
MEMORANDUM

TO: IL TRM TECHNICAL ADVISORY COMMITTEE

FROM: KALEE WHITEHOUSE, PROJECT MANAGER and SAM DENT, TECHNICAL LEAD - VEIC

SUBJECT: IL TRM VERSION 10.0 DRAFT 3 FINAL - SUMMARY

DATE: 09/24/2021

Cc: CELIA JOHNSON, SAG

VEIC has submitted the Final version 10.0 Illinois TRM to the Technical Advisory Committee and uploaded to SharePoint. This draft includes both proposed redline changes to existing measures and new measures (also in redline) proposed to be included for the first time in this version. Changes have been made to all four volumes:

- IL-TRM_Effective_010122_v10.0_Vol_1_Overview_09242021_FINAL
- IL-TRM_Effective_010122_v10.0_Vol_2_C_and_I_09242021_FINAL
- IL-TRM_Effective_010122_v10.0_Vol_3_Res_09242021_FINAL
- IL-TRM_Effective_010122_v10.0_Vol_4_X-Cutting_Measures_and_Attach_09242021_FINAL

VEIC have also provided on SharePoint:

- A Excel file titled 'IL Comment Matrix_09242021' containing all comments received from Deliverable 1, 2 and Almost Final, together with VEIC response and outcome.
- A Final errata memo documenting approved changes to Version 9.0, effective 1/1/2021.

Presented below are two summary tables. The first provides the measures that have been edited or added, with a brief description of what has changed, whether it is being considered an errata, and a link to the corresponding SharePoint Tracker Item(s). Highlighted in red are changes made since the last deliverable. The second table provides a list of those tracker items that have not resulted in a change.

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
Volume 1 – Overview and User Guide				
1.1 1.3	Acknowledgements Enabling ICC Policy	N	Updating Itron company name to Verdant.	N/A
1.3.1	Climate and Equitable Jobs Act (SB2408)	N	Addition of new temporary section to add language reviewed during 9/21 TAC call, stating that any further changes stemming from the Climate and Equitable Jobs Act, signed on September 15, 2021, will be treated as an errata for v10 and applied retroactively from 1/1/2022.	N/A
1.4	Development Process	N	ICC Docket Numbers for Version 9 and 10 are not yet provided. Minor edits. Addition of cumulative persisting annual savings (CPAS) as outcome of TRM assumptions.	N/A
3.2	General Savings Assumptions	N	Update to measure life definition to be in line with Glossary definition. Minor edits.	Clarifications and Updates to Descriptions of Applicable Coincidence Factors
3.3.3	Furnace Baseline	N	Update to future furnace baseline assumption based on language in 2021 Final Interpretive Rule (“2021-01-15 Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters; Notification of final interpretive rule”)	N/A
3.6	Electric Loadshape	N	Removal of language re ComEd using DSMore software. Removal of ‘Table 3.4 Loadshapes by Month and Day of Week’ as we understand these are no longer required by any party.	Clarifications and Updates to Descriptions of Applicable Coincidence Factors
3.7	Summer Peak Period Definition (kW)	N	Updates to language and definition of “utility’s peak hour” provided.	Clarifications and Updates to Descriptions of Applicable Coincidence Factors
Volume 2 – Commercial and Industrial Measures				
4.1.11	Commercial LED Grow Light	N	Update to Design Lights Consortium (DLC) horticultural version 2.1 specifications. No efficacy increase within the requirements, however range of eligible product is increased.	LED Grow Lights - DLC v2.0 Horticultural Specifications
4.1.13	Irrigation Pump VFD	N	New measure	Variable Frequency Drives for Irrigation Pumps - Golf Courses Measure

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
4.1.14	High Efficiency Grain Dryer	N	New measure Removal of “Heater_EfficiencyElectric” term as built into dryer efficiency. Other minor edits.	Grain Dryer Measure
4.1.15	Grain Dryer Tune-Up	N	New measure Added kWh savings example.	Grain Dryer Tune Up
4.1.16	Greenhouse Boiler Tune-Up	N	New measure	Greenhouse Boiler Tune Up
4.1.17	Greenhouse Thermal Curtains	N	New measure Added clarification on floor space area.	Greenhouse Heat Curtains
4.1.18	Infrared Film for Greenhouse	N	New measure Added clarification on floor space area.	Infrared Film for Greenhouse
4.1.19	ENERGY STAR Dairy Water Heater	N	New measure	ENERGY STAR Dairy Water Heater
4.2.6	ENERGY STAR Dishwasher	N	Updates to ENERGY STAR specification and associated deemed assumptions. Updates to cost assumptions Removal of Cook County distinction for secondary water savings.	New Commercial Dishwasher ESTAR specification
4.2.7	ENERGY STAR Fryer	N	Reliability Review. Updated costs, added Preheat Energy to Electric & Gas Savings algorithms, updated idle energy rate for baseline electric fryers.	N/A
4.2.10	Ice Maker	N	CEE T2 specifications have been removed as they have not been updated since the federal standard and ENERGY STAR update. An update to the CEE T2 spec is expected in 2021 and so we have set the review deadline to 1/1/2023 for review next year.	N/A
4.2.11	High Efficiency Pre-Rinse Spray Valve	N	Inclusion of ISR for kits. Update to supply water temperature assumption. Removal of Cook County distinction for secondary water savings.	C&I Kit ISR Defaults
4.2.13	Rotisserie Oven	N	Removal of “Infrared” from measure title, and opened up to allow other design approaches that combine radiative heat exchangers and convection heating.	Modify Infrared Rotisserie Oven Eligibility Criteria
4.2.19	ENERGY STAR Electric Convection Oven	N	Reliability Review. Updated costs. Updated assumptions based on size (1/2 or full oven), based on ENERGY STAR	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			Commercial Kitchen calculator updates and data from the Regional Technical Forum for the Northwest Council (RTF NW).	
4.2.20	Efficient Dipper Wells	N	Clarification that secondary kWh savings should not be included in TRC tests. Removal of Cook County distinction for secondary water savings.	v10 typo fixes
4.2.21	On-Demand Package Sealers – Provisional Measure	N	New measure. Propose making Provisional as key Energy Savings Factor assumption is awaiting data to finalize value.	On Demand Package Sealer
4.3.1	Water Heater	Y	Fix error in large (>12kW) electric unit standby loss calculation. Example calculations updated.	Fix error in algorithm for large electric water heaters
		N	Addition of heat pump water heater Clarification added relating to baseline for >55 gallon HPWHs. Update to supply water temperature assumption.	
4.3.2	Low Flow Faucet Aerators	N	Addition of unknown %ElectricDHW assumption. Addition of ISR for kits. Update to supply water temperature assumption. Removal of Cook County distinction for secondary water savings.	Add Fuel Split Guidance for C&I Faucet Aerators C&I Kit ISR Defaults
4.3.3	Low Flow Faucet Showerheads	N	Reliability Review. Addition of ISR for kits and guided/virtual install. Clarification added that ISR is specific only for self install after virtual assessment. Update to supply water temperature assumption. Removal of Cook County distinction for secondary water savings.	C&I Kit ISR Defaults Virtual-Assessment with Self-Installation Measure ISRs
4.3.6	Ozone Laundry	N	Removal of Cook County distinction for secondary water savings.	N/A
4.3.7	Multifamily Central Domestic Hot Water Plants	N	Update to supply water temperature assumption.	N/A
4.3.8	Controls for Central Domestic Hot Water	N	Updates to measure costs. Updates to deemed measure. Addition of hotel/motel building type assumptions. Clarification that capacity assumptions are per guest room.	4.3.8 Controls for Central Domestic Hot Water

