

# Public Utility Commission of Texas

**Texas Technical Reference Manual**

**Version 8.0**

**Volume 5: Implementation Guidance**

**Program Year 2021**

**Last Revision Date:**

**March 2021**



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## **Acknowledgments**

The Texas Technical Reference Manual (TRM) is maintained by the Public Utility Commission of Texas' (PUCT) independent evaluation, monitoring, and verification (EM&V) contractor, Tetra Tech.

This version of the TRM was primarily developed from program documentation and measure savings calculators used by the Texas electric utilities and their energy efficiency services providers (EESPs) to support their energy efficiency efforts, and original source material from petitions filed with the Public Utility Commission of Texas by the utilities, their consultants, and EESPs such as Frontier Associates (TXu 1-904-705), ICF, CLEAResult, and Nexant. Portions of the TRM are copyrighted 2001–2017 by the Electric Utility Marketing Managers of Texas (EUMMOT), while other portions are copyrighted 2001–2018 by Frontier Energy. Certain technical content and updates were added by the EM&V team to provide further explanation and direction as well as consistent structure and level of information.

## **TRM Technical Support**

Technical support and questions can be emailed to the EM&V team's project manager ([lark.lee@tetrattech.com](mailto:lark.lee@tetrattech.com)) and PUCT staff ([therese.harris@puct.texas.gov](mailto:therese.harris@puct.texas.gov)).

# 1. INTRODUCTION

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This volume of the technical reference manual (TRM) contains EM&V team recommendations regarding program implementation that may affect claimed savings. The EM&V contractor drafts guidance memos for the electric utilities' energy efficiency programs to provide clear direction on calculating or claiming savings. Guidance memos are consistent with the Energy Efficiency Rule P.U.C. SUBST. R. 25.181 (16 TAC §25.181) and the TRM but address areas where additional direction is needed for consistency and transparency across utilities' claimed savings from the programs. This volume compiles the various guidance memos produced during the EM&V effort.

Implementation guidance contained in this volume is summarized by sector below:

## Commercial

- Project documentation
- Incentives and claimed savings
- New construction

## Cross-Sector

- Load management programs
- Commercial and residential HVAC split-systems without AHRI certification
- Measurement and verification claimed savings
- Upstream/midstream program cross-sector savings
- Data model



## 2. COMMERCIAL

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### 2.1 PROJECT DOCUMENTATION

This section summarizes the progress and current status of the evaluation, measurement, and verification (EM&V) team's assessment of the utilities' efforts to meet and conform to project documentation standards and provides additional guidance for areas still in need of improvement as part of the annual EM&V statewide report.

#### 2.1.1 Background

For all energy efficiency programs, critical inputs and methodologies needed to replicate claimed savings calculations are captured in a combination of the TRM, program manuals, program tracking data systems, and individual project documentation. Project-level documentation is critical to the transparency of claimed savings and facilitates efficient third-party EM&V at the project, program, and portfolio levels. This section specifically addresses individual project documentation needs; individual project documentation includes all relevant site-specific details (e.g., audit reports, worksheets, program applications, invoices, project overviews and descriptions, photos, installation reports).

We provide detail on documentation best practices currently incorporated into many Texas programs (based on information gathered during annual evaluation activities) and recommendations for improvement. The objective is to support the utilities in achieving industry-standard degrees of documentation rigor, clarity, and efficacy; these standards are necessary to organize and manage such information to yield transparency and facilitate efficient and effective evaluation.

#### 2.1.2 Additional Documentation Guidance

In this section, we provide guidance geared specifically to help improve CSOP program documentation scores. However, the guidance may also be used to support the continued improvement of program documentation for other programs.

##### **Recommendation 1: Clearly organize project files.**

Organized project files are critical for many reasons, including:

- clear and transparent reporting of documentation used to support claimed savings,
- ease of identification of related program project files that may not have made the data transfer,
- backup support for information within tracking data systems,
- support custom parameter usage, and
- support deviation or enhancement of methodologies to gain greater accuracy.

An important part of organized project folders, files, and documents is clear naming conventions; this helps keep files organized and improves consistency in document placement and locating critical documents to support the EM&V efforts. Below are some examples of the difficulty the EM&V team has had with project-level folders and files received:

- The project folders often contained inconsistencies regarding file and document names, locations, and contents. Files with similar names often contained disparate information, while seemingly identical files contained dissimilar information.
- The project folders included multiple copies of project documents. Locating the final documents used to support the reported savings proved difficult for many projects. For example, when numerous photos are provided, locating those that support the key savings assumptions is difficult. Distinguishing between pre- and post-equipment photos was also, at times, difficult.
- Project folders contained documents labeled as verification reports when they were still actually measurement and verification (M&V) plans with no completed verification data. Such plans provided the methodology to verify project savings estimates yet did not document that the projects were complete.

