA-V04-190101	Revision	Addition of unknown household type size. Addition of secondary kWh savings for water supply and waste water treatment	Increase
		5.4.9 Shower Timer	RS-DHW-SHTM-V02-190101	Revision	Addition of unknown household type size. Addition of secondary kWh savings for water supply and waste water treatment	Increase
	5.5 Lighting	5.5.1 Compact Fluorescent Lamp	RS-LTG-ESCF-V07-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-ESCF-V08-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		5.5.2 Specialty Compact Fluorescent Lamp	RS-LTG-ESCC-V06-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-ESCC-V07-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		5.5.3 ENERGY STAR Torchiere	RS-LTG-ESTO-V05-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-ESTO-V06-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		5.5.4 Exterior Hardwired Compact Fluorescent Lamp Fixture	RS-LRG-EFOX-V07-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LRG-EFOX-V08-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		5.5.5 Interior Hardwired Compact Fluorescent Lamp Fixture	RS-LTG-IFIX-V07-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-IFIX-V08-190101	Revision	Addition of language that measure is effective until 12/31/2018.	N/A
		5.5.6 LED Specialty Lamps	RS-LTG-LEDD-V08-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-LEDD-V09-190101	Revision	Updates to Res v C&I split, ISR, leakage, CF and HOU. Decorative and Directional Lamp EISA backstop adjustments added. Format of watts tables updated. Clarification on deferred install methodology.	Decrease in Savings
		5.5.7 LED Exit Signs	RS-LTG-LEDE-V03-190101	Revision	Clarity of application within multifamily unit. Measure made RF only. Measure life adjusted accordingly.	Dependent on Inputs

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
					Measure cost updated. Base and Efficient wattage adjusted.	
		5.5.8 LED Screw Based Omnidirectional Bulbs	RS-LTG-LEDA-V06-180101	Errata	Addition of leakage assumption to kW and waste heat algorithms.	Decrease in kW savings
			RS-LTG-LEDA-V07-190101	Revision	Updates to Res v C&I split, ISR, leakage, CF and HOU. Clarification on deferred install methodology.	Dependent on Inputs
		5.5.9 LED Fixtures	RS-LTG-LDFX-V01-190101	New	New Measure	N/A
		5.5.10 Holiday String Lighting	RS-LTG-LEDH-V01-190101	New	New Measure	N/A
		5.5.11 LED Nightlights	RS-LTG-NITL-V01-190101	New	New Measure	N/A
	5.6 Shell	5.6.1 Airsealing	RS-SHL-AIRS-V07-190101	Revision	Update to measure life. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure Addition of cooling, heating fan and gas heating adjustment factors, with distinction made between measures combined with attic insulation or not.	Dependent on Inputs
		5.6.2 Basement Sidewall Insulation	RS-SHL-BINS-V09-190101	Revision	Update to measure life. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Decrease in lifetime savings
		5.6.3 Floor Insulation Above Crawlspace	RS-SHL-FINS-V09-190101	Revision	Update to measure life. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure.	Decrease in lifetime savings
		5.6.4 Wall Insulation	RS-SHL-WINS-V08-190101	Revision	Separation of Wall and Ceiling/Attic Insulation measures Update to measure life. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure	Decrease in lifetime savings
		5.6.5 Ceiling/Attic Insulation	RS-SHL-AINS-V01-190101	Revision	Separation of Wall and Ceiling/Attic Insulation measures Update to measure life. Addition of midlife adjustment to account for HVAC replacement during lifetime of measure Updates to cooling, gas heating adjustment factors plus addition of heating fan adjustment factor, with distinction made between measures combined with airsealing measure or not.	Dependent on Inputs
		5.6.6 Rim/Band Joist Insulation	RS-SHL-RINS-V01-190101	New	New Measure	
	5.7	5.7.1 High Efficiency	RS-MSC-RPLP-V02-190101	Revision	Update to ENERGY STAR specifications.	Dependent

Volume	End Use	Measure Name	Measure Code	Change Type	Explanation	Impact on Savings
	Miscellaneous	Pool Pumps			Addition of above ground pools. Update to measure cost.	on Inputs
Volume 4: Cross Cutting Measures and Attachments	6.1 Behavior	6.1.1 Adjustments to Behavior Savings to Account for Persistence	CC-BEH-BEHP-V03-190101	Revision	Footnote added to Retention Rate variable to acknowledge uncertainty related to the current assumption, and a recommendation to update should better evaluation information become available.	N/A
	Attachment B: Effective Useful Life for Custom Measure Guidelines	N/A	N/A	New	New section providing guidelines and default assumptions for custom measure effective useful lives.	N/A

Table 1.4: Summary of Attachment A: IL-NTG Methods Revisions

IL-TRM Volume	Sectors	Protocol Name	Change Type	Explanation
Vol. 4	All Sectors	Programs Currently Covered in this Document	Revision	Added language to allow SAG-approved updates to go into effect before the effective date of the updated TRM.
Vol. 4	All Sectors	Spillover Specific Issues	Revision	Added language and table for estimating spillover from trade allies for all sectors (not only for residential).
Vol. 4	All Sectors	Commercial, Industrial and Public Sector Programs	Revision	Updated table with 2018-21 programs.
Vol. 4	All Sectors	Core Free Ridership Scoring Algorithm: Algorithm 1 and Algorithm 2	Revision	Added language to aid evaluators in selecting the appropriate algorithm to use.
Vol. 4	Residential and Low Income	Residential and Low Income Programs	Revision	Updated table with 2018-21 programs. Added footnote regarding NTG value for Income Eligible programs.
Vol. 4	Residential and Low Income	Residential and Low Income Programs	Revision	Changed language from program influence on *decision* to program influence on *making* energy efficiency improvements.
Vol. 4	All Sectors	Non-Participant Spillover Measured Through Trade Allies	Revision	Moved and revised language from section 4.1.3 to section 5.1 to allow for combining trade ally free ridership with customer free ridership for all sectors.
Vol. 4	Residential and Low Income	Appliance Recycling	Revision	Deleted language in section 4.2 regarding Induced Replacement to reflect current industry practiced described in the latest version of the Uniform Methods Protocol.
Vol. 4	Residential and Low Income	Nonparticipant Spillover Measured Through Trade Allies	Revision	Deleted section 4.1.3 to allow estimating nonparticipant spillover through trade allies for all sectors.
Vol. 4	Residential and Low Income	Multifamily Protocol	Revision	Added language clarifying CFL, non-CFL, LED and non-LED measures.
Vol. 4	Residential and Low Income	Builder Nonparticipant Spillover	Revision	Updated Table 4-6 to IECC 2015 Building Energy Code.
Vol. 4	Cross- Sectors	Combining Participant and Trade-Ally Free Ridership Scores	Revision	Added section 5.1 for combining trade ally free ridership with customer free ridership for all sectors.
Vol. 4	Cross- Sectors	Combining Participant and Trade-Ally Free Ridership Scores	Revision	Added section 5.2 for estimating spillover through trade allies for all sectors.
Vol. 4	Cross-Sectors	Consumption Data Analysis Protocol	Revision	Revised to address when consumption data analysis yields net savings, gross savings, or something in between.
Vol. 4	Cross-Sectors	Survey-Based Approaches	Revision	Added language to consider survey mode effects, especially online vs. telephone.

1.3 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'[6] Energy Efficiency Plan dockets. In the Final Orders, the ICC required the utilities to work with the Illinois Department of Commerce and Economic Opportunity (DCEO) and the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) to develop a statewide TRM. *See, e.g.,* ComEd's Final Order *(Docket No. 10-0570, Final Order[7] at 59-60, December 21, 2010);* Ameren's Final Order *(Docket No. 10-0568, Order on Rehearing[8] at 19, May 24, 2011);* Peoples Gas/North Shore Gas' Final Order *(Docket No. 10-0564, Final Order[9]at 76, May 24, 2011),* and Nicor's Final Order *(Docket No. 10-0562, Final Order[10] at 30, May 24, 2011).*

As directed in the Utilities' Efficiency Plan Orders, the SAG had the opportunity to, and also participated in, every aspect of the development of the TRM. Interested members of the SAG participated in weekly teleconferences to review, comment, and participate in the development of the TRM. The active participants in the TRM were designated as the "Technical Advisory Committee" (TAC). The TAC participants include representatives from the following organizations:

- the Utilities (ComEd, Ameren IL, Nicor Gas, Peoples Gas/North Shore Gas),
- Implementation contractors (CLEAResult, Conservation Services Group, Elevate Energy, Franklin Energy, GDS Associates, PECI, 360 Energy Group),
- Illinois Department of Commerce and Economic Opportunity (DCEO),
- the independent evaluators (ADM Associates, The Cadmus Group, Itron, Navigant Consulting, Michael's Engineering, Opinion Dynamics Corporation),
- ICC Staff,
- the Illinois Attorney General's Office (AG),
- Natural Resources Defense Council (NRDC),
- the Environmental Law and Policy Center (ELPC),
- the Citizen's Utility Board (CUB),
- The University of Illinois at Chicago,
- Future Energy Enterprises,
- Issue-specific invited participants including; Geothermal Alliance of Illinois, the Geothermal Exchange Organization, Embertec, TrickleStar, Google Nest, Ecobee, and US EPA ENERGY STAR.