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
4.3.12	Tank Insulation	N	Updates to Thermal Regain Factor assumptions including allowing custom determination, assumptions for annual use and defaults for location not specified.	Refine the guidance for Pipe Insulation Thermal Regain Factors
4.4	HVAC End Use	Y	Fix of existing building Heating and Cooling EFLH for 'Office - High Rise - CAV econ'.	N/A
		N	Addition of Greenhouse with and without curtain building type for use with measures such as Modulating Boiler Controls and Boiler Oxygen Trim Controls.	Greenhouse Modulating Boiler Control Greenhouse Boiler O2 Trim Control
4.4.5	Condensing Unit Heaters	N	Reliability Review. Updated methodology to be algorithmic instead of deemed.	N/A
4.4.7	ENERGY STAR and CEE Super Efficient Room Air Conditioner	N	Reliability Review. Hours of use updated to be consistent with other commercial AC measures.	N/A
4.4.8	Guest Room Energy Management (PTAC and PTHP)	N	Reliability Review. No changes recommended.	N/A
4.4.9	Air and Water Source Heat Pump Systems	N	Reliability Review. Early replacement and fuel switch assumptions added, consistent with other measures. Additional language added reflecting that the unknown baseline for Time of Sale should be based upon EM&V. Variables for Hgrid split in to LifetimeHgrid, FirstYearHgrid, PostAdjHgrid and algorithms set out appropriately. Algorithms adjusted to reflect Climate and Equitable Jobs Act instruction to base calculations at site. IECC 2012 code baseline assumptions for new construction removed. Update to measure life. After discussion at TAC, GasSystemDistribution Loss value set to 0% with footnote indicating this will continue to be discussed for v11.	N/A
4.4.10	High Efficiency Boiler	N	Update to residential-sized gas fired hot water boiler federal standard. Measure costs updated to be consistent with 4.4.54.	Residential sized Boiler Federal Standard update (Commercial measure)