The project file organization example below provides a list of potential project subfolders and documents that would be ideal for collecting information to determine whether a pre- and post-inspection has been completed. Many documents listed are key elements necessary to support custom project assumptions and review.

**Table 1. Project File Organization Example**

Stage	Retrofit and new construction
<b>Pre-project*</b>	<ul style="list-style-type: none"> <li>• Pre-project calculator</li> <li>• Plans (e.g., drawings, fixture list)</li> <li>• Pre-project inspection photos</li> <li>• Pre-project audit reports</li> <li>• Project descriptions, sponsor agreements, etc.</li> </ul>
<b>Post-project</b>	<ul style="list-style-type: none"> <li>• Post-project inspection calculator</li> <li>• Post-inspection field notes</li> <li>• Post-project inspection photos</li> <li>• As-built plans</li> <li>• Installation reports</li> </ul>
<b>Supporting documents</b>	<ul style="list-style-type: none"> <li>• Calculators (old and archived)</li> <li>• Spreadsheets or other backup documentation (especially those to support custom calculations)</li> <li>• Specifications, cut sheets, certifications</li> <li>• Check requests to utility</li> <li>• Partner letters or savings summaries</li> <li>• Material purchase orders and invoices</li> <li>• Email communication</li> <li>• M&amp;V plan for custom key input assumptions (e.g., operating hours) or custom savings methodologies</li> </ul>
<b>Final documents**</b>	<ul style="list-style-type: none"> <li>• Final calculator</li> <li>• Final M&amp;V plan for custom projects</li> <li>• Final verification documents for custom projects</li> <li>• Final project notes</li> </ul>

\* New construction projects may not necessarily include these documents.

\*\* These documents also support EM&V on-site minimum requirements for data collection needs.

**Recommendation #2: Use photo verifications to support key measure assumptions.**

When on-site fieldwork is complete—whether by trade allies, implementation staff, or utility staff—representative photos can help document and support key measure attributes and assumptions. Most programs include some form of photo documentation to support projects. Some programs in Texas even use tablets in the field whereby the project site and equipment photos are taken by trade allies and automatically uploaded to tracking systems and project folders. The table below outlines how photos can support project documentation for some of the most common commercial project types (i.e., lighting- and HVAC-based projects).

**Table 2. Project Verification Applications and Examples**

Stage	Lighting projects*	HVAC projects
<b>Pre-project</b>	<ul style="list-style-type: none"> <li>• Existing lighting system types (e.g., lamp, ballast, fixture)</li> <li>• Existing lighting equipment quantities</li> <li>• Existing control type</li> <li>• Existing lighting equipment operability and inoperability</li> <li>• Building type</li> <li>• Air conditioning type</li> </ul>	<ul style="list-style-type: none"> <li>• Existing HVAC equipment types and sizes</li> <li>• Existing HVAC equipment quantities</li> <li>• Existing HVAC equipment operability and inoperability (e.g., setpoint, load display shots)</li> <li>• Building type</li> </ul>
<b>Post-project</b>	<ul style="list-style-type: none"> <li>• New lighting system types (e.g., lamp, ballast, fixture)</li> <li>• New lighting equipment quantities</li> <li>• New control type</li> <li>• New control schedule automation (e.g., building and lighting automation system screenshots)</li> <li>• New lighting equipment operability</li> <li>• Building type</li> <li>• Air conditioning type</li> </ul>	<ul style="list-style-type: none"> <li>• New HVAC equipment types and sizes</li> <li>• New HVAC equipment quantities</li> <li>• New HVAC equipment operability (e.g., setpoint, load display shots)</li> <li>• Building type</li> </ul>

\* Note that some of these project parameters may not be possible to capture for all lighting quantities for large lighting projects. In these cases, alternative project documentation types may be preferred.

**Recommendation #3: Include clear descriptors of measure type as well as quality assurance/quality control (QA/QC) inspections in the tracking system.**

Different projects (e.g., retrofit versus new construction projects, inspected versus not inspected sites) have different documentation needs. Capturing participant descriptors can aid evaluation efforts significantly, keep cost burdens low, and facilitate transparency.