1.4 Development Process

The first edition of the IL-TRM was approved by the Commission in ICC Docket No. 12-0528[11]. The second edition of the IL-TRM was approved by the Commission in ICC Docket No. 13-0437[12]. The policies surrounding the applicability and use of the IL-TRM in planning, implementation, and evaluation were originally established by the

[6] 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, and Northern Illinois Gas Company d/b/a Nicor Gas.
[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] http://www.icc.illinois.gov/docket/files.aspx?no=12-0528&docId=187554
[12] http://www.icc.illinois.gov/docket/files.aspx?no=13-0437&docId=200492

Commission in ICC Docket No. 13-0077[13], and most recently in ICC Docket No. 17-0270[14]. The third edition of the IL-TRM was approved by the Commission in ICC Docket No. 14-0189[15]. The fourth edition of the IL-TRM was approved by the Commission in ICC Docket No. 15-0187[16]. The fifth edition of the IL-TRM was approved by the Commission in ICC Docket No. 16-0171[17]. The sixth edition of the IL-TRM was approved by the Commission in ICC Docket No. 17-0106[18].

This document represents the seventh edition of the IL-TRM and it applies to Section 8-103B and Section 8-104 energy efficiency programs. It contains a series of new measures, as well as a series of errata items[19] and updates to existing measures that were already present in the first six editions. Like the previous editions, it is a result of an ongoing review process involving the Illinois Commerce Commission (ICC) Staff (Staff or ICC Staff), the Utilities, the Evaluators, the SAG TAC, and the SAG. VEIC meets with the SAG and/or the TRM TAC at least once each month to create a high level of transparency and vetting in the development of this TRM.

Measure requests that are submitted by interested parties are ranked based on the following criteria to determine the approximate priority level for order of inclusion in the TRM:

1. High Priority
    a. For those existing measures that make up a significant portion of a utilities' portfolio and/or where the impact of the requested change is high
    b. For new measures where plans are in place to implement in the next program year
2. Medium Priority
    a. For existing measures that are a less significant percent of a utilities' portfolio and value change will not have a significant impact
    b. For new measures where a savings value is estimated but implementation plans not yet developed
3. Low Priority
    a. For existing measures that represent a very small percent of a utilities' portfolio
    b. For new measures that are just beginning to be explored and will not be implemented in the next program year

These rankings are used to align budget and schedule constraints with desired updates from the TRM.

As measure requests are finalized leading up to the next update of the TRM, weekly TAC meetings are often scheduled to maximize the level of collaboration and visibility into the measure characterization process. Where consensus does not emerge on specific measures or issues, those items are identified in a memo. As a result, this TRM represents a broad consensus amongst the SAG and TAC participants. In keeping with the goal of transparency, all of the comments and their status to-date are available through the TAC SharePoint web site, https://portal.veic.org.

For each measure characterization, this TRM includes engineering algorithm(s) and a value(s) for each parameter in the equation(s). These parameters have values that fall into one of three categories: a single deemed value, a lookup

[13] http://www.icc.illinois.gov/docket/files.aspx?no=13-0077&docId=203903; http://www.icc.illinois.gov/docket/files.aspx?no=13-0077&docId=195913; http://www.icc.illinois.gov/downloads/public/edocket/339744.pdf

[14] https://www.icc.illinois.gov/docket/files.aspx?no=17-0270&docId=257523 Please see IL-TRM Policy Document Version 2.0 available at https://www.icc.illinois.gov/downloads/public/edocket/447989.pdf

[15] http://www.icc.illinois.gov/docket/files.aspx?no=14-0189&docId=210478 http://www.icc.illinois.gov/downloads/public/Illinois_Statewide_TRM_Effective_060114_Version_3.0_022414_Clean.pdf

[16] http://www.icc.illinois.gov/docket/files.aspx?no=15-0187&docId=226161 http://www.icc.illinois.gov/downloads/public/Illinois_Statewide_TRM_Effective_060115_Final_022415_Clean.pdf

[17] https://www.icc.illinois.gov/docket/files.aspx?no=16-0171&docId=239985 https://www.icc.illinois.gov/downloads/public/IL-TRM%20Version%205.0%20dated%20February%2011,%202016%20Final%20-%20Compiled%20Volumes%201-4.pdf

[18] https://www.icc.illinois.gov/docket/files.aspx?no=17-0106&docId=250827 https://www.icc.illinois.gov/downloads/public/edocket/442527.pdf

[19] Errata as well as links to the official IL-TRM documents, dockets, and policy documents are available on the following ICC webpage: http://www.icc.illinois.gov/Electricity/programs/TRM.aspx

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*[20] in the lookup tables are the next most accurate choice, and in the absence of either an actual value or an appropriate value in a lookup table, the single, *deemed value* should be used. As a result, this single, *deemed value* can be thought of as a default value for that particular input to the algorithm.

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

Algorithms and their parameter values are included for calculating estimated:

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

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

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

1.4.1 Reliability Review

The process of incorporating new and better information into the TRM occurs annually as new measures and errors are identified, program designs change, old measures are dropped from programs, or other external events (such as code and standard changes or new evaluations and other data) warrant a review of assumptions. However, not all measures have updates triggered by such events, and some measures continue to appear in the TRM without ongoing review. Short of proactively identified issues that would trigger an update to a TRM characterization, a regular reliability review should be undertaken to assess that the information in older measures is still relevant and reliable. This review will include a general appraisal of reasonableness and continued program relevancy and an update of any assumptions to reflect new information.

To ensure that measures initially developed in the past and not recently revisited are updated and retired as needed, each measure is given a Review Deadline – a date that triggers a reliability review. This Review Deadline is established for each measure based on factors such as expected revisions to energy codes or federal standards; knowledge of upcoming evaluation or research efforts; knowledge of rapidly changing technology, cost, baselines, or other factors; or expected shifts in current customer practices. No Review Deadline is longer than six years from the date of the initial characterization or last update of a measure. The TRM Administrator will propose Review Deadlines for each measure, and they are reviewed and approved by the TAC. The Review Deadline for each measure is indicated in the measure characterization within the TRM. For example, a Review Deadline specified as 1/1/2019 means that the measure will be reviewed no later than the annual IL-TRM update process that occurs in 2018, in advance of the 1/1/2019 Review Deadline. Following a review and/or update, a new Review Deadline will be assigned to that measure.

[20] 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 Organizational Structure

The organization of this document follows a three-level format. These levels are designed to define and clarify what the measure is and where it is applied.

1. **Market Sectors Volumes**[21]
    - This level of organization specifies the type of customer the measures apply to, either Commercial and Industrial (provided in Volume 2), Residential (provided in Volume 3), or cross-cutting measures, such as Behavior Persistence (provided in Volume 4, together with Attachments including the documentation of Illinois Statewide Net-to-Gross methodologies).
    - 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[22]

Volume 2: Commercial and Industrial Market Sector	Volume 3: Residential Market Sector	Volume 4: Cross-Cutting Measures and Attachments
Agricultural Equipment	Appliances	Behavior
Food Service Equipment	Consumer Electronics	
Hot Water	Hot Water	
HVAC	HVAC	
Lighting	Lighting	
Refrigeration	Shell	
Compressed Air	Miscellaneous	
Miscellaneous		

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.

2.1 Measure Code Specification

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

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

[21] Note that the Public sector buildings and low income measures are not listed as a separate Market Sector. The Public building type is one of a series of building types that are included in the appropriate measures in the Commercial and Industrial Sector.