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
4.4.11	High Efficiency Furnace	N	Reliability Review. Addition of assumptions for >225,000 Btu units. Electric fan savings only for Residential sized early replacement scenarios. Costs updated.	N/A
4.4.13	Package Terminal Air Conditioner (PTAC) and Package Terminal Heat Pump (PTHP)	N	Reliability Review. Updates to assumptions of existing unit efficiency. Clarification of Standard v Non-standard size assumptions IECC 2012 code baseline assumptions for new construction removed.	N/A
4.4.14	Pipe Insulation	N	Updates to Thermal Regain Factor assumptions including allowing custom determination, assumptions for annual use and defaults for location not specified. Value for "Location no specified – Commercial" corrected.	Refine the guidance for Pipe Insulation Thermal Regain Factors
4.4.15	Single-Package and Split System Unitary Air Conditioners	N	Reliability Review. IECC 2012 code baseline assumptions for new construction removed. Review deadline set to next year to discuss upcoming Federal Standards.	N/A
4.4.16	Steam Trap Replacement or Repair	Y	Fix error in Sa calculation for low pressure steam systems. The variable D should be squared.	N/A
4.4.19	Demand Control Ventilation	N	Clarification that the measure does not apply to packaged single-zone rooftop units with functioning economizers – use 4.4.41 Advanced Rooftop Controls for this scenario.	Review overlap between DCV and ARC measures
4.4.21	Linkageless Boiler Controls for Space Heating	N	Reliability Review. Updates to measure life and measure cost.	N/A
4.4.22	Oxygen Trim Controls for Space Heating Boilers	N	Reliability Review. Updates to measure life.	N/A
4.4.24	Small Pipe Insulation	N	Updates to Thermal Regain Factor assumptions including allowing custom determination, assumptions for annual use and defaults for location not specified. Value for "Location no specified – Commercial" corrected.	Refine the guidance for Pipe Insulation Thermal Regain Factors
4.4.26	Variable Speed Drives for HVAC	N	Reliability Review.	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
	Supply and Return Fans		IECC 2012 code baseline assumptions for new construction removed. Clarification added to address interaction of this measure and new measure 4.4.53.	
4.4.29	Stack Economizer for Boilers Serving Process Loads	N	Reliability Review. No changes recommended.	N/A
4.4.30	Notched V Belts for HVAC Systems	Y	Reliability Review. The HOU for High School was updated after recalculation using OpenStudio. This change was added in the first table for calculating EUL, but not in the second table for HOU. Also, measure did not have a CF applied to calculate summer coincident peak demand savings. This has been added. Updated measure cost and provided alternative semi-custom approach to costs.	v10 typo fixes
4.4.31	Small Business Furnace Tune-Up	N	Update to Fan Energy factor to make consistent with Commercial savings.	4.4.48 Fan Energy Factor
4.4.32	Combined Heat and Power	N	Working group is still reviewing options for this measure. After TAC review, decision to make no changes in v10 and to work to do a comprehensive update in v11. Note added to this effect.	N/A
4.4.33	Industrial Air Curtain	N	Reliability Review. No changes recommended.	N/A
4.4.35	Economizer Repair and Optimization	N	Clarification that OAn used in the equation is the %OSA × 100.	v10 typo fixes
4.4.37	Unitary HVAC Condensing Furnace	N	Reliability Review. No changes recommended. Review deadline set for next year to review new federal standards.	N/A
4.4.44	Commercial Ground Source and Ground Water Source Heat Pump	N	Additional language added reflecting that the unknown baseline for Time of Sale should be based upon EM&V. New 'HeatLoad' variable used (calculated as GSHP FLH * Capacity). Addition of "GasSystemDistributionLoss factor. Nicor value has been added. Still looking for P/NS and Ameren if available. After discussion at TAC, value set to 0% with	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>footnote indicating this will continue to be discussed for v11.</p> <p>Updated calculation method to be based on conversion of Total SourceEnergySavings back to appropriate fuel at site.</p> <p>Update of lifetime heat rate assumption and application of midlife adjusted values for calculation of savings. Addition of footnote stating that if legislation is passed requiring site calculations, that 3412 Btu/kWh will be used. Variables for Hgrid split in to LifetimeHgrid, FirstYearHgrid, PostAdjHgrid and algorithms set out appropriately.</p> <p>Algorithms adjusted to reflect Climate and Equitable Jobs Act instruction to base calculations at site.</p> <p>Proposal to calculate savings when electric and gas utility is supporting measure based on % of incentive provided. Note added that alternative methodologies can be used if total MMBtu is same.</p> <p>Update to supply water temperature assumption.</p>	
4.4.48	Small Commercial Thermostats	N	<p>Removal of "Provisional" status.</p> <p>Update to eligibility requirements – increase of capacity cap to 10 tons.</p> <p>Additional support for existing heating savings percentage.</p> <p>Clarification of %ElecHeat assumption.</p> <p>Additional variable to account for when existing thermostat is programmable.</p> <p>Update to Fan Energy factor to make consistent with Commercial savings.</p> <p>Update of %ElecHeat assumption.</p> <p>Additional default assumptions provided.</p> <p>Data source detail provided.</p>	<p>Prog-to-Smart Thermostats</p> <p>Heating Fuel Flag to Algorithms</p> <p>PROVISIONAL: Small Commercial Thermostats</p> <p>4.4.48 Fan Energy Factor</p>
4.4.50	Electric Chillers with Integrated Variable Speed Drives	N	Update to measure life.	Correction: Chillers w/ Integrated VSD EUL (4.4.50)

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			Clarification that magnetic bearing chillers include VSDs and to add characterization for VCD screw chiller types. Capacity limits provided, now up to 1,250 tons. Note some comments from DNVL have been included for review. Clarification of savings and hours assumptions.	Electric Chillers with Integrated Variable Speed Drives
4.4.51	Advanced Rooftop Controls with High Rotor Pole Switch Reluctance Motors	N	Updating ESF table- cooling savings were switched (NC v Retrofit) and updating Fan savings based on forthcoming ComEd field study.	SRM Motors for HVAC
4.4.53	HVAC Supply, Return and Exhaust Fans – Fan Energy Index	N	New measure. Equation terminology was adjusted slightly and the interaction of this measure with the existing measure 4.4.26 specified, both in this new measure and in 4.4.26. Clarification that power and FEI is at 100% Flow Fraction and reference for part load ratio table added.	Fan Energy Index
4.4.54	Process Heating Boiler	N	New measure Early replacement scenario added. Other minor edits. Clarification of timing of 2023 code baseline.	Process Heating Boiler
4.4.55	Commercial Gas Heat Pump	N	New measure Baseline language updated. Additional language added reflecting that the unknown baseline for Time of Sale should be based upon EM&V. Fuel switch scenario calculations updated to be consistent with other measures. Correction of GasSystemDistributionLoss factor to (1 + GasSystemDistributionLoss). After discussion at TAC, GasSystemDistribution Loss value set to 0% with footnote indicating this will continue to be discussed for v11.	Commercial Gas Heat Pump
4.5.4	LED Bulbs and Fixtures	N	Updates to Commercial and Residential Split. Updates to ISR assumptions. Updates to wattage assumptions. Removal of New Construction assumptions which were added in error.	LED Lamps, Fixtures, and TLEDs ISR & R/NR split Update LED Lamp Wattages Review lighting forecast