Many commercial programs continue to track and describe measure-level savings at the measure-category level (or savings calculator level) instead of the measure-specific level. For example, the tracking system will document the savings associated with a lighting project captured within a lighting calculator (e.g., Lighting Equipment Survey Form version 9.02). However, the calculator includes many different lighting fixture types, effective useful lives, and related savings. Tracking project data at the measure-specific level (e.g., integrated-ballast LED lamps, linear fluorescent, lighting controls) rather than the measure-category level will improve

the data's transparency to readily assess measure types and individual claimed savings. This structure also supports ease for calculating cost-effectiveness.

As another example, new construction projects may not have pre-inspection forms or field notes. In contrast, retrofit projects may have many pre-project documentation types (e.g., pre-project calculator, pre-project plans, pre-inspection photos). Providing information regarding "greenfield" or complete demolition and rebuild projects as a differentiator from retrofits and small remodels upfront is a valuable population segmenting descriptor. When tracking systems use descriptors like these, they become a valuable screening tool; they can inform evaluators not to request certain documentation (that may not exist), which can misdirect time and resources. It also allows better budgeting and allocation of resources, improving overall efficacy. Another example is those sites or program participants that receive internal QA/QC versus those that do not. Some programs have modified their tracking systems to begin logging this data and provide a list as part of the EM&V data collection process; this list notifies the EM&V team that a site will not have specific project-level documentation because it was not site-inspected or verified, etc.

#### **Recommendation #4: Complete M&V plans and reports needed for custom projects.**

The industry standard for M&V plans and reports is based on the guidelines of Efficiency Valuation Organizations (EVO) International Performance Measurement and Verification Protocol (IPMVP). IPMVP Volume I EVO 10000-1:2012 is the current version available; it includes clear recommendations for meeting the minimum information requirements for complying with IPMVP protocols, including those specific to the M&V plan contents summarized in Chapter 5 and M&V reporting summarized in Chapter 6.

Utilities and their implementation contractors are encouraged to engage and collaborate with the EM&V team to discuss issues and options, obstacles, and possible solutions for M&V plans as new technologies or offerings become part of the Texas portfolios.

## 2.2 INCENTIVES AND CLAIMED SAVINGS

This section provides guidance on claiming savings when a financial incentive does not cover all project savings during the implementation of energy efficiency measures.<sup>1</sup>

### 2.2.1 Background

To meet various program objectives, it is common practice for utilities to set a ceiling or cap for the financial incentive any one energy efficiency service provider (EESP) or project can receive. These "individual incentive caps" are set as an overall percentage of the total incentive budget or as a dollar amount. The established caps vary by utility and are noted in their program manuals.

Individual incentive caps are different from a "set incentive." During the application phase, utilities calculate a project incentive based on pre-installation estimated savings; reserving incentive funds are at that time. Once the project is complete, there may be some variation in the initial agreed-upon savings estimates while setting the incentive and the actual post-installation savings. This variation is due to changes in efficiency levels, quantities, or equipment types that take place between the project planning phase and the project implementation phase.

### 2.2.2 Considerations

In the case of incentive caps, the EM&V team has some concerns regarding claiming all project savings when reaching an incentive cap. Since all project savings are not being incentivized at the project planning phase, claiming all project savings may result in increased free-ridership. A free-rider is "a program participant who would have implemented the program measure or practice in the absence of the program." (16 TAC § 25.181 (c) (24)).<sup>2</sup>

In the case of set incentives, the EM&V team has some concerns that spillover could be claimed incorrectly during post-project inspections. Spillover is "reductions in energy consumption and demand caused by the presence of an energy efficiency program, beyond the program-related gross savings of the participants and without financial or technical assistance from the program." ((16 TAC § 25.181 (c) (53)). Spillover is a component of net savings, and claimed savings are based on gross savings. Therefore, spillover should not be included in claimed savings if found on-site during post-project inspections.

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<sup>1</sup> This guidance does not apply to behavioral, code or other market transformation programs where the primary program strategy is technical assistance and/or education that results in behavioral or operational changes for energy and demand savings.

<sup>2</sup> In addition to the incentive caps or set incentives at the individual EESP or customer-level, utilities may also set caps on incentives a customer can receive at the measure level. For example, a utility may cap lighting incentives at 50 percent of the total project incentive. The EM&V team does not have the same concerns regarding free-ridership for measure-level caps and the recommendations in this memo do not apply to these situations.

