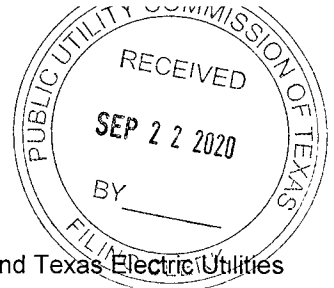


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TO: Therese Harris and Keith Rogas, Public Utility Commission of Texas (PUCT), and Texas Electric Utilities
FROM: Lark Lee, Evaluation Measurement, and Verification Project Manager and Robert McKay, EM&V Impact Evaluation Lead and TRM Lead

SUBJECT: Program Year 2021 Texas Technical Reference Manual (TRM) Version 8.0

DATE: September 21, 2020

Maintenance of the statewide Technical Reference Manual (TRM) is one of the primary objectives of the Public Utility Commission of Texas' Evaluation, Measurement and Verification (EM&V) of the investor-owned utilities' energy efficiency programs. This memo summarizes the updates made for the Program Year 2021 Texas Technical Reference Manual Version 8.0 (PY2021 TRM 8.0)

PY2020 TRM 8.0 Update Summary

The TRM is divided into five separate documents for ease of use:

- **Volume 1: TRM Overview and User Guide** covers the process for TRM updates and version roll-outs, weather zones, TRM structure, and the format of the TRM measure overviews.
- **Volume 2: Residential Measures** contains the measure descriptions and deemed savings estimates for measures installed in residential dwellings.
- **Volume 3: Nonresidential Measures** contains the measure descriptions and deemed savings estimates for measures installed in nonresidential businesses.
- **Volume 4: M&V Protocols** has standardized EM&V protocols for technologies and new program types.
- **Volume 5: Implementation Guidance** contains EM&V recommendations regarding program implementation that may affect claimed savings

Several deemed savings updates and additions were made in Volumes 2, 3, and 4 summarized in Tables 1, 2, and 3 below respectively.

Volume 5 updates and red lines will be released later this year

Table 1. Residential PY2021 TRM 8.0 Volume 2 Updates by Measure

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
Lighting	Standard compact fluorescent lamps						Removed measure
	Specialty compact fluorescent lamps						Removed measure
	ENERGY STAR® omni-directional LED lamps	-	-	X	-	-	Defined midstream methodology and clarified default wattages by lumen range
	ENERGY STAR® specialty and directional LED lamps	-	-	X	-	-	Defined midstream methodology and clarified default wattages by lumen range. Updated specialty lamps baselines.
HVAC	Air conditioner or heat pump tune-up	-	-	X	-	-	Updated coincidence factors
	Duct sealing	-	-	X	-	X	Updated eligibility and documentation requirements for electric resistance heat.
	Ground source heat pumps	-	X	X	-	-	Updated algorithms to make units consistent.
	Central air conditioners and heat pumps	-	X	-	-	-	Clarified early retirement age eligibility. Updated electric resistance baseline documentation
	Mini-split air conditioners and heat pumps	-	X	-	-	-	Clarified early retirement age eligibility. Updated electric resistance baseline documentation
	Large capacity split system and single-package air conditioners and heat pumps	-	-	X	-	-	Updated coincidence factors

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
Load management	Packed terminal heat pumps	-	-	X	-	-	Clarified early retirement age eligibility. Added winter demand algorithm. Updated coincidence factors and documentation requirements
	Room air conditioners	-	-	X	-	-	Clarified early retirement age eligibility.
	ENERGY STAR® connected thermostats	-	X	-	-	-	No revision
	Evaporative Cooling	-	X	-	-	-	No revision
	Smart thermostat load management	-	X	-	-	-	Updated description and tracking requirements.
Building Envelope	Air infiltration	-	X	-	-	X	Reduced leakage cap, updated documentation requirements. Updated eligibility to only LI/HTR. Added space heat adjustment factor and electric resistance documentation requirement.
	Ceiling insulation	-	X	-	-	-	Updated savings tables. Added space heat adjustment factor and electric resistance documentation requirement.
	Attic encapsulation	-	X	-	-	-	Updated savings tables. Added space heat adjustment factor and electric resistance documentation requirement.
	Wall insulation	-	X	-	-	-	Added space heat adjustment factor and electric resistance documentation requirement.
	Floor insulation	-	X	-	-	-	Added space heat adjustment factor and