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

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
CI (C&I)	AGE (Agricultural Equipment)	BLR_	V01	YYMMDD
RS (Residential)	APL (Appliances)	T5FX	V02	YYMMDD
CC (Cross-Cutting)	BEH (Behavior)	T8FX	V03	YYMMDD
	CEL (Consumer Electronics)	…	…	…
	CPA (Compressed Air)			
	FSE (Food Service Equipment)			
	HVC (HVAC)			
	HWE (Hot Water)			
	LTG (Lighting)			
	MSC (Miscellaneous)			
	RFG (Refrigeration)			
	SHL (Shell)			

2.2 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

Brief description of measure stating how it saves energy, the markets it serves and any limitations to its applicability.

DEFINITION OF EFFICIENT EQUIPMENT

Clear definition of the criteria for the efficient equipment used to determine delta savings. Including any standards or ratings if appropriate.

DEFINITION OF BASELINE EQUIPMENT

Clear definition of the efficiency level of the baseline equipment used to determine delta savings including any standards or ratings if appropriate. If a Time of Sale measure the baseline will be new base level equipment (to replace existing equipment at the end of its useful life or for a new building). For Early Replacement or Early Retirement measures the baseline is the existing working piece of equipment that is being removed.

DEEMED LIFETIME OF EFFICIENT EQUIPMENT

The expected duration in years (or hours) of the savings. If an early replacement measure, the assumed life of the existing unit is also provided.

DEEMED MEASURE COST

For time of sale measures, incremental cost from baseline to efficient is provided. Installation costs should only be included if there is a difference between each efficiency level. For Early Replacement the full equipment and install cost of the efficient installation is provided in addition to the full deferred hypothetical baseline replacement cost.

LOADSHAPE

The appropriate loadshape to apply to electric savings is provided.

COINCIDENCE FACTOR

The summer coincidence factor is provided to estimate the impact of the measure on the utility's system peak – defined as 1PM to hour ending 5PM on non-holiday weekdays, June through August.

Algorithm

CALCULATION OF ENERGY SAVINGS

Algorithms are provided followed by list of assumptions with their definition.

If there are no Input Variables, there will be a finite number of Output values. These will be identified and listed in a table. Where there are custom inputs, an example calculation is often provided to illustrate the algorithm and provide context.

ELECTRIC ENERGY SAVINGS

SUMMER COINCIDENT PEAK DEMAND SAVINGS

NATURAL GAS SAVINGS

WATER IMPACT DESCRIPTIONS AND CALCULATION

DEEMED O&M COST ADJUSTMENT CALCULATION

Only required if the operation and maintenance cost for the efficient case is different to the baseline.

MEASURE CODE

REVIEW DEADLINE

If not otherwise updated as part of an identified new TRM issue request before this Review Deadline, the measure will undergo a reliability review for reasonableness, continued program relevancy, and update of material assumptions during the update cycle prior to this deadline.

2.3 Variable 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 measure has a custom allowable input.

2.3.1 C&I Custom Value Use in Measure Implementation

This section defines the requirements for capturing Custom variables that can be used in place of defaults for select assumptions within the prescriptive measures defined in this statewide TRM. This approach is to be used when a variable in a measure formula can be replaced by a verifiable and documented value that is not presented in the TRM. This approach assumes that the algorithms presented in the measure are used as stated and only allows changes to certain variable values and is not a replacement algorithm for the measure. A custom variable is when customer input is provided to define the number or the value is measured at the site. Custom values can also be supplied from product data of the measure installed. In certain cases the custom data can be provided from a documented study or report that is applicable to the measure. Custom variables and potential sources are clearly defined in the specific measures where "Actual" or "Custom" is noted.

In exceptional cases where the participant, program administrator, and independent evaluator all agree that the TRM algorithm for a particular energy efficiency measure does not accurately characterize the energy efficiency measure within a project due to the complexity in the design and configuration of the particular energy efficiency project, a more comprehensive custom engineering and financial analysis may be used that more accurately incorporates the attributes of the measure in the complex energy efficiency project. In such cases and consistent with Commission policy adopted in ICC Docket No. 17-0270, Program Administrators are subject to retrospective evaluation risk (retroactive adjustments to savings based on ex post evaluation findings) for such projects using customized savings calculations.

2.4 Program Delivery & Baseline Definitions

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

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

Table 2.3: Program Delivery Types

Program	Attributes
Time of Sale (TOS)	Definition: A program in which the customer is incented to purchase or install higher efficiency equipment than if the program had not existed. This may include retail rebate (coupon) programs, upstream buydown programs, online store programs or contractor based programs 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	Definition: A program that retires duplicative equipment before its expected life is over.

Program	Attributes
Retirement (ERET)	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
Efficiency Kits (KITS)	Definition: A program where measures are provided free of charge to a customer in an Efficiency Kit. 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 four 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

3 Assumptions

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

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

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

3.1 Footnotes & Documentation of Sources

Each new and updated measure characterization is supported by a work paper, which is posted to the SharePoint web site (https://portal.veic.org).[23] Both the work paper and the measure characterizations themselves use 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 to the TRM's SharePoint website. These files can be found in the 'Sources and Reference Documents' folder in the main directory, and are also posted to the SAG's public web site (http://www.ilsag.info/technical-reference-manual.html).

3.2 General Savings Assumptions

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

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

3.3 Shifting Baseline Assumptions

The TRM anticipates the effects of changes in efficiency codes and standards on affected measures. When these changes take effect, a shift in the baseline is usually required. This complicates the measure savings estimation somewhat, and will be handled in future versions of the TRM by describing the choice of and reasoning behind a shifting baseline assumption. In this version of the TRM, this applies to CFLs and T5/T8 Linear Fluorescents, Furnaces and Early Replacement Measures.

[23] To gain access to the SharePoint web site, please contact the TRM Administrator at iltrmadministrator@veic.org.

3.3.1 CFL and T5/T8 Linear Fluorescents and LED Baseline Assumptions

Specific reductions in savings have been incorporated for CFL and LED 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) mandated a phase-in process that began in 2012 for all general-purpose light bulbs (defined as omnidirectional or A-lamps) between 40W and 100W to be approximately 30% more energy efficient than current incandescent bulbs, in essence beginning the phase-out of the current style, or "standard", incandescent bulbs. From 2012, standard 100W incandescent bulbs could 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 and LED Omnidirectional Lamp measure in the corresponding program years therefore became bulbs (improved or "efficient" incandescent, or halogen) that met the new standard and have the same lumen equivalency. In addition, a backstop provision requires replacement baseline lamps meet 45 lumens/watt from 2020. To account for this shifting baseline, annual savings are reduced within the lifetime of the measure using a midlife baseline adjustment. The magnitude and timing of these adjustments are specified within each measure.

Specialty and Directional lamps were not included in the original definition of General Service Lamps in the Energy Independence and Security Act of 2007 (EISA). Therefore, the initial baseline is an incandescent / halogen lamp described in that measure.

However, a DOE Final Rule released on 1/19/2017 updated the EISA regulations to remove the exemption for these lamp types such that they become subject to the backstop provision defined within the original legislation. There is, however, uncertainty around the final application of the EISA backstop provision, particularly whether the expanded definition will hold, as well as uncertainty regarding how the market for these products would change absent the backstop. Therefore, the 2019 version of the LED Specialty Lamp measure delays application of the midlife adjustment associated with the backstop provision to 1/1/2024. However, TAC members commit to making appropriate mid-year adjustments to the measure characterization in the event that new information adds sufficient clarity and concludes any legal challenges to support making a change to this agreement. This means that, if within PY2019 it becomes clear that the EISA backstop *will* apply to the measures characterized herein, the timing of the midlife adjustment will be changed to be applied in 2021, consistent with the omnidirectional measure. Likewise, if it becomes clear that these lamp types will revert to being exempt, the midlife adjustment will be removed. In addition, the TAC and IL TRM Administrator must consider NTG and lifetime assumptions and, if consensus is reached, apply coordinated adjustments to the TRM at that time (if consensus is not reached the most recent NTG evaluation results for these measures will be applied). Any mid-year adjustments to the TRM and NTG would be applied for all installs beginning 30 days after agreement is reached, rather than waiting for the next TRM update.

In July 14, 2012, Federal Standards were enacted that were expected to eliminate T-12s as an option for linear fluorescent fixtures. Through v3.0 of the TRM, it was assumed that the T-12 would no longer be baseline for retrofits from 1/1/2016. However, due to significant loopholes in the legislation, T-12 compliant product is still freely available, and in Illinois T-12s continue to hold a significant share of the existing and replacement lamp market. Therefore, the timing of the sunsetting of T-12s as a viable baseline was pushed back in v7.0 to 1/1/2020, and will be revisited in future update sessions and incorporate findings from any baseline studies conducted through the year.