## 2.2.3 Recommendations

Establish greater consistency in the treatment of projects where claimed savings exceed incentive amounts and most accurately represent the savings results from these projects. The EM&V team recommends utilities either only claim the savings from the incentivized measures or the utilities apply the most updated net-to-gross (NTG) research<sup>3</sup> to the total project savings for the claimed savings<sup>4</sup> as follows:

For projects where the *claimed savings are more than 10 percent higher than the "set incentive,"* the NTG ratio inclusive of free-ridership and spillover should be applied to the total project savings. No NTG ratio should be applied for projects where the set incentive and claimed savings differ by 10 percent or less to allow for normal variation between project planning and implementation

For projects where *claimed savings exceed the "incentive cap" savings up to 20 percent of incentivized savings,* the NTG ratio inclusive of free-ridership and spillover should be applied to the total project savings.

$$NTG\ ratio_{projects\ exceeding\ set\ incentive} = 1 - Free\ Ridership + Spillover$$

**Equation 1**

For projects where total *claimed savings exceed the "incentive cap" by more than 20 percent of incentivized savings,* the NTG ratio only accounting for free-ridership should be applied to the total project savings. Applying the NTG ratio that is also inclusive of spillover to projects that exceed incentive amounts by a percentage of incentivized savings this large would likely result in double-counting spillover.

$$NTG\ ratio_{projects\ exceeding\ incentive\ cap} = 1 - Free\ Ridership$$

**Equation 2**

The PY2017 EM&V research updated NTG ratios for the commercial standard offer (CSOP) and market transformation programs (CMTPs). The PY2017 NTG research accounts for both free riders and spillovers. The CSOP NTG ratio is 91 percent for kWh and 89 percent for kW. The CMTP NTG ratio is 86 percent for kWh and 99 percent for kW.

**Table 3. PY2017 Commercial Statewide NTG Ratios by Program Type**

Program type/weighting	Free-ridership (%)	Spillover (%)	NTG (%)
CSOP kWh	33	24	91
CSOP kW	32	21	89
CMTP kWh	36	22	86
CMTP kW	33	32	99

<sup>3</sup> The use of a net to gross adjustment to account for free-riders is addressed in § 25.181 (e)(5)(B)(ii).

<sup>4</sup> This recommendation does not apply to behavioral, code or other market transformation programs where the primary program strategy is technical assistance and education that results in behavioral or operational changes for energy and demand savings.

Projects might have multiple measures with different effective useful lives (EULs) that are taken into account when calculating lifetime savings; for these cases, the EM&V team provides the following additional guidance for adjusting claimed savings that exceed incentive levels:

1. Determine the total calculated savings by EUL.
2. Determine the percent of total project savings attributed to each EUL.
3. Adjust savings as recommended above.
4. Distribute adjusted savings to various project EULs using the percentages calculated in step 2.

The following is an example of a project with 50 kW and 50,000 kWh of calculated savings. An RTU HVAC project with a 15-year EUL attributes twenty percent of those savings, and a chiller project with a 25-year EUL attributes the remaining 80 percent. The adjusted savings are 40 kW and 40,000 kWh. Those adjusted savings would be attributed to each EUL as follows:

1.  $40 \text{ kW} \times 20\% = 8 \text{ kW}$  and  $40,000 \text{ kWh} \times 20\% = 8,000 \text{ kWh}$  attributed to the 15-year EUL
2.  $40 \text{ kW} \times 80\% = 32 \text{ kW}$  and  $40,000 \text{ kWh} \times 80\% = 32,000 \text{ kWh}$  attributed to the 25-year EUL

## **2.3 NEW CONSTRUCTION**

This section provides additional guidance to select the appropriate baseline for commercial new construction projects.

### **2.3.1 Overview**

Utility programs include incentives for a variety of projects applicable to commercial new construction such as lighting, HVAC, and roofs. To effectively implement new construction energy efficiency projects, utility programs need to reach decision-makers during the project design phase. However, it is common for several years to pass between the project design phase and project completion in commercial new construction. Since baselines change, this situation raises the question of what baseline utilities should use commercial new construction projects to claim savings. For example, in PY2016, Texas' new construction baseline was IECC 2009 based on the state code in effect at that time. In PY2018, the baseline was IECC 2015 based on the state code in effect.

### **2.3.2 Recommendation**

For commercial new construction projects, utilities should use the building permit date to determine the applicable version of the Texas TRM and baseline to calculate savings.



## 3. CROSS-SECTOR

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### 3.1 LOAD MANAGEMENT PROGRAMS

This section summarizes guidance from the EM&V team on two load management issues raised by one or more utilities during PY2014–PY2015 EM&V: (1) rounding of demand impacts and (2) meter issues.