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>Fix to typos in the directional lamp delta watts table.</p> <p>Updates to mid-life adjustment and O&M assumptions based on moving one year along the forecast.</p> <p>Addition of efficiency kit ISR</p>	C&I Kit ISR Defaults
4.5.6	LED Traffic and Pedestrian Signals	N	Minor fixes to deemed savings table.	v10 typo fixes
4.5.7	Lighting Power Density	N	IECC 2012 code baseline assumptions for new construction removed.	N/A
4.5.10	Lighting Controls	N	<p>Minor text edits to remove reference only to occupancy sensors.</p> <p>Updates to measure cost for LLLCs and Network controls.</p> <p>Default kW controlled provided for NLCs.</p> <p>Additional hour assumptions for NLCs and LLLCs.</p> <p>Updates to high end trim, NLC and LLLC savings factors.</p> <p>Addition of (ESFEE – ESFBase) in interactive effect algorithms.</p>	Lighting Controls Proposed Update to Networked Lighting HOU
4.5.15	LED Open Sign	N	<p>Reliability Review.</p> <p>No changes recommended.</p>	N/A
4.5.16	LED Streetlighting	N	Clarification of mid life baseline adjustment	Update Mercury Vapor midlife adjustment
4.6.2	Beverage and Snack Machine Controls	N	<p>Reliability Review.</p> <p>Update to methodology and cost assumptions.</p> <p>Update to occupancy hours assumptions.</p> <p>Vending machine class definitions provided.</p>	N/A
4.6.3	Door Heater Controls for Cooler or Freezer	N	<p>Reliability Review.</p> <p>Updated a number of variables based on updated reference including ESF, kW Connected Load, Bonus Factor Coincident Factor and Incremental Cost)</p> <p>Incremental cost assumption updated based on Ameren cost data provided.</p>	N/A
4.6.4	Electronically Commutated Motors (ECM) for Walk-in and Reach-	N	<p>Reliability review.</p> <p>Savings values updated based on an update to the CA workpapers that the measure is based upon.</p>	N/A

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	in Coolers / Freezers		VEIC reviewed the analysis files and in response to question posed, we can confirm that the measures do currently account for interactive effects.	Check for refrigeration savings on ECM for Walk-In Fan with Controller
4.6.6	Evaporator Fan Control for Electrically Commutated Motors	N	Savings values updated based on an update to the CA workpapers that the measure is based upon.	N/A
4.6.7	Strip Curtain for Walk-In Coolers	N	Reliability review. Methodology updated to be consistent with the NW Regional Technical Forum approach.	N/A
4.6.10	High Speed Rollup Doors	N	Reliability Review. No changes recommended.	N/A
4.6.11	Q-Sync Motors for Walk-in and Reach-in Coolers/Freezers	N	Reliability Review. No changes recommended.	N/A
4.6.13	Add Doors to Open Refrigerated Display Cases	N	Addition of horizontal case assumptions. Minor language edits.	Add Doors to Open Refrigerated Display Cases
4.6.14	Floating Head Pressure Control	N	New measure	Floating Head Pressure Controls, Commercial Refrigeration
4.7.1	VSD Air Compressor	N	Reliability Review. Update to measure costs.	N/A
4.7.2	Compressed Air Low Pressure Drop Filters	N	Reliability Review. No changes recommended. Added unknown value for hours and CF.	N/A
4.7.12	AODD Pump Controls	N	New measure	New Measure: AODD Pump Controls
4.8.1	Pump Optimization	N	Reliability Review. No changes recommended.	N/A
4.8.2	Roof Insulation for C&I Facilities	N	Update to Fan Energy factor to make consistent with Commercial savings. IECC 2012 code baseline assumptions for new construction removed.	4.4.48 Fan Energy Factor
4.8.3	Computer Power Management Software	N	Clarification on peak savings assumptions.	v10 typo fixes
4.8.8	High Efficiency Transformer	N	Reliability Review. No changes recommended.	N/A
4.8.15	Smart Irrigation Controls	N	Reliability Review. No changes recommended in absence of actual project data.	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
4.8.18	ENERGY STAR Uninterruptible Power Supply	N	Measure limited to telecommunications or similar facilities. Other applications should be done as a custom measure.	Proposed changes on 4.8.18 ENERGY STAR Uninterruptible Power Supply
4.8.19	Energy Efficient Rectifier	N	Update to measure cost	4.8.19 Energy Efficient Rectifier - Update to Cost
4.8.22	Smart Sockets – Provisional	N	Update to open hours assumptions. Note additional updates to wattages and ISR are expected to be included in the second deliverable. Following that, we will likely remove the Provisional status of the measure. Update of ISR and appliance wattage based on Guidehouse study. Unknown average wattage controlled added. Smart socket wattage updated. Proposal to apply 50% factor for those wattages that represent “on” rather than “standby” status. Proposal to remove provisional status.	Smart Socket Input Factors
4.8.23	Lithium Ion Forklift Batteries	N	New measure	Lithium ion forklifts
4.8.24	Building Operator Certification – Provisional Measure	N	New measure New version of the measure has been provided based on discussions with other evaluation companies and ICC Staff. Provisional status removed and review deadline set for 1/1/2023. Text edits to section on studies informing TRM update. Update to table for Ameren per participant kW and therm savings and weighted average. Additional language added: “No previous custom study of customer participation in BOC shall inform eligibility for this measure.”	New Measure: Building Operator Certification
4.8.25	Warm-Mix Asphalt Chemical Additives	N	New measure	Warm Mix Asphalt Chemical Additives
4.8.26	High Efficiency Hand Dryers	N	New measure	High Efficiency Hand Dryers
Volume 3 – Residential Measures				
5.1.1	ENERGY STAR Air Purifier/Cleaner	N	New algorithmic approach to the measure replacing ESTAR deemed savings by EPA.	Air Purifiers: Update savings calculation method and savings values