3.3.2 Early Replacement Baseline Assumptions

A series of measures have an option to choose an Early Replacement Baseline if the following conditions are met:

Early Replacement determination will be based on meeting the following conditions:

- The existing unit is operational when replaced, or
- The existing unit requires minor repairs (see table below) [24].

[24] The Technical Advisory Committee agreed that if the cost of repair is less than 20% of the new baseline replacement cost it can be considered early replacement.

Existing System	Maximum repair cost
Air Source Heat Pump	$918
Central Air Conditioner	$734
Boiler	$709
Furnace	$528
Ground Source Heat Pump	<$249 per ton

- All other conditions will be considered Time of Sale.

The Baseline efficiency of the existing unit replaced:

- If the efficiency of the existing unit is less than the maximum shown below, the Baseline efficiency is the actual efficiency value of the unit replaced. If the efficiency is greater than the maximum, the Baseline efficiency is shown in the "New Baseline" column below:

Existing System	Maximum efficiency for Actual	New Baseline
Air Source Heat Pump	10 SEER	14 SEER
Central Air Conditioner	10 SEER	13 SEER
Boiler	75% AFUE	82% AFUE
Furnace	75% AFUE	80% AFUE
Ground Source Heat Pump	10 SEER	13 SEER

- If the operational status, repair cost or efficiency of the existing unit is unknown, the Baseline efficiency is the "New Baseline" column above.

3.3.3 Furnace Baseline

The prior national standard for residential oil and gas furnaces was 78% AFUE. DOE raised the standard in 2007 to 80% AFUE, effective 2015. However, virtually all furnaces on the market have an AFUE of 80% or better, which prompted states and environmental and consumer groups to sue DOE over its 2007 decision. In April 2009, DOE accepted a "voluntary remand" in that litigation. In October 2009, manufacturers and efficiency advocates negotiated an agreement that, for the first time, included different standard levels in three climate regions: the North, South, and Southwest. DOE issued a direct final rule (DFR) in June 2011 reflecting the standard levels in the consensus agreement. The DFR became effective on October 25, 2011 establishing new standards: In the North, most furnaces will be required to have an AFUE of 90%.The 80% AFUE standard for the South and Southwest will remain unchanged at 80%. Oil furnaces will be required to have an AFUE of 83% in all three regions. The amended standards will become effective in May 2013 for non-weatherized furnaces and in January 2015 for weatherized furnaces. DOE estimates that the standards will save about 3.3 quads (quadrillion Btu) of energy over 30 years and yield a net present value of about $14 billion at a 3 percent discount rate.

Update*:* On January 14th 2013, the U.S. Department of Energy (DOE) proposed to settle a lawsuit brought by the American Public Gas Association (APGA) that seeks to roll back gas furnace efficiency standards. As a result, the new standards, completed in 2011 and slated to take effect in May 2013, would be eliminated in favor of yet another round of DOE hearings and studies. Even if DOE completes a new rulemaking in two years, it's unlikely to take effect before 2020.[25]

As a result, each of the furnace measures contains the following language describing the baseline assumption:

"Although the current Federal Standard for gas furnaces is an AFUE rating of 78%, based upon review of available product in the AHRI database, the baseline efficiency for this characterization is assumed to be 80%. The baseline

[25] Appliance Standards Awareness Project, http://www.appliance-standards.org/product/furnaces

will be adjusted when the Federal Standard is updated."

3.4 Glossary

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

Building Types[26]:

Note where a measure installation is within a building or application that does not fit with any of the defined building types below, the user should apply custom assumptions where it is reasonable to estimate them, else the building of best fit should be used.

Building Type	Definition
Assisted Living MultiFamily	Applies to residential buildings of three of more units with staff to assist the occupants. Gross Floor Area should include all fully-enclosed space within the exterior walls of the building(s) including individual rooms or units, wellness centers, exam rooms, community rooms, small shops or service areas for residents and visitors (e.g. hair salons, convenience stores), staff offices, lobbies, atriums, cafeterias, kitchens, storage areas, hallways, basements, stairways, corridors between buildings, and elevator shafts.
Auditorium/Assembly	Applies to any performance space such as a theater, arena, or hall. Gross Floor Area should include all space within the building(s), including seating, stage and backstage areas, food service areas, retail areas, rehearsal studios, administrative/office space, mechanical rooms, storage areas, elevator shafts, and stairwells.
Childcare/Pre-school	Applies to any building providing childcare to pre-kindergarten age children.
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.
Convenience Store	Applies to facility space used for the retail sale of a limited selection of food and beverage products. 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), and administrative areas.
Elementary School	Applies to a school serving children In any grades from Kindergarten through sixth grade. 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.
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. 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.
Healthcare Clinic	Applies to a facility space used to provide diagnosis and treatment for medical, dental, or psychiatric outpatient care. Gross Floor Area should include all space within the building(s) including offices, exam rooms, laboratories, lobbies, atriums, conference rooms and auditoriums, employee break rooms and kitchens, rest rooms, elevator shafts, stairways, mechanical rooms, and storage areas.

[26] Source: US EPA, www.energystar.gov, Space Type Definitions, or definitions as developed through the Technical Advisory Committee.

Building Type	Definition
High School/Middle School	Applies to facility space used as a school building for 7th 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.
Hospital	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. Spaces more accurately characterized as a Healthcare Clinic should use that definition. The definition of Hospital accounts for all space types that are located within the Hospital building/campus, such as medical offices, administrative offices, and skilled nursing. The total floor area should include the aggregate floor area of all buildings on the campus as well as all supporting functions such as: stairways, connecting corridors between buildings, medical offices, exam rooms, laboratories, lobbies, atria, cafeterias, storage areas, elevator shafts, and any space affiliated with emergency medical care, or diagnostic care.
Hotel/Motel Combined (All Spaces)	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. Where distinction between Hotel and Motel is necessary: Hotel: Room entrances and Corridors are located in the *interior* of the building. Corridors are conditioned spaces. Building can be significantly larger in size/height. Motel: Room entrances and Corridors are located on the *exterior* of the building. Corridors are not conditioned spaces. Buildings tend to be two to three stories in height.
Hotel/Motel Common Areas	All the common areas open to guests of the hotel such as the lobby, corridors and stairways, and other spaces that may have continuous or large lighting and HVAC hours.
Hotel/Motel Guest Room	Applies to the guest rooms of the hotel or motel. These spaces are occupied intermittently.
Low-use Small Business	Any business type with low (<3000) operating hours (provided as option in lighting measures).
Manufacturing	Applies to buildings that are dedicated to manufacturing activities. Includes light industry buildings characterized by consumer product and component manufacturing and heavy industry buildings typically characterized by a plant that includes a main production area that has high-ceilings and contains heavy equipment used for assembly line production. These building types may be distinguished by categorizing NAICS (SIC) codes according to the needs of the Program Administrator.
Miscellaneous	Applies to spaces that do not fit clearly within any available categories should be designated as "miscellaneous".
Mobile Home	A mobile home is a prefabricated structure, built in a factory on a permanently attached chassis before being transported to site. Use single family assumptions throughout the TRM unless otherwise specified.
Movie Theater	Applies to buildings used for public or private film screenings. Gross Floor Area should include all space within the building(s), including seating areas, lobbies, concession stands, bathrooms, administrative/office space, mechanical rooms, storage areas,

Building Type	Definition
	elevator shafts, and stairwells.
Multifamily-Mid Rise	Applies to residential buildings with up to four floors, including all public and multiuse spaces within the building envelope. Small Multifamily buildings best described as a house should use the residential measure characterizations.
Multifamily-High Rise Combined (All Spaces)	Applies to residential buildings with five or more floors, including all public and multiuse spaces within the building envelope. Gross Floor Area should include all fully-enclosed space within the exterior walls of the building(s) including living space in each unit (including occupied and unoccupied units), interior common areas (e.g. lobbies, offices, community rooms, common kitchens, fitness rooms, indoor pools), hallways, stairwells, elevator shafts, connecting corridors between buildings, storage areas, and mechanical space such as a boiler room. Open air stairwells, breezeways, and other similar areas that are not fully-enclosed should not be included in the Gross Floor Area.
Multifamily-High Rise Common Areas	All the common areas open to occupants of the building such as the lobby, corridors and stairways, and other spaces that may have continuous or high lighting and HVAC hours.
Multifamily-High Rise Residential Units	Applies to the residential units in the building only.
Office-Low Rise	Applies to facility spaces in buildings with four floors or fewer 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.
Office-Mid Rise	Applies to facility spaces in buildings with five to nine floors 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.
Office-High Rise	Applies to facility spaces in buildings with ten floors or more 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.
Religious Worship/Church	Applies to buildings that are used as places of worship. This includes churches, temples, mosques, synagogues, meetinghouses, or any other buildings that primarily function as a place of religious worship. Gross Floor Area should include all areas inside the building that includes the primary worship area, including food preparation, community rooms, classrooms, and supporting areas such as restrooms, storage areas, hallways, and elevator shafts.
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-Department store	Applies to facility space used to conduct the retail sale of consumer product goods. Stores must be at least 30,000 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: Grocery, Convenience Stores, Automobile Dealerships, and Restaurants.
Retail/Service- Strip Mall	Applies to facility space used to conduct the retail sale of consumer product goods. Stores must less than 30,000 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 excluded under this definition are: Grocery, Convenience Stores,

Building Type	Definition
	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.