#### 3.1.1 Rounding

During the EM&V contractor's evaluation efforts on commercial load management programs, the EM&V contractor has found some differences in rounding in the commercial load management programs' demand impacts. These rounding differences are minor and are not a concern in the accuracy of the reporting of impacts. However, in response to a request for guidance to address rounding consistently, the EM&V team recommends utilities round commercial load management impacts consistently with how incentives are awarded, which is at the customer level.

#### 3.1.2 Meter Issues

Utilities are responsible for calling a test event each program year for the load management programs. The test event has several purposes, including assuring the proper functioning of program meters. Utilities are responsible for maintaining working program meters.

**Commercial load management programs.** Without complete interval meter data to calculate the baseline and event impacts, savings may not be claimed. However, if a customer has alternate interval meter data available, it can be used in lieu of program meter data to calculate claimed savings. Using customer meters for the load management program savings requires that the data meet interval metering requirements presented in the version of the Texas TRM for the program year. In general, it is recommended that customer-owned interval meters should only be used if utility interval meters fail. Data from each should not be combined for claiming savings for a specific event and must cover both the event day data and baseline data.

The EM&V team requests utilities notify them in these circumstances. All calculations and data stemming from the use of customer meters should be provided as part of the EM&V data request, similar to using program meter data. If requested by the utility, the EM&V team is available to review the use of customer meter data in advance of a program claiming savings from customer meters.

**Residential load management programs.** If there are random, non-systematic errors in smart meter data for less than one percent of total participants, the average savings from a similar group of participants (e.g., single-family, multifamily) may be used for claimed savings if: (1) the control event technology and intervention are the same and (2) the control event intervention can be confirmed based on standard program practices for event confirmation.

The EM&V team requests utilities notify them in these circumstances to discuss the approach for determining and applying average savings for those customers with incomplete meter data.

## 3.2 COMMERCIAL AND RESIDENTIAL HVAC SPLIT-SYSTEMS WITHOUT AHRI CERTIFICATION

This section provides guidance to determine efficiency levels of eligible HVAC split systems that do not have AHRI certification. The methodology outlined below can be used starting in PY2021.

Constructing AC and heat pump systems can be done using outdoor units and indoor units from different manufacturers; not all these combinations are certified by AHRI. Savings should be calculated and reported consistently across utilities and in agreement with industry-standard practices and the Energy Efficiency Rule 16 TAC § 25.181.

Projects in PY2020 were affected by changes in supply chains due to COVID-19, leading to project equipment and timeline adjustments; it is expected that supply chain issues will continue into PY2021. In addition to the AHRI certification, the process outlined below may guide HVAC project efficiency calculations impacted by supply chain issues. Coordination with the evaluation team for alternate applications of the process is recommended.

### 3.2.1 Background

Texas TRM 7.0 allows air conditioning and heat pump split systems to be either AHRI-certified or listed on the DOE Compliance Certification Management System (CCMS). Split systems consist of an outdoor unit and an indoor unit, which can be made by the same manufacturer or separate manufacturers. The system's efficiency and size are driven primarily by the outdoor unit, although various indoor units can slightly affect the system efficiency.

Texas TRM 8.0 clarifies the allowable efficiency levels for outdoor and indoor unit pairs listed in the DOE CCMS and not AHRI-certified. The TRM states that the claimed efficiency for these non-certified pairs should not exceed the AHRI-certified pairs' average. The guidance below provides an example to identify the not-to-exceed value.

### 3.2.2 Guidance

The following guidance should be applied if paired outdoor and indoor HVAC units are not in the AHRI certification list and only have DOE CCMS testing results. In this case, the high-efficient condition's capacity and efficiency shall not exceed the average of the AHRI-certified pair listing for the matching outdoor (condenser) unit. The DOE CCMS listing provides documentation of the results that are on the AHRI certification listing and can be downloaded and filtered based on listings that use a similar condenser and various indoor units.

The following is an example scenario designed to direct the user on interpreting the guidance in this memo.

*Example: A split system is listed in DOE CCMS and is not AHRI certified.*

Analysis scenario: A high-efficiency split-system heat pump is installed with a Goodman GSZ16 outdoor unit (condenser) and a third-party indoor unit (air handler). The specific pair is not listed in the AHRI database.

**Step 1: Access the DOE CCMS<sup>5</sup> and select the appropriate measure category for the product pair.** In this example, it is the *Air Conditioners and Heat Pump – Central* measure category.<sup>6</sup> Search for the critical component to the system's efficiency (the outdoor unit (condenser)), with model number GSZ160241B\*. The \* is added near the end of the model number to allow for different condenser unit variations.