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
							electric resistance documentation requirement.
	ENERGY STAR® windows	-	X	-	-	-	Added space heat adjustment factor and electric resistance documentation requirement.
	Solar screens	-	X	-	-	-	Added space heat adjustment factor and electric resistance documentation requirement.
	Cool roofs	-	X	-	-	-	Updated savings tables. Added space heat adjustment factor and electric resistance documentation requirement..
Domestic Water Heating	Faucet aerators	-	-	X	-	-	Updated coincidence factors
	Low-flow showerheads	-	-	X	-	-	Added new savings category and updated coincidence factors
	Water heater pipe insulation	-	-	X	-	-	Updated ambient temperatures
	Water heater tank insulation	-	-	X	-	-	Updated ambient temperatures
	Water heater installation-electric tankless and fuel substitution	-	-	X	-	-	Clarified HPWH baseline for tanks sizes over 55 gal. Updated algorithms to refer to UEF
	Heat pump water heaters	-	X	-	-	-	Added new construction eligibility
	Solar water heaters	-	X	-	-	-	Updated algorithms and coincidence factors
	Showerhead temperature sensitive restrictor valves	--	--	X	--	--	Updated coincidence factors
	Tub spout and showerhead	--	--	X	--	--	Updated coincidence factors

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
	temperature-sensitive restrictor valves						
Appliances	ENERGY STAR® ceiling fans	-	-	X	-	-	No revision
	ENERGY STAR® clothes washers	-	X	-	-	-	No revision
	ENERGY STAR® clothes dryers	-	X	-	-	-	No revision
	ENERGY STAR® dishwashers	-	X	-	-	-	No revision
	ENERGY STAR® refrigerators	-	-	X	-	X	Updated early retirement age eligibility
	ENERGY STAR® freezers	-	X	-	-	-	Updated early retirement age eligibility
	ENERGY STAR® pool pumps	--	--	X	--	--	Incorporated ENERGY STAR® version 2.0 calculator and updated deemed savings
	ENERGY STAR® Air purifiers	-	X	-	-	-	No revision
	Advanced power strips	-	X	-	-	-	No revision
	ENERGY STAR® Electric vehicle supply equipment	-	X	-	-	-	Updated deemed savings tables
Appliance Recycling	Solar attic fans			X			Removed measure
	Refrigerator/freezer recycling	X	-	X	-	-	Updated baseline energy consumption.

Table 2. Nonresidential PY2021 TRM 8.0 Volume 3 Updates by Measure

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
Lighting	Lighting: Lamps and Fixtures	--	--	X	X	X	General reference checks and text edits. Updated EUL for new construction projects to apply to whole project. Updated dusk-to-dawn operating hours. Minor formula corrections. Updated DLC references to refer to v3.0 or later rather than explicit versions. Removed 10% nonqualified fixture threshold. Established lumens/watt assumptions for new construction baselines.
	Lighting Controls	--	--	X	X	X	General reference checks and text edits.
	LED Traffic Signals	--	--	X	X	X	General reference checks and text edits.
HVAC	AC Tune-up	--	--	X	--	X	General reference checks and text edits.
	Package and Split-System (AC and Heat Pumps)	--	--	X	X	X	General reference checks and text edits. Clarified use of post capacity for ROB baselines. Verify M&V plan requirement for VRF and documentation requirements. Added unknown age defaults for early retirement.
	Chillers	--	--	X	X	X	General reference checks and text edits. Clarified use of post capacity for ROB baselines. Added unknown age defaults for early retirement..

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
HVAC	Package Terminal Units and Room Air Conditioners (AC and Heat Pumps)	--	--	X	X	X	General reference checks and text edits. Clarified use of post capacity for ROB baselines. Added unknown age defaults for early retirement.
	Variable Frequency Drives	--	X	X	--	--	General reference checks and text edits. Added motor efficiency default assumptions.
	Condenser Air Evaporative Pre-cooling	--	--	X	--	X	General reference checks and text edits.
	Computer Room Air Conditioners	--	--	X	X	--	General reference checks and text edits. Removed text referring to building types other than data centers.
	High-volume Low-speed Fans	--	--	X	--	--	General reference checks and text edits.
	Computer Room Air Handler Motor Efficiency	--	--	X	X	--	TRM v8.0 origin.
	ENERGY STAR® Roofs	X	--	X	X	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
Building Envelope	Window Treatments	X	--	X	X	--	General reference checks and text edits. Updated peak demand values for climate zones and PDPF values.