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

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

Energy Efficiency: "Energy efficiency" means measures that reduce the amount of electricity or natural gas consumed in order to achieve a given end use. "Energy efficiency" includes voltage optimization measures that optimize the voltage at points on the electric distribution voltage system and thereby reduce electricity consumption by electric customers' end use devices. "Energy efficiency" also includes measures that reduce the total Btus of electricity, natural gas and other fuels needed to meet the end use or uses (20 ILCS 3855/1-10). For purposes of this Section, "energy efficiency" means measures that reduce the amount of energy required to achieve a given end use. "Energy efficiency" also includes measures that reduce the total Btus of electricity and natural gas needed to meet the end use or uses (220 ILCS 5/8-104(b)).

Equivalent Full Load Hours (EFLH): 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) or therms.

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).

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

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. See Section 3.8 Measure Incremental Cost Definition for full definition.

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

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 2.4 for a list of program descriptions that are presently operating in Illinois.

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

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 ICC to work with the SAG on the development of a statewide TRM.

Table 3.1: 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	2,181	Chicago O'Hare AP / Chicago
3	4,379	1,108	3,406	2,666	Springfield #2 / Springfield
4	3,378	1,570	2,515	3,358	Belleville SIU RSCH / Belleville
5	3,438	1,370	2,546	3,090	Carbondale Southern IL AP / Marion
Average	4,860	947	3,812	2,362	Weighted by occupied housing units

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

	Residential		C&I		
Zone	HDD	CDD	HDD	CDD	Weather Station / City
Base Temp	60F	65F	55F	55F	Year climate normals, 1981-2010

3.5 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 3.2: On and Off Peak Energy Definitions

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

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

1. Itron eShapes data for Missouri, provided by Ameren and reconciled to Illinois loads, 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.
3. Loadshapes have also been developed from primary research studies conducted in Illinois or other jurisdictions if robust datasets were available to support hourly analysis of end use consumption.

The following pages provide the loadshape values for most measures provided in the TRM[29]. The source of the loadshape is also provided.

ComEd uses 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 VEIC SharePoint site, and is publicly accessible through the Stakeholder Advisory Group's web site. http://www.ilsag.info/technical-reference-manual.html
http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Residential_Loadshapes_References.zip
http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Commercial_Loadshapes_References.zip
http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_3/Final_Draft/Sources%20and%20References%20-%20Loadshapes/TRM_Version_3_Loadshapes_2.24.zip
http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/2018_Loadshape_Files.zip

Table 3.3: 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	Loadshape Source
Residential Clothes Washer	R01	47.0%	11.1%	34.0%	8.0%	Itron eShapes
Residential Dish Washer	R02	49.3%	8.7%	35.7%	6.3%	Itron eShapes
Residential Electric DHW	R03	43.2%	20.6%	24.5%	11.7%	Itron eShapes
Residential Freezer	R04	38.9%	16.4%	31.5%	13.2%	Itron eShapes
Residential Refrigerator	R05	37.0%	18.1%	30.1%	14.7%	Itron eShapes
Residential Indoor Lighting	R06	35.1%	26.1%	22.0%	16.8%	Opinion Dynamics IL Metering Study[30]
Residential Outdoor Lighting	R07	18.0%	44.1%	9.4%	28.4%	Efficiency Vermont
Residential Cooling	R08	4.1%	0.7%	71.3%	23.9%	Itron eShapes
Residential Electric Space Heat	R09	57.8%	38.8%	1.7%	1.7%	Itron eShapes
Residential Electric Heating and Cooling	R10	35.2%	22.8%	31.0%	11.0%	Itron eShapes
Residential Ventilation	R11	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Residential - Dehumidifier	R12	12.9%	16.2%	31.7%	39.2%	Efficiency Vermont
Residential Standby Losses - Entertainment Center	R13	26.0%	32.5%	18.9%	22.6%	Efficiency Vermont
Residential Standby Losses - Home Office	R14	23.9%	34.6%	17.0%	24.5%	Efficiency Vermont
Residential Pool Pumps	R15	0%	0%	58.9%	41.1%	Efficiency Vermont
Residential Holiday String Lighting	R16	43.1%	56.9%	0%	0%	Estimate[31]
Commercial Electric Cooking	C01	40.6%	18.2%	28.7%	12.6%	Itron eShapes
Commercial Electric DHW	C02	40.5%	18.2%	28.5%	12.8%	Itron eShapes
Commercial Cooling	C03	4.9%	0.8%	66.4%	27.9%	Itron eShapes
Commercial Electric Heating	C04	53.5%	43.2%	1.9%	1.4%	Itron eShapes
Commercial Electric Heating and Cooling	C05	19.4%	13.5%	47.1%	19.9%	Itron eShapes
Commercial Indoor Lighting	C06	30.1%	27.5%	22.8%	19.7%	Navigant EmPOWER study[32]

[30] See 'IL Res Indoor LED Lighting Load Shape_2018-06-06' and 'IL Res Indoor LED Lighting Load Shape Development Methodology_2018-05-18' for details.
[31] Based on average of Residential Indoor and Outdoor lighting winter usage only.
[32] See '3.5 Electrical Load Shapes_Il TRM Workpapre_CI_Ltg_2018-06-28' and 'IL Commercial Lighting Load Shape Development Methodology_2018-06-28' for

		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	Loadshape Source
Grocery/Conv. Store Indoor Lighting	C07	28.0%	30.2%	20.3%	21.5%	Navigant EmPOWER study
Health Indoor Lighting	C08	29.1%	28.9%	21.6%	20.3%	Navigant EmPOWER study
Office Indoor Lighting	C09	29.9%	28.2%	22.3%	19.6%	Navigant EmPOWER study
Restaurant Indoor Lighting	C10	32.1%	25.7%	23.4%	18.8%	Efficiency Vermont
Retail Indoor Lighting	C11	32.6%	25.4%	24.2%	17.9%	Navigant EmPOWER study
Warehouse Indoor Lighting	C12	26.0%	29.0%	22.4%	22.6%	Navigant EmPOWER study
Education Indoor Lighting	C13	34.7%	26.2%	23.6%	15.5%	Navigant EmPOWER study
Indust. 1-shift (8/5) (e.g., comp. air, lights)	C14	50.5%	7.2%	37.0%	5.3%	Efficiency Vermont
Indust. 2-shift (16/5) (e.g., comp. air, lights)	C15	47.5%	10.2%	34.8%	7.4%	Efficiency Vermont
Indust. 3-shift (24/5) (e.g., comp. air, lights)	C16	34.8%	23.2%	25.5%	16.6%	Efficiency Vermont
Indust. 4-shift (24/7) (e.g., comp. air, lights)	C17	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Industrial Indoor Lighting	C18	44.3%	13.6%	32.4%	9.8%	Efficiency Vermont
Industrial Outdoor Lighting	C19	18.0%	44.1%	9.4%	28.4%	Efficiency Vermont
Commercial Outdoor Lighting	C20	16.8%	44.6%	9.3%	29.3%	Navigant EmPOWER study
Commercial Office Equipment	C21	37.7%	20.9%	26.7%	14.7%	Itron eShapes
Commercial Refrigeration	C22	38.5%	20.6%	26.7%	14.2%	Itron eShapes
Commercial Ventilation	C23	38.1%	20.6%	29.7%	11.6%	Itron eShapes
Traffic Signal - Red Balls, always changing or flashing	C24	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - Red Balls, changing day, off night	C25	37.0%	20.9%	27.1%	14.9%	Efficiency Vermont
Traffic Signal - Green Balls, always changing	C26	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - Green Balls, changing day, off night	C27	37.0%	20.9%	27.1%	14.9%	Efficiency Vermont
Traffic Signal - Red Arrows	C28	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - Green Arrows	C29	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - Flashing Yellows	C30	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - “Hand” Don’t Walk Signal	C31	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - “Man” Walk Signal	C32	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Traffic Signal - Bi-Modal Walk/Don’t Walk	C33	25.8%	32.3%	18.9%	23.0%	Efficiency Vermont
Industrial Motor	C34	47.5%	10.2%	34.8%	7.4%	Efficiency Vermont

details.