**Step 2: Identify the specific air handler match and record the specifications from the DOE CCMS.** In this example, the Airmark GES244 indoor unit pairs with the Goodman GSZ160241B outdoor unit with the following specifications:

**Table 4: Specification of an Example Split System**

Cooling capacity (Btu/h)	24,000
Heating capacity (Btu/h)	24,000
SEER	16
EER	13
HSPF	9
Link to FTC Energy Guide label	(blank)*

\* (blank) indicates the pair is not listed in the AHRI database.

The *Link to FTC Energy Guide Label* column will identify other certifications obtained by this equipment pair. In the example, the column is blank, indicating it is not listed in the AHRI database.

**Step 3: Filter the DOE CCMS database to match the specification of the installed pair.** Filter the *product code description*, *cooling capacity*, and *Link to FTC Energy Guide Label* to find a representative sample of similar AHRI-listed units. Table 5 details the filter selected for the example. Figure 1 shows the filter on the CCMS database interface.

**Table 5: Example DOE CCMS Filter to Similar Equipment**

Product code description	Single-split-system-heat-pump
Cooling capacity	22,500 to 26,500
Link to FTC Energy Guide Label	<a href="http://www.ahridirectory.org">www.ahridirectory.org</a>

<sup>5</sup> DOE Compliance Certification Database. [https://www.regulations.doe.gov/certification-data/#q=Product\\_Group\\_s%3A\\*](https://www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A*)

<sup>6</sup> Note that the measure categories are based on technology and not use. The example is for a split system, but the category in the database is central system because the condenser technology meets that definition.

Figure 1. Example Filter of DOE CCMS database

The screenshot shows the DOE CCMS database interface for 'Air Conditioners and Heat Pumps - Central'. At the top, there is a search bar with the text 'Air Conditioners and Heat Pumps - Central' and a refresh icon. Below the search bar, a note states: 'Please note: The Compliance Certification Database houses information submitted by importers and U.S. manufacturers of covered products and equipment subject to those standards. The appearance of a model on this web site is not an indication that DOE has determined that the model is compliant with DOE energy conservation standards. Each importer must submit a valid certification report for each model it imports, even if the model already appears on this web site. Link to Full Disclosure. This web site is updated approximately every two weeks.'

The main filter panel includes several sections:
 

- Brand Name(s):** A dropdown menu showing '(All 17)'.
- Product Group Code Description:** A dropdown menu showing 'Single-split-system heat pumps'.
- Seasonal Energy Efficiency Ratio (SEER) in Btu/W-h:** A slider ranging from 12 to 42.
- Energy Efficiency Ratio (EER) in Btu/W-h:** A slider ranging from 7.6 to 20.4.
- Cooling Capacity (Btu/h):** A slider ranging from 22500 to 28500.
- Heating Capacity (Btu/h):** A slider ranging from 7000 to 77000.
- Heating Seasonal Performance Factor (HSPF) in Btu/W-h:** A slider ranging from 7.2 to 15.2.
- Average Off Mode Power Consumption (Watts):** A slider ranging from 1 to 33.
- Note:** 'Valid only with specified blower'.
- Link to FTC EnergyGuide Label:** A dropdown menu showing 'https://www.ahridirectory.org'.

Below the filter panel, a table displays search results. The table has columns for Brand Name(s), Product Group Code Description, Outdoor Unit or Package Unit Individual Model Number, Indoor Unit Individual Model Number, Air Mover (Blower) in Indoor Unit if Fan is Part of Indoor Unit Individual Model Number, Cooling Capacity (Btu/h), Heating Capacity (Btu/h), Seasonal Energy Efficiency Ratio (SEER) in Btu/W-h, Average Off Mode Power Consumption (Watts), Energy Efficiency Ratio (EER) in Btu/W-h, Is the Efficiency Based on a System Tested without an Air Mover (i.e., Coil-Only System) or a System Tested with an Air Mover, such as a Furnace (i.e., a Blower-Coil System)?, Link to FTC EnergyGuide Label, and Energy Cost Estimate. The first row shows a model with a cooling capacity of 22600 and a SEER of 14.5.

A large black oval highlights a detailed view of a single product entry, showing the same filter panel as above. A red arrow points to a 'Download' button in the top right corner of the interface.

**Step 4: Download the filtered database using the *download* button on the right side of the screen.** A .csv spreadsheet will download. Project documentation should include a copy of the downloaded .csv file with the download date in the file name. Since the DOE CCMS is frequently updated, this file is the record of the DOE CCMS entries on the date of application review.