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			Utilizes average Clean Air Delivery Rate (CADR) of ENERGY STAR QPI rather than minimum specification.	
5.1.2	ENERGY STAR Clothes Washers	N	Removal of Cook County distinction for secondary water savings	N/A
5.1.3	ENERGY STAR Dehumidifier	N	Updates to assumed hours of use based on field studies. Corresponding change to coincident factor.	Dehumidifiers: Update annual operating hours based on field studies
5.1.4	Dishwasher	N	Reliability Review. No changes recommended. Review deadline set to next year as ENERGY STAR spec is currently under revision. Removal of Cook County distinction for secondary water savings	N/A
5.1.7	ENERGY STAR and CEE Tier 2 Room Air Conditioner	N	Addition of CEE Tier 1 assumptions	CEE-rated Room AC
5.1.8	Refrigerator and Freezer Recycling	N	Reliability Review. Clarification of CF assumptions.	N/A
5.1.12	Ozone Laundry	N	Addition of Federal Standard specifications for clothes washers. Update to supply water temperature assumption.	Ozone Laundry - Clothes Washer Federal Standards
5.1.13	Income Qualified: ENERGY STAR and CEE Tier 2 Room Air Conditioner	N	Addition of CEE Tier 1 assumptions	CEE-rated Room AC
5.2.1	Advanced Power Strip	Y	Fixing typo in 5-plug time of sale kW savings.	v10 typo fixes
5.3.1	Air Source Heat Pump	N	Additional clarity to definition of ASHP provided. Future furnace federal standard assumption changed from 90% to 80% due to new based on language in 2021 Final Interpretive Rule ("2021-01-15 Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters; Notification of final interpretive rule"). Costs updated accordingly. Addition of deemed efficiency assumptions for Time of Sale measures through a midstream program. Deemed values now	ASHP / Fuel switch issues raised in v9 Heat Pump Description

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		<p>removed and additional language added reflecting that the unknown baseline for Time of Sale should be based upon EM&V.</p> <p>Heating baseline for midstream updated to be based on ASHP (8.2 HSPF). Note added that if evaluation indicates that program influenced decision to move from resistance or gas heating to ASHP (rather than just influence increased efficiency) then appropriate baseline can be used.</p> <p>New 'HeatLoad' variable used (calculated as ASHP FLH * Capacity).</p> <p>Algorithms adjusted to reflect Climate and Equitable Jobs Act instruction to base calculations at site.</p> <p>Addition of "GasSystemDistributionLoss factor." Nicor value has been added. Still looking for P/NS and Ameren if available. After discussion at TAC, value set to 0% with footnote indicating this will continue to be discussed for v11.</p> <p>Updated calculation method to be based on conversion of Total SourceEnergySavings back to appropriate fuel at site.</p> <p>Update of lifetime heat rate assumption and application of midlife adjusted values for calculation of savings. Addition of footnote stating that if legislation is passed requiring site calculations, that 3412 Btu/kWh will be used. Variables for Hgrid split in to LifetimeHgrid, FirstYearHgrid, PostAdjHgrid and algorithms set out appropriately.</p> <p>Proposal to calculate savings when electric and gas utility is supporting measure based on % of incentive provided. Note added that alternative methodologies can be used if total MMBtu is same.</p>	<p>Default baseline equipment efficiencies</p> <p>Add De-rating equation to measure</p> <p>Correct Derating Reference</p> <p>SEER Derating correction in Residential HVAC Measures</p> <p>Remove Hanging Research References to QI</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>Removal of language around pending ComEd study on QI.</p> <p>Early replacement default updated based on ComEd data.</p>	
5.3.2	Boiler Pipe Insulation	N	<p>Update to formula, removing the different circumference for pre and post insulation, and calculating effective length since 3E Plus tool indicates savings is higher for horizontal pipe than vertical.</p> <p>New default values for uninsulated pipe.</p> <p>Updates to footnote to refer to boiler rather than DHW pipe.</p> <p>Footnote added stating: "Where possible it should be ensured that the R-value of the insulation is at the appropriate mean rating temperature (125F)."</p> <p>"L" term corrected to "L_effective".</p> <p>Fixed example calc deltaT.</p>	<p>Pipe Insulation: Revise savings calculation to account for pre/post Delta T. Use O.D. for pipe sizes. Update R exist. Update measure costs.</p>
5.3.4	Duct Insulation and Sealing	N	<p>Addition of mid-life adjustment algorithm for therm savings from Methodology 1. %Gas and %Elec heated buildings added.</p> <p>Nicor assumptions adjusted to be equal North Shore rather than ComEd.</p>	<p>Correct Duct Sealing Gas Mid-Life Adjustment Errors</p>
5.3.5	Furnace Blower Motor	N	<p>Clarification that incremental cost of \$0 should be applied for ECM when coupled with an early replacement furnace.</p>	N/A
5.3.6	Gas High Efficiency Boiler	N	<p>Federal Standard update.</p> <p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p>	<p>Upcoming federal standard change for residential boilers</p> <p>SEER Derating correction in Residential HVAC Measures</p>
5.3.7	Gas High Efficiency Furnace	N	<p>Future furnace federal standard assumption changed from 90% to 80% due to new based on language in 2021 Final Interpretive Rule ("2021-01-15 Energy Conservation Program for Appliance Standards: Energy Conservation Standards for Residential Furnaces and Commercial Water Heaters; Notification of final</p>	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>interpretive rule”). Costs updated accordingly.</p> <p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p>	<p>SEER Derating correction in Residential HVAC Measures</p>
5.3.8	Ground Source Heat Pump	N	<p>Boiler Federal Standard update. Future furnace federal standard assumption changed from 90% to 80%</p> <p>Fix baseline EER assumptions in baseline section (correct in variable list).</p> <p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>New ‘HeatLoad’ variable used (calculated as GSHP FLH * Capacity).</p> <p>Algorithms adjusted to reflect Climate and Equitable Jobs Act instruction to base calculations at site.</p> <p>Addition of “GasSystemDistributionLoss factor.</p> <p>Nicor value has been added. Still looking for P/NS and Ameren if available. After discussion at TAC, value set to 0% with footnote indicating this will continue to be discussed for v11.</p> <p>Updated calculation method to be based on conversion of Total SourceEnergySavings back to appropriate fuel at site. Variables for Hgrid split in to LifetimeHgrid, FirstYearHgrid, PostAdjHgrid and algorithms set out appropriately.</p> <p>Update of lifetime heat rate assumption and application of midlife adjusted values for calculation of savings. Addition of footnote stating that if legislation is passed requiring site calculations, that 3412 Btu/kWh will be used.</p>	<p>Upcoming federal standard change for residential boilers</p> <p>v10 typo fixes</p> <p>SEER Derating correction in Residential HVAC Measures</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			Proposal to calculate savings when electric and gas utility is supporting measure based on % of incentive provided. Note added that alternative methodologies can be used if total MMBtu is same.	
5.3.11	Programmable Thermostats	N	Update to Unknown %Electric Heat to be consistent with Advanced Thermostat measure.	N/A
5.3.12	Ductless Heat Pumps	N	<p>Additional clarity to definition of DMSHP provided</p> <p>Added clarification on what constitutes 'supplemental or limited zonal' (defined as single zone) and 'whole house' (defined as multi zone).</p> <p>Boiler Federal Standard update. Future furnace federal standard assumption changed from 90% to 80%</p> <p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>New 'HeatLoad' variable used (calculated as DMSHP FLH * Capacity).</p> <p>Algorithms adjusted to reflect Climate and Equitable Jobs Act instruction to base calculations at site.</p> <p>Addition of "GasSystemDistributionLoss factor.</p> <p>Nicor value has been added. Still looking for P/NS and Ameren if available. After discussion at TAC, value set to 0% with footnote indicating this will continue to be discussed for v11.</p> <p>Updated calculation method to be based on conversion of Total SourceEnergySavings back to appropriate fuel at site.</p> <p>Update of lifetime heat rate assumption and application of midlife adjusted values for calculation of savings. Addition of</p>	<p>Heat Pump Description</p> <p>Definition request - DHP</p> <p>Upcoming federal standard change for residential boilers</p> <p>SEER Derating correction in Residential HVAC Measures</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>footnote stating that if legislation is passed requiring site calculations, that 3412 Btu/kWh will be used. Variables for Hgrid split in to LifetimeHgrid, FirstYearHgrid, PostAdjHgrid and algorithms set out appropriately.</p> <p>Proposal to calculate savings when electric and gas utility is supporting measure based on % of incentive provided. Note added that alternative methodologies can be used if total MMBtu is same.</p> <p>Added default early replacement rate assumption based on ComEd program data.</p>	
5.3.16	Advanced Thermostats	Y	<p>The heating % savings are reduced slightly to apply a 90% ISR to the additional Thermostat Optimization savings (the base heating % savings already incorporate inherent in service rate impacts). The ISR derived during the cooling savings analysis should therefore not be applied to the heating savings, so the ISR is now separated for heating (100%) and cooling (90%) calculations.</p>	N/A
		N	<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p>	SEER Derating correction in Residential HVAC Measures
5.3.17	Gas High Efficiency Combination Boiler	N	<p>Federal Standard update.</p> <p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>Update to supply water temperature assumption.</p>	<p>Upcoming federal standard change for residential boilers</p> <p>SEER Derating correction in Residential HVAC Measures</p>
		N	<p>New measure</p> <p>Following TAC discussion, a second draft of this measure is being developed and will be circulated as soon as we receive it. 2nd draft was provided with multiple changes. Based on review, fixed error in ERV Electric Cooling Savings algorithm which was using both heating and cooling efficiency component. Defaults for</p>	Residential Energy Recovery Ventilator (ERV)