		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	Loadshape Source
Industrial Process	C35	47.5%	10.2%	34.8%	7.4%	Efficiency Vermont
HVAC Pump Motor (heating)	C36	38.7%	48.6%	5.9%	6.8%	Efficiency Vermont
HVAC Pump Motor (cooling)	C37	7.8%	9.8%	36.8%	45.6%	Efficiency Vermont
HVAC Pump Motor (unknown use)	C38	23.2%	29.2%	21.4%	26.2%	Efficiency Vermont
VFD - Supply fans <10 HP	C39	38.8%	16.1%	28.4%	16.7%	Efficiency Vermont
VFD - Return fans <10 HP	C40	38.8%	16.1%	28.4%	16.7%	Efficiency Vermont
VFD - Exhaust fans <10 HP	C41	34.8%	23.2%	20.3%	21.7%	Efficiency Vermont
VFD - Boiler feedwater pumps <10 HP	C42	42.9%	44.2%	6.6%	6.3%	Efficiency Vermont
VFD - Chilled water pumps <10 HP	C43	11.2%	5.5%	40.7%	42.6%	Efficiency Vermont
VFD Boiler circulation pumps <10 HP	C44	42.9%	44.2%	6.6%	6.3%	Efficiency Vermont
Refrigeration Economizer	C45	36.3%	50.8%	5.6%	7.3%	Efficiency Vermont
Evaporator Fan Control	C46	24.0%	35.9%	16.7%	23.4%	Efficiency Vermont
Standby Losses - Commercial Office	C47	8.2%	50.5%	5.6%	35.7%	Efficiency Vermont
VFD Boiler draft fans <10 HP	C48	37.3%	48.9%	6.4%	7.3%	Efficiency Vermont
VFD Cooling Tower Fans <10 HP	C49	7.9%	5.2%	54.0%	32.9%	Efficiency Vermont
Engine Block Heater Timer	C50	26.5%	61.0%	4.1%	8.5%	Efficiency Vermont
Door Heater Control	C51	30.4%	69.6%	0.0%	0.0%	Efficiency Vermont
Beverage and Snack Machine Controls	C52	10.0%	48.3%	7.4%	34.3%	Efficiency Vermont
Flat	C53	36.3%	21.8%	26.2%	15.7%	Itron eShapes
Religious Indoor Lighting	C54	26.8%	31.4%	18.9%	22.8%	Efficiency Vermont
Commercial Clothes Washer	C55	47.0%	11.1%	34.0%	8.0%	Itron eShapes[33]

[33] Assumed equal to R01 Residential Clothes Washer loadshape.

Table 3.4: 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	5.9%	2.7%	5.7%	2.2%	6.5%	2.2%	5.5%	2.7%	5.8%	2.5%	5.1%	1.9%	4.8%	2.4%	5.6%	2.0%	5.9%	3.0%	6.6%	2.7%	6.4%	2.8%	5.9%	3.3%
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																									
Residential Holiday String Lighting	R16	9%	11%	2%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	3%	9%	11%	22%	28%
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	5.5%	2.8%	5.2%	2.3%	6.2%	2.2%	5.4%	2.7%	6.1%	2.4%	6.2%	2.3%	5.5%	3.0%	6.5%	2.2%	5.5%	2.7%	5.9%	2.5%	5.7%	2.5%	5.4%	3.1%
Grocery/Conv. Store Indoor Lighting	C07	5.7%	2.8%	5.5%	2.2%	6.3%	2.2%	5.5%	2.8%	6.0%	2.5%	6.0%	2.2%	5.4%	3.0%	6.3%	2.2%	5.5%	2.8%	6.0%	2.5%	5.7%	2.5%	5.5%	3.0%
Health Indoor Lighting	C08	5.4%	2.9%	5.3%	2.4%	6.4%	2.2%	5.5%	2.7%	6.0%	2.4%	6.0%	2.1%	5.5%	3.0%	6.4%	2.3%	5.5%	2.7%	6.0%	2.4%	5.8%	2.4%	5.2%	3.3%
Office Indoor Lighting	C09	5.2%	3.0%	5.1%	2.6%	6.3%	2.4%	5.3%	3.0%	5.7%	2.6%	6.0%	2.4%	5.3%	3.2%	6.3%	2.3%	5.2%	2.9%	5.5%	2.7%	5.5%	2.8%	5.2%	3.3%
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	5.6%	2.8%	5.4%	2.3%	6.3%	2.3%	5.5%	2.8%	6.0%	2.5%	6.0%	2.2%	5.4%	3.0%	6.4%	2.3%	5.5%	2.7%	5.9%	2.5%	5.7%	2.5%	5.5%	3.1%
Warehouse Indoor Lighting	C12	5.4%	2.8%	4.7%	2.1%	5.8%	1.9%	5.0%	2.3%	6.5%	2.3%	7.1%	2.2%	6.2%	2.8%	7.3%	2.2%	5.8%	2.6%	6.0%	2.3%	5.9%	2.4%	5.3%	3.2%
Education	C13	5.1%	2.8%	5.7%	3.3%	7.8%	1.9%	6.9%	2.5%	7.2%	2.1%	5.5%	1.6%	4.2%	1.7%	6.4%	1.6%	6.3%	2.4%	6.6%	2.1%	6.2%	2.1%	4.9%	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
Indoor Lighting																									
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	6.1%	3.2%	6.3%	2.5%	6.8%	2.4%	5.3%	2.7%	5.8%	2.4%	5.2%	1.9%	4.8%	2.6%	5.8%	2.0%	5.5%	2.7%	6.0%	2.5%	5.8%	2.5%	6.0%	3.4%
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%

		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
		M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S	M-F	S-S
Traffic Signal - Red Balls, changing day, off night	C25	5.5%	2.9%	4.9%	2.8%	5.2%	3.3%	5.3%	2.9%	5.5%	3.0%	5.2%	3.1%	5.7%	2.8%	5.4%	3.1%	5.3%	3.0%	5.5%	2.9%	5.1%	3.1%	5.4%	3.0%
Traffic Signal - Green Balls, always changing	C26	3.8%	4.6%	3.4%	4.3%	3.6%	5.1%	3.7%	4.4%	3.8%	4.6%	3.6%	4.7%	3.9%	4.3%	3.8%	4.8%	3.7%	4.6%	3.9%	4.4%	3.6%	4.8%	3.8%	4.7%
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%

		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
HVAC Pump Motor (unknown use)	C38	3.4%	4.1%	3.1%	3.9%	3.3%	4.6%	3.3%	4.0%	4.4%	5.2%	4.1%	5.4%	4.5%	4.9%	4.3%	5.5%	4.2%	5.2%	3.5%	4.0%	3.2%	4.4%	3.4%	4.2%
VFD - Supply fans <10 HP	C39	5.7%	2.3%	5.2%	2.1%	5.5%	2.5%	5.6%	2.2%	5.8%	3.3%	5.5%	3.4%	5.9%	3.1%	5.7%	3.5%	5.5%	3.3%	5.8%	2.2%	5.4%	2.4%	5.7%	2.3%
VFD - Return fans <10 HP	C40	5.7%	2.3%	5.2%	2.1%	5.5%	2.5%	5.6%	2.2%	5.8%	3.3%	5.5%	3.4%	5.9%	3.1%	5.7%	3.5%	5.5%	3.3%	5.8%	2.2%	5.4%	2.4%	5.7%	2.3%
VFD - Exhaust fans <10 HP	C41	5.1%	3.3%	4.6%	3.1%	4.9%	3.7%	5.0%	3.2%	4.1%	4.3%	3.9%	4.4%	4.2%	4.1%	4.1%	4.6%	4.0%	4.3%	5.2%	3.2%	4.8%	3.5%	5.1%	3.4%
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 %