Figure 2 below shows the downloaded spreadsheet with three rows added above. Rows 2 and 3 identify the filters and the performance metric columns. Column C is the filter to the outdoor unit in Step 1. Columns G and Q (not shown) are the filters applied in Step 3.

Columns I, K, and M contain the performance metrics for the filtered products and represent the AHRI-certified performance metrics for similar split-system pairs with the matching outdoor unit (condenser).

**Figure 2. Sample Downloaded Spreadsheet with Calculation**

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1			Filter to Outdoor				Filter to approx Size		Average =	15.20918	Average =	8.61169	Average =	12.58307
2			Unit Model				Range		Performance Metric		Performance Metric	Performance Metric		
3			Condenser Model				Cooling Capacity		SEER	HSPF	EER			
4	Brand_Name	Product_Group	Basic_Model_Num	Outdoor_Unit_c	Indoor_Unit_In	Air_Move	Cooling_Capacity_B	Heating_Cc	Seasonal_Energ	Note_s	Heating_Seaso	Average_Off	Energy_Efficien	Is_tf
5	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CSCF3036N6D*	D*80VC08	23000	23200	15	Valid only wi	8.5	33	12.5	Blow
6	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CA*F3636*6D*	D*80VC08	23000	23200	15	Valid only wi	8.5	33	12.5	Blow
7	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CSCF3036N6D*	D*80VC08	23000	23000	14.5	Valid only wi	8.2	33	12.2	Blow
8	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CHPF3636B6C*	D*80VC08	23000	23400	15	Valid only wi	8.5	33	12.5	Blow
9	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CHPF3636B6C*	D*80VC08	23000	23400	15	Valid only wi	8.5	33	12.5	Blow
10	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CA*F3636*6D*	D*80VC06	23000	23200	15	Valid only wi	8.5	33	12.5	Blow
11	DAIKIN	Single-split-sys	GSZ160241B*	DZ16SA0241B*	CA*F3137*6A*	D*80VC06	23400	23600	16	Valid only wi	9	33	13	Blow
12	GOODMAN	Single-split-sys	GSZ160241B*	GSZ160241B*	CA*F3137*6A*	A*VM970	23400	23600	16	Valid only wi	9	33	13	Blow
13	FRANKLIN	Single-split-sys	GSZ160241B*	GSZ160241B*	CA*F3636*6D*	A*VM970	23000	23200	15	Valid only wi	8.5	33	12.5	Blow
14	ENERGI AIR	Single-split-sys	GSZ160241B*	GSZ160241B*	CA*F3636*6D*	A*VM970	23000	23200	15	Valid only wi	8.5	33	12.5	Blow

Column I, K, and M are the DOE CCMS logged values of SEER, HSPF, and EER, respectively. Row 1 uses the =Average() function in Microsoft Excel to identify the average performance metrics from the data in the database. Record these values rounded to one decimal point.

**Table 6. Average Performance Metrics of Similar Certified Units**

SEER (AHRI average)	15.2
EER (AHRI average)	12.6
HSPF (AHRI average)	8.6

**Step 5: Identify the performance metrics used for TRM energy efficiency calculations.**

The installed unit pair's performance metrics for the calculation shall not exceed the similar-sized unit pair's performance metrics in the AHRI database.

**Table 7. TRM Calculation Performance Metrics Determination**

Performance metric	DOE CCMS (actual)	AHRI certification average	TRM calculation value <sup>7</sup>
SEER	16	15.2	15
EER	13	12.6	12.5
HSPF	9	8.6	8.6

**Step 6: Complete the TRM energy savings calculation using the TRM calculation values determined in Table 7.**

Include (1) the additional documentation of the original downloaded .csv file and (2) the average efficiency calculation spreadsheet file with the project documentation required in TRM Volume 2 and Volume 3.

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<sup>7</sup> TRM calculation was determined using the rounding for EER and HSPF values to matched deemed tables. If the calculator can handle more detail, using the values rounded to the nearest tenth is acceptable.

### 3.3 MEASUREMENT AND VERIFICATION CLAIMED SAVINGS

This section provides guidance on claiming savings for projects implemented in one program year with measurement and verification (M&V) methodologies across two program years. This guidance aims to balance the level of savings claimed in the same year as the project activities with savings claimed once the M&V is completed.

#### 3.3.1 Introduction

The annual reporting of program savings poses a challenge to accurately estimate impacts when the M&V methodology requires information across program years (such as 12 months of post-project consumption data to see seasonal effects or summer peak metering to estimate kW reductions). Projects extending beyond program years are a common challenge for behavioral programs and complex custom commercial and industrial projects.