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>efficiency ratings and cfm for single, multi and unknown applications.</p> <p>Updates to ERV default value tables.</p>	
5.4.1	Domestic Hot Water Pipe Insulation	N	<p>Update to formula, removing the different circumference for pre and post insulation, and calculating effective length since 3E Plus tool indicates savings is higher for horizontal pipe than vertical.</p> <p>New default values for uninsulated pipe. Additional unknowns for each size pipe insulation provided. ½" and ¾" were switched – now corrected.</p> <p>Deemed savings for common configurations provided.</p> <p>New ISR for Virtual Assessment / self install.</p> <p>Clarification added that ISR is specific only for self install after virtual assessment. Minor clarifications added.</p> <p>Footnote added stating: "Where possible it should be ensured that the R-value of the insulation is at the appropriate mean rating temperature (125F)."</p> <p>Measure cost updated to be based on average of ranges provided.</p> <p>Example calculation updated.</p> <p>Added language that if hot water recirculating pump used, measure is viable for entire hot water loop.</p>	<p>Pipe Insulation: Revise savings calculation to account for pre/post Delta T. Use O.D. for pipe sizes. Update R exist. Update measure costs.</p> <p>Virtual-Assessment with Self-Installation Measure ISRs</p>
5.4.2	Gas Water Heater	N	<p>Update to ENERGY STAR specifications. No impact on savings.</p> <p>Update to supply water temperature assumption.</p>	<p>Residential Water Heaters - New ESTAR Specifications</p>
5.4.3	Heat Pump Water Heaters	N	<p>Future furnace federal standard assumption changed from 90% to 80%</p> <p>New default for UEFbase for <55 gallons. Update to incoming water temperature. Addition of reduced dehumidifier savings.</p> <p>% waste heat assumed to be reheated assumption changed from 49% to 5%.</p>	<p>N/A</p> <p>HPWHs: Account for latent heat transfer in heating penalties. Interactive dehumidification savings. Update incoming water temperature. Update LF for unknown location.</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			%Gas and %Elec heated buildings added. Nicor assumptions adjusted to be equal North Shore rather than ComEd.	
5.4.4	Low Flow Faucet Aerators	N	Addition of virtual assessment / self install In Service Rate assumptions. Clarification added that ISR is specific only for self install after virtual assessment. Kit measure ISR assumptions added. Update to supply water temperature assumption. Language on freerider rate being zero moved and clarified to be only where the default values are used. Example kWh calcs typo fixed. Removal of Cook County distinction for secondary water savings.	Virtual-Assessment with Self-Installation Measure ISRs Kit Measure ISRs
5.4.5	Low Flow Faucet Showerheads	N	Addition of virtual assessment / self install In Service Rate assumptions. Clarification added that ISR is specific only for self install after virtual assessment. Kit measure ISR assumptions added. Update to supply water temperature assumption. Language on freerider rate being zero moved and clarified to be only where the default values are used. Removal of Cook County distinction for secondary water savings.	Virtual-Assessment with Self-Installation Measure ISRs Kit Measure ISRs
5.4.7	Water Heater Wrap	N	Reliability Review. As per pipe insulation measure agreement, pre and post insulation surface area assumptions are removed and just pre is applied, leaving just the R-value changing between pre and post.	N/A
5.4.8	Thermostatic Restrictor Shower Valve	N	Update to supply water temperature assumption. Removal of Cook County distinction for secondary water savings.	N/A
5.4.9	Shower Timer	N	Removal of Cook County distinction for secondary water savings. Update to supply water temperature assumption.	N/A
5.4.10	Pool Covers	N	Reliability Review. No changes recommended.	N/A
2.4.11	Drain Water Heat Recovery	N	Update to supply water temperature assumption.	N/A