		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
Beverage and Snack Machine Controls	C52	1.5%	6.8%	1.3%	6.4%	1.4%	7.6%	1.4%	6.6%	1.5%	6.8%	1.4%	7.0%	1.5%	6.4%	1.5%	7.2%	1.4%	6.8%	1.5%	6.6%	1.4%	7.2%	1.5%	7.0%
Flat	C53	5.4%	3.1%	4.8%	2.9%	5.1%	3.4%	5.2%	3.0%	5.3%	3.1%	5.0%	3.2%	5.5%	2.9%	5.2%	3.3%	5.1%	3.1%	5.4%	3.0%	5.0%	3.3%	5.3%	3.2%
Religious Indoor Lighting	C54	4.0%	4.4%	3.6%	4.2%	3.8%	5.0%	3.8%	4.3%	3.9%	4.5%	3.6%	4.7%	3.9%	4.3%	3.8%	4.8%	3.7%	4.5%	4.0%	4.3%	3.7%	4.7%	3.9%	4.6%
Commercial Clothes Washer	C55	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%

3.6 Summer Peak Period Definition (kW)

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

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

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

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

3.7 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[34] 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[35]. Residential cooling is based on 65F in agreement with a field study in Wisconsin[36]. 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[37]. Custom degree-days with building-specific base temperatures are recommended for large C&I projects.

Table 3.5: 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

[34] 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.
[35] Belzer and Cort, Pacific Northwest National Laboratory in "Statistical Analysis of Historical State-Level Residential Energy Consumption Trends," 2004.
[36] Energy Center of Wisconsin, May 2008 metering study; "Central Air Conditioning in Wisconsin, A Compilation of Recent Field Research", p. 32 (amended in 2010).
[37] This value is based upon experience, and it is preferable to use building-specific base temperatures when available.

	Residential		C&I		
Zone	HDD	CDD	HDD	CDD	Weather Station / City
4	3,378	1,570	2,515	3,090	Belleville SIU RSCH / Belleville
5	3,438	1,370	2,546	2,182	Carbondale Southern IL AP / Marion
Average	4,860	947	3,812	3,051	Weighted by occupied housing units
Base Temp	60F	65F	55F	55F	30 year climate normals, 1981-2010

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. In addition, an Excel file containing all Illinois Zip Codes with the corresponding Heating and Cooling Degree-day zones is provided on the SharePoint site within the 'TRM Reference Documents' section.