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
	Entrance and Exit Door Air Infiltration	--	X	X	--	--	General reference checks and text edits. Degradation factor added to deemed savings values. Guidance clarified for measuring gap sizes.
Food Service	ENERGY STAR® Combination Ovens Measure Overview	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	ENERGY STAR® Electric Convection Ovens	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	ENERGY STAR® Commercial Dishwashers	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	ENERGY STAR® Commercial Electric Hot Food Holding Cabinets	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	ENERGY STAR® Kitchen Electric Fryers	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	Pre-rinse Spray Valves	--	X	X	--	--	General reference checks and text edits.

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
Refrigeration	ENERGY STAR® Electric Steam Cookers	--	X	X	--	--	General reference checks and text edits. Removed EStar qualification requirement and defers to meeting criteria.
	Demand Controlled Kitchen Ventilation	--	X	X	--	--	General reference checks and text edits.
	Commercial Ice Makers	--	X	X	--	--	General reference checks and text edits.
	Vacuum-Sealing and Packaging Machines	--	X	--	--	--	TRM v8.0 origin
	Door Heater Controls	--	X	X	--	--	General reference checks and text edits.
	ECM Evaporator Fan Motors	--	--	X	--	--	General reference checks and text edits.
	Electronic Defrost Control	--	--	X	--	--	General reference checks and text edits.
	Evaporator Fan Controls	--	--	X	--	--	General reference checks and text edits.
	Night Covers for Open Refrigerated Cases	--	X	X	--	--	General reference checks and text edits.
	High-efficiency Solid and Glass Door Reach-in Cases	--	--	X	--	--	General reference checks and text edits.
Strip Curtains for Walk-in Cooler/ Freezer	--	X	--	--	--	General reference checks and text edits.	

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
Miscellaneous	Zero Energy Glass Doors	--	X	X	--	--	General reference checks and text edits.
	Door Gaskets for Walk-in and Reach-in Coolers and Freezers	--	X	X	--	--	General reference checks and text edits.
	Vending Machine Controllers	--	X	X	--	--	General reference checks and text edits.
	Lodging Guest Room Occupancy Sensor Control	--	X	--	--	--	General reference checks and text edits.
	Pump-Off Controller	--	X	X	--	--	General reference checks and text edits.
	ENERGY STAR® Pool Pumps	--	X	X	--	--	General reference checks and text edits.
	Computer Power Management	--	X	X	--	--	General reference checks and text edits. Incorporated version 2 baseline adjustments and revised savings.
	Premium Efficiency Motors	--	--	X	--	--	General reference checks and text edits. Replace-on-burnout and Early Retirement clarifications.
	Central DHW Controls	--	X	X	--	--	General reference checks and text edits.
	Showerhead Temperature Sensitive Restrictor Valves	--	--	X	--	--	TRM v8.0 origin.
Tub Spout and Showerhead Temperature	--	--	X	--	--	TRM v8.0 origin.	

Measure Category	Measure Description	Point Estimates	Deemed Savings Tables	Savings Algorithm	Calculator	M&V	8.0 Update
	Sensitive Restrictor Valves						
	ENERGY STAR® Electric Vehicle Supply Equipment	--	X	X	--	--	TRM v8.0 origin.

Table 3. M&V Protocols PY2020 TRM 8.0 Volume 4 Updates by Measure

Sector	Measure Category	Guidance Subject	8.0 Update
Commercial	HVAC	Variable refrigerant flow	Require AHRI or DOE CCMS certificate; modified tracking data requirements
Residential	Whole house	User-defined reference home	Modified reference home to include IECC 2015 table 405.5.2 for mechanical ventilation
Commercial	Solar PV	Savings calculator	Update guidance to represent changes to the PVWatts calculator
Residential	Solar PV	Savings calculator	Update guidance to represent changes to the PVWatts calculator
Commercial	Behaviorial	Savings calculations	Clarified how to determine baseline energy use and calculate peak kW savings
Commercial	Retro commissioning	Savings calculations	Clarified how to determine baseline energy use and calculate peak kW savings
Commercial	Thermal energy storage	Eligibility	Require 30 min (or more frequent) interval data