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
5.5.6	LED Specialty Lamps	N	<p>Updates to wattage assumptions. Fix to typos in the directional lamp delta watts table.</p> <p>Updates to mid-life adjustment and O&M assumptions based on moving one year along the forecast.</p> <p>Addition of virtual assessment / self install In Service Rate assumptions. Clarification added that ISR is specific only for self install after virtual assessment. 2nd and 3rd year installs calculated.</p>	<p>Update LED Lamp Wattages</p> <p>Review lighting forecast</p> <p>Virtual-Assessment with Self-Installation Measure ISRs</p>
5.5.8	LED Screw Based Omnidirectional Bulbs	N	<p>Updates to wattage assumptions</p> <p>Updates to mid-life adjustment and O&M assumptions based on moving one year along the forecast.</p> <p>Addition of virtual assessment / self install In Service Rate assumptions. Clarification added that ISR is specific only for self install after virtual assessment. 2nd and 3rd year installs calculated.</p>	<p>Update LED Lamp Wattages</p> <p>Review lighting forecast</p> <p>Virtual-Assessment with Self-Installation Measure ISRs</p>
5.5.9	LED Fixtures	N	<p>Updates to wattage assumptions</p> <p>Updates to mid-life adjustment and O&M assumptions based on moving one year along the forecast.</p>	<p>Update LED Lamp Wattages</p> <p>Review lighting forecast</p>
5.5.10	LED Nightlights	N	<p>Reliability Review. No changes recommended.</p>	N/A
5.6.1	Air Sealing	Y	<p>Removal of IENetCorrection multiplier from ΔkWh_heatingGas algorithm since this has already been applied in the ΔTherms algorithm.</p>	<p>Correction: Air Sealing & Ceiling Insulation</p>
		N	<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>Distribution efficiency default provided.</p> <p>Future furnace federal standard assumption changed from 90% to 80%</p> <p>Boiler Federal Standard update.</p>	<p>SEER Derating correction in Residential HVAC Measures</p> <p>Distribution System Efficiency Default Value</p> <p>N/A</p> <p>Upcoming federal standard change for residential boilers</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>Update to electric v gas heat assumption. Nicor assumptions adjusted to be equal North Shore rather than ComEd.</p> <p>Addition of prescriptive cooling savings.</p> <p>Kit measure ISR assumptions added. Other item ISR provided for distributed self install kits.</p> <p>Second ISR table in gas section removed.</p>	<p>N/A</p> <p>Add Electric Cooling Savings to Prescriptive Methodology Air Sealing Measures</p> <p>Kit Measure ISRs</p>
5.6.2	Basement Sidewall Insulation	N	<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p>	<p>SEER Derating correction in Residential HVAC Measures</p>
5.6.3	Floor Insulation Above Crawlspace	N		
5.6.4	Wall Insulation	N	<p>Distribution efficiency default provided.</p> <p>Future furnace federal standard assumption changed from 90% to 80%</p> <p>Boiler Federal Standard update.</p> <p>%Gas and %Elec heated buildings added. Nicor assumptions adjusted to be equal North Shore rather than ComEd.</p>	<p>Distribution System Efficiency Default Value</p> <p>Upcoming federal standard change for residential boilers</p>
5.6.5	Ceiling/Attic Insulation	Y	<p>Removal of IENetCorrection multiplier from $\Delta kWh_{heatingGas}$ algorithm since this has already been applied in the $\Delta Therms$ algorithm.</p>	<p>Correction: Air Sealing & Ceiling Insulation</p>
		N	<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p> <p>Distribution efficiency default provided.</p> <p>Future furnace federal standard assumption changed from 90% to 80%</p> <p>Boiler Federal Standard update.</p> <p>%Gas and %Elec heated buildings added. Nicor assumptions adjusted to be equal North Shore rather than ComEd.</p>	<p>SEER Derating correction in Residential HVAC Measures</p> <p>Distribution System Efficiency Default Value</p> <p>Upcoming federal standard change for residential boilers</p>
5.6.6	Rim/Band Joist Insulation	N	<p>Consistent application of degradation factors if using rated efficiency of existing unit. Cap of 30 years added.</p>	<p>SEER Derating correction in Residential HVAC Measures</p> <p>Distribution System Efficiency Default Value</p>