Figure 3.1: Cooling Degree-Day Zones by County

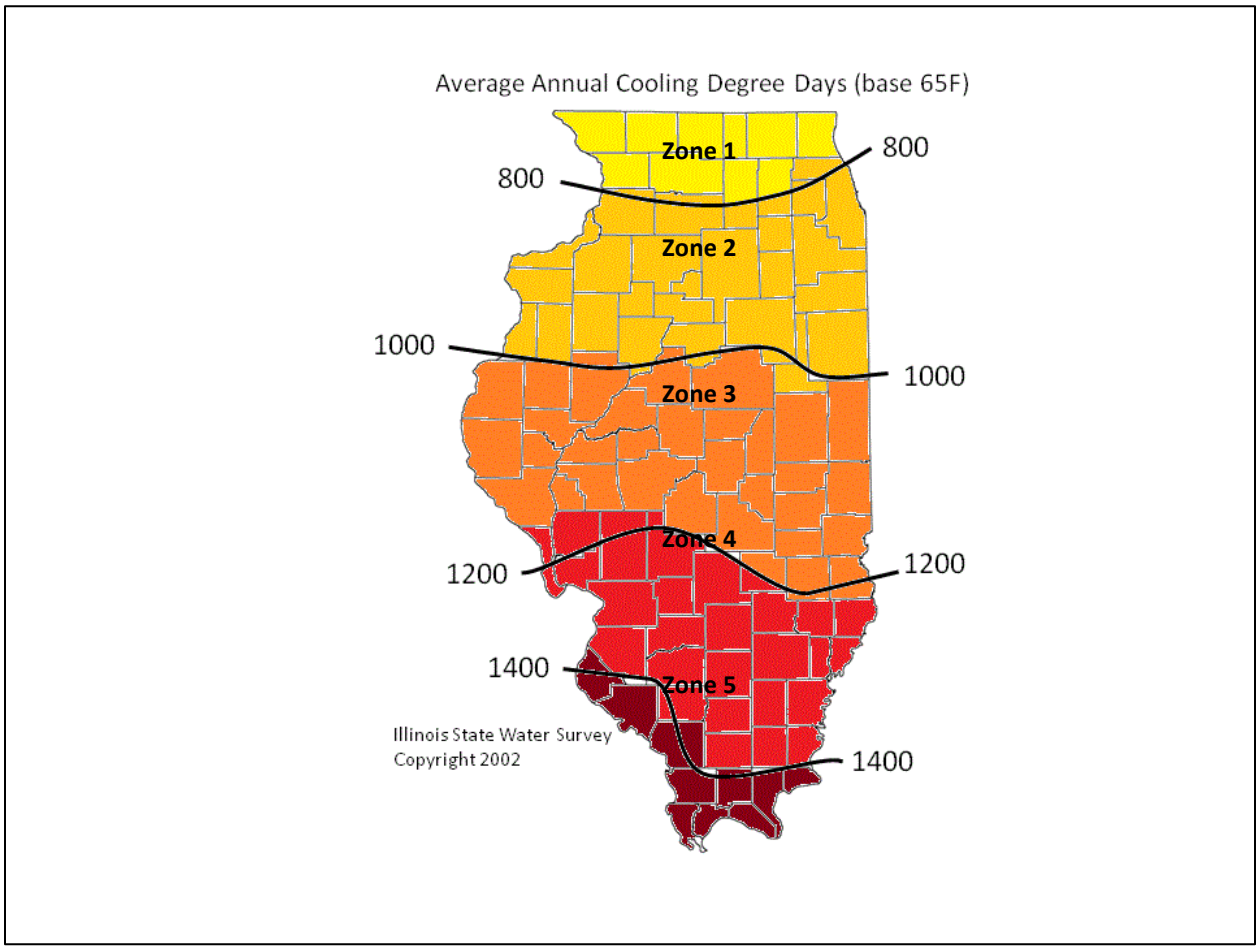

Figure 3.2: Heating Degree-Day Zones by County

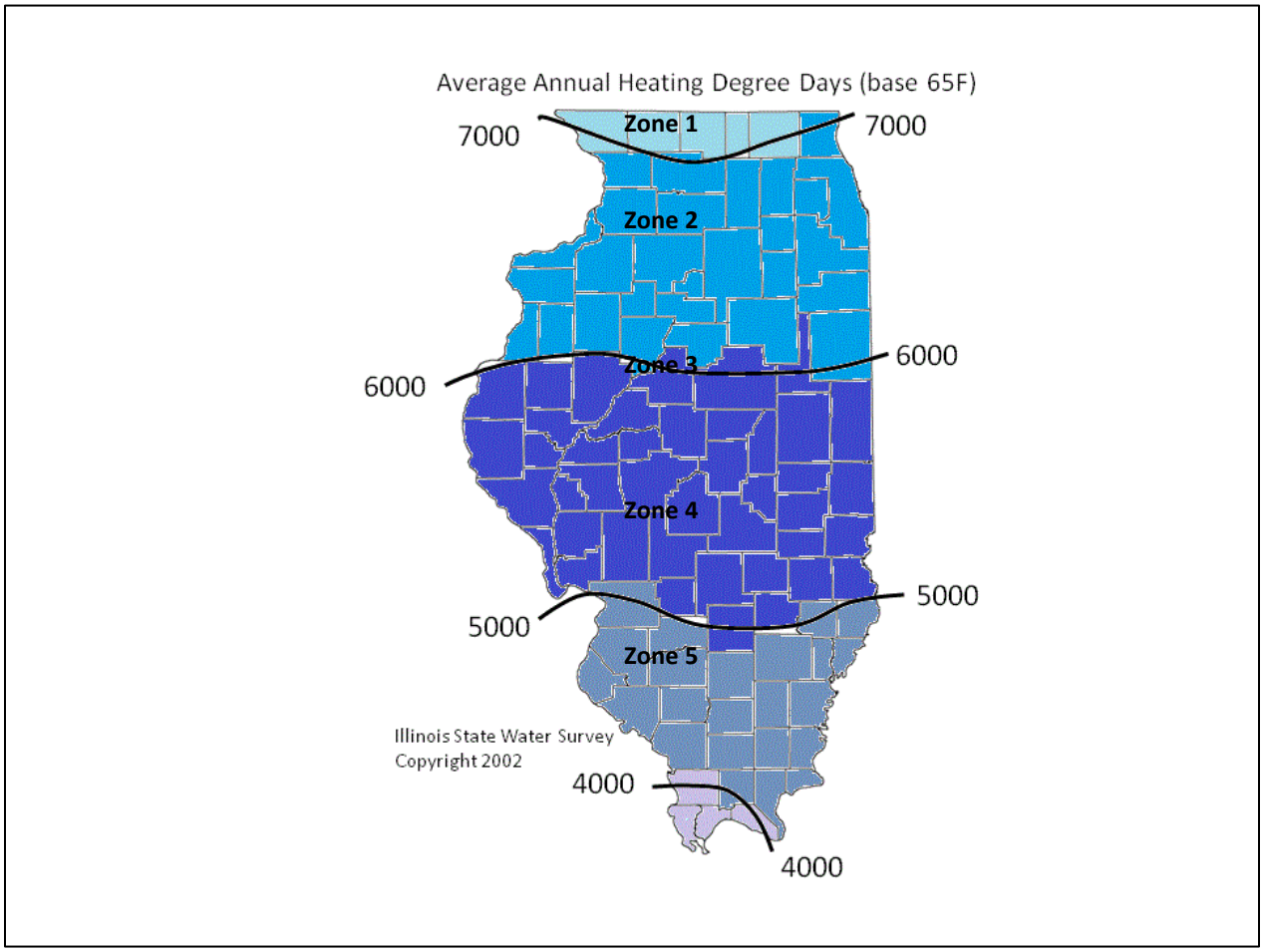

Table 3.6: Heating Degree-Day Zones by County

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Boone County	Bureau County	Adams County	Clinton County	Alexander County
Jo Daviess County	Carroll 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	

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	McHenry County	Fulton County	St. Clair County	
	Mercer County	Greene County	Wabash County	
	Ogle County	Hancock County	Washington County	
	Peoria County	Jasper County	Wayne County	
	Putnam County	Jersey County	White County	
	Rock Island County	Logan County	Williamson County	
	Stark County	Macon County		
	Warren County	Macoupin County		
	Whiteside County	Mason County		
	Will County	McDonough County		
	Woodford County	McLean County		
		Menard County		
		Montgomery		
		Morgan County		
		Moultrie County		
		Piatt County		
		Pike County		
		Sangamon County		
		Schuyler County		
		Scott County		
		Shelby County		
		Tazewell County		
		Vermilion County		

Table 3.7: Cooling Degree-day Zones by County

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

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	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		

3.8 Measure Incremental Cost Definition

Incremental Costs means the difference between the cost of the efficient Measure and the cost of the most relevant baseline measure that would have been installed (if any) in the absence of the efficiency Program. Installation costs (material and labor) and Operations and Maintenance (O&M) costs shall be included if there is a difference between the efficient Measure and the baseline measure. In cases where the efficient Measure has a significantly shorter or longer life than the relevant baseline measure (e.g., LEDs versus halogens), the avoided baseline replacement measure costs should be accounted for in the TRC analysis. The Customer's value of service lost, the Customer's value of their lost amenity, and the Customer's transaction costs shall be included in the TRC analysis where a reasonable estimate or proxy of such costs can be easily obtained (e.g., Program Administrator payment to a Customer to reduce load during a demand response event, Program Administrator payment to a Customer as an inducement to give up duplicative functioning equipment). This Incremental Cost input in the TRC analysis is not reduced by the amount of any Incentives (any Financial Incentives Paid to Customers or Incentives Paid to Third Parties by a Program Administrator that is intended to reduce the price of the efficient Measure to the Customer). Incremental Cost calculations will vary depending on the type of efficient Measure being implemented, as outlined in the examples provided below and as set forth in the IL-TRM.

Examples of Incremental Cost calculations include:

a. The Incremental Cost for an efficient Measure that is installed in new construction or is being purchased at the time of natural installation, investment, or replacement is the additional cost incurred to purchase an efficient Measure over and above the cost of the baseline/standard (i.e., less efficient) measure (including any incremental installation, replacement, or O&M costs if there is a difference between the efficient Measure and baseline measure).

b. For a retrofit Measure where the efficiency Program caused the Customer to update their existing equipment, facility, or processes (e.g., air sealing, insulation, tank wrap, controls), where the Customer would not have otherwise made a purchase, the appropriate baseline is zero expenditure, and the Incremental Cost is the full cost of the new retrofit Measure (including installation costs).

c. For the early replacement of a functioning measure with a new efficient Measure, where the Customer would not have otherwise made a purchase for a number of years, the appropriate baseline is a dual baseline that begins as the existing measure and shifts to the new standard measure after the expected remaining useful life of the existing measure ends. Thus, the Incremental Cost is the full cost of the new efficient Measure (including installation costs) being purchased to replace a still-functioning measure less the present value of the assumed deferred replacement cost of replacing the existing measure with a new baseline measure at the end of the existing measure's life (described in section 3.9). This deferred credit may not be necessary when the lifetime of the measure is short, the costs are very low, or for other reasons (e.g., certain Direct Install Measures, Measures provided in Kits to Customers).

d. For study-based services (e.g., facility energy audits, energy surveys, energy assessments, retro-commissioning) that are truly necessary for a Customer to implement efficient Measures, as opposed to being principally intended to be a form of marketing, the Incremental Cost is the full cost of the study-based service. Even if the study-based service is performed entirely by a Program Administrator's implementation contractor, the full cost of the study-based service charged by the implementation contractor is the Incremental Cost, because this is assumed to be the cost of the study-based service that would have been incurred by the Customer if the Customer were to have the study-based service performed in the absence of the efficiency Program. If the Customer implements efficient Measures as a result of the study-based service provided by the efficiency Program, the Incremental Cost for those efficient Measures should also be classified as Incremental Costs in the TRC analysis.

e. For the early retirement of duplicative functioning equipment before its expected life is over (e.g., appliance recycling Programs), the Incremental Costs are composed of the Customer's value placed on their lost amenity, any Customer transaction costs, and the pickup and recycling cost. The Incremental Costs include the actual cost of the pickup and recycling of the equipment (often paid for by a Program Administrator to an implementation contractor) because this is assumed to be the cost of recycling the equipment that would have been incurred by the Customer if the Customer were to recycle the equipment on their own in the absence of the efficiency Program. The payment a Program Administrator makes to the Customer serves as a proxy for the value the Customer places on their lost amenity and any Customer transaction costs.

3.9 Discount Rates, Inflation Rates, and O&M Costs

The Illinois Utilities use screening tools that apply an appropriate discount rate to any future costs or benefits. The societal discount rate, required for use by all electric utilities, is defined as a nominal discount rate of 2.38%, or a real (inflation-adjusted) discount rate of 0.46%[38].

Where a future cost is provided within the TRM (e.g., in early replacement measures where a deferred baseline replacement cost is provided) and the future cost has been adjusted using an inflation rate (based upon the 20-year Treasury yield of 1.91%[39]), the nominal discount rate should be used to discount to the present value. Where future costs have not been adjusted for inflation, the real discount rate should be used to discount to present value.

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. For most measures 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:

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 real discount rate.

For a select few measures that include baseline shifts that result in multiple component costs and lifetimes over the lifetime of the measure, this standard method cannot be used. 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 real societal discount rate of 0.46%.

3.10 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,

[38] Based on the current 10 year Treasury bond yield rates, as of January 2017. The 10 year rates are used to be consistent with the average measure life of the measures specified within this TRM.

[39] Established for use in the TRM in late 2015.

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[40]. For instance, waste heat factors are included in the lighting characterizations to capture the interaction between more-efficient lighting measures and the amount of heating and/or cooling that is subsequently needed in the building.

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

[40] For more information, please refer to the document, "Dealing with interactive Effects During Measure Characterization" Memo to the Stakeholder Advisory Group dated 12/13/11.
http://portal.veic.org/projects/illinoistrm/Shared%20Documents/Memos/Interactive_Effects_Memo_121311.docx