Measure # and Name		Errata?	Brief description of what changed	Tracker Item(s)
			<p>Distribution efficiency default provided.</p> <p>Future furnace federal standard assumption changed from 90% to 80%</p> <p>Boiler Federal Standard update.</p> <p>%Gas and %Elec heated buildings added. Nicor assumptions adjusted to be equal North Shore rather than ComEd.</p>	Upcoming federal standard change for residential boilers
5.6.8	Triple Pane and Thin Triple Windows	N	<p>New measure</p> <p>Minor clarifications and footnotes added.</p>	Thin Triple Windows - New Measure
5.7.1	High Efficiency Pool Pumps	N	<p>Updates to Federal Standard and ENERGY STAR specifications.</p> <p>New methodology (consistent with most recent ENERGY STAR Calculator) applied.</p> <p>Addition of CEE Tier pumps.</p> <p>Minor clarifications added.</p>	<p>Residential Pool Pumps - New Codes and Standards</p> <p>CEE-rated Pool Pumps</p>
5.7.2	Low Flow Toilets	N	Removal of Cook County distinction for secondary water savings	N/A
Volume 4 – Cross-Cutting Measures and Attachments				
6.2.1	Voltage Optimization	N	Footnote added to clarify how to handle feeders with no-load in a given year.	VO Future Feeders
Attachment A	Illinois Statewide Net-to-Gross Methodologies	N	<p>Added footnote clarifying treatment of Building Operator Certification.</p> <p>Updated Table 3-1 to reflect current utility programs.</p> <p>Updated Table 4-1 to reflect current utility programs.</p>	N/A
Attachment B	Effective Useful Life for Custom Measure Guidelines	N	<p>Updates to introductory text.</p> <p>Update to apply attachment B EUL values prospectively rather than retroactively.</p> <p>New EULs for Commercial Behavioral and Operations and Maintenance Programs, Retro commissioning, Virtual Commissioning, Strategic Energy Management and Custom measures.</p> <p>Measures that are now in the TRM removed from custom table. 3 additional measures removed.</p>	<p>Timing of Custom EULs</p> <p>Attachment B Expand Custom Gas Process EULs</p> <p>Correct the RCx EUL in Attachment B</p>

Measure # and Name	Errata?	Brief description of what changed	Tracker Item(s)
		Language on prospective application of changes updated.	

The following table provides a list of those tracker items still pending with progress made to date and those requests that have not resulted in a change.

Tracker Items:	Comments
Confirm 3-lamp T8HO low-bay wattage	<p>VEIC tracked down the original source of this assumption (which came from Efficiency Vermont). The baseline input watts was based on the following common fixture: https://www.bulbsdepot.com/media/pdf/advance/ICN-2S86-v1.pdf</p> <p>For the 3 lamp, the 1 lamp and 2 lamp fixtures are summed (59+98 = 157W). For the 2,6 and 8 it just multiplies the 2 lamp by the appropriate sum.</p> <p>We think this is reasonable to keep as is.</p>
Review T5 baseline wattage	<p>Since fluorescent fixtures are now very low quantity if offered at all, and the TRM allows custom entries we propose it is not worth attempting to fix this one baseline entry.</p>
Duct Sealing Loss Factors	<p>This question related to the applicability of SLF and RLF factors when CFM is measured in realtime.</p> <p>VEIC believe that SLF and RLF still need to be evaluated and used in the scenario described (measuring duct leakage in real time). These factors are accounting for the fact that different leaks will have a different impact on energy consumption. The default is that leaks in the supply side ducts are assumed to be lost to the outside (so factor of 1), while return leaks contribute less to energy loss (factor of 0.5). The blower door is evaluating how much air is being leaked, these factors account for <i>where</i> they are and their relative impact on heat loss. We follow the approach from the Energy Conservatory Duct Blaster Manual which has more information (https://energyconservatory.com/wp-content/uploads/2014/07/Duct-Blaster-Manual-Series-B-DG700.pdf)</p>
HE CACs and Tstats	<p>This question relates to the proprietary thermostats with high efficiency CAC equipment and whether they can claim the additional savings from the advanced thermostat characterization or whether the SEER rating takes in to account the presence of the thermostat.</p> <p>VEIC do not believe that the presence of a thermostat would impact the SEER rating. We also do not believe inbuilt thermostats would provide the equivalent savings of the Advanced Thermostats, but if the thermostat provides set back scheduling would provide similar savings as a programmable thermostat. We would therefore suggest claiming savings from programmable thermostat in this case, not the Advanced Thermostat.</p>

Tracker Items:	Comments
Coolant Recharge	Question on whether once in life coolant recharge is included in the current tune- up characterization. VEIC's understanding is that this would be included in the HVAC Tune up measure if required.
Deemed ER rates	The workpaper provided on this Tracker item is the same as the Default baseline equipment efficiencies item. It does not appear that additional assumptions relating to the deemed early replacement rate are being provided at this time.
Correct full load hours assumptions 5.3.1 Air Source Heat Pump	VEIC reviewed this request with the author. It was agreed that the heat load should be consistent between the baseline and efficient case. The proposed solution is to calculate a new variable called 'Heatload' using the installed ASHP (FLH * capacity) and use that across all algorithms.
Checking ARC Electric Heat Calculations for Incremental Benefits of VFDs	Question on why heating savings goes down with the addition of VFDs. Response provided by CLEAResult that measure was "simulated with the ComEd eQUEST prototype models. The simulated RTU supply fan motor heat is added to the supply airstream. With the VFD less heat is added to the airstream at lower speeds resulting in a slight heating penalty."
PROVISIONAL Energy efficient hydraulic oils	Confirmation in TAC that evaluation planned to inform v11.
PROVISIONAL Energy Efficient Gear Oils	Confirmation in TAC that evaluation planned to inform v11.
PROVISIONAL Thermostatic Radiator Valves	Confirmation in TAC that evaluation planned to inform v11.
PROVISIONAL Air Deflector for Unit Ventilator	Confirmation in TAC that evaluation was put on hold due to Covid. Hope to proceed this winter.
PROVISIONAL Vortex Tube Thermostat	Currently this measure is very low quantity. TAC agreement that keeping the measure in the TRM as provisional is ok, and that if/when the quantity increases we will look for evaluation at that time.
Steam Traps	Item placed on hold by request of author.
Res. Thermostat AC assumption	Item placed on hold by request of author.
Add ENERGY STAR Most Efficient Refrigerators to ENERGY STAR Refrigerator measure	Item placed on hold by request of author.
Use of program PRQs data to inform values in TRM	Item placed on hold by request of author.
Standardize EUL language	If time allows, VEIC will work on this request in a subsequent draft.