Volume 4 of the TRM includes an M&V protocol for behavioral programs based on 12 months of pre-install and post-install data to accurately determine energy savings. Although savings can be estimated through custom calculations, the final amount of energy savings needs to be *trueed-up* once all 12 months of post-install data is collected and analyzed. Trueing-up project savings is also common for custom commercial projects where M&V is required across program years. Utilities have employed the standard practice for custom projects of awarding 40 percent of the incentives and claiming 40 percent of the savings in the first program year based on the initially-estimated savings. In the subsequent program year, when M&V post-install data is fully collected and analyzed, the remaining 60 percent, or *trueed-up* amount, is awarded and savings claimed. We refer to this as a 40/60 split though the percentage claimed in the second year may be less than or greater than 60.

In addition to these two common examples, this claimed savings guidance could also apply to any program wanting to claim savings through an M&V protocol as opposed to TRM deemed savings.

#### 3.3.2 Recommendation

We recommend that a 40/60 split of incentives and claimed savings is employed whenever M&V spans two program years. In other words, award 40 percent of incentives and savings claimed in the first program year—and the true-up, whether it is greater or less than 60 percent—would be awarded and claimed the second program year. The true-up is required, whether it is to claim the remainder of the estimated savings or increases and decreases to the previously claimed energy savings. For example, if a project is estimated to reduce the peak kW by 100 kW, the project should claim 40 kW at project completion. Once the M&V is completed, the full savings may be claimed. For this example, we assume the M&V found the peak demand reductions were 110 kW. The true-up claim would be 70 kW in the second program year instead of the 60 kW as initially estimated in the 40/60 split. However, if the completed M&V analysis instead finds the total peak demand reduction is 30 kW, the true-up claim would be negative 10 kW.

This 40/60 split balances the first program year implementation of the measure and its planned savings with what savings are found actually to be in the second year once M&V is complete.

There may be instances when a utility feels a different balance, such as a 50/50 split, which may be more appropriate. The utility should seek the PUCT EM&V contractor's review and approval of a different split of incentives and claimed savings across program years than the standard recommendation of 40/60 in this guidance section.



## 3.4 UPSTREAM/MIDSTREAM PROGRAM CROSS-SECTOR SAVINGS

This section provides guidance to calculate and allocate savings at the sector-level for upstream and midstream programs where installation location is not identified. The methodology that was reviewed and approved for use in PY2021 is also outlined.

### 3.4.1 Background

TRM v8.0 updated methods to calculate and allocate savings for lighting equipment sold through participating upstream and midstream programs. The TRM v8.0 method attempted to simplify the process for equipment sold when installation location is not known, although several unintended consequences require adjustment. The recommendations below apply to programs when installation location must be generalized. If location installation is known at the time of sale, the assumptions for building type and lamp watts from the TRM should be used.

### 3.4.2 Recommendations

**Claimed savings by sector.** To account for the cross-over between commercial and residential applications in an upstream or midstream delivery method, the EM&V team recommends that five percent of upstream and midstream lighting program benefits and costs are allocated to commercial customers, with the remaining 95 percent allocated to residential customers. This recommendation replaces the recommendation on [page 13](#) of TRM v8 volume 2 and agrees with the guidance memo put forth by the EM&V team, dated April 28, 2016.

**Residential savings.** The EM&V team recommends that the calculation methodology outlined in TRM v8.0 volume 2 be used for the residential portion of the savings. Savings should be calculated using the TRM stipulated average HOU per year for residential applications, 803 hours, and the coincidence factors summarized in [Table 5](#) and [Table 14](#). The blended HOU and coincidence factors summarized in [Table 7](#) and [Table 16](#) of section 2.1.1 and 2.1.2, respectively, should not be used to calculate savings. The EM&V team will clarify these assumptions in the TRM 9.0 update.

**Residential low-income savings determination.** Programs that are able to determine low-income and hard-to-reach eligibility by collecting customer information are permitted to use the 10-year low-income EUL to claim savings. For PY2021, utilities should continue documenting low-income accounts using the program eligibility certification forms maintained by the PUCT. Updated requirements are incorporated when implemented.

**Commercial savings.** The commercial lighting savings per lamp can be determined using commercial midstream assumptions identified in [Table 11](#) and [Table 12](#) of TRM volume 3. These tables identify the annual operating hours (AOH), coincidence factors, and in-service rates (ISR). Table 8 below is an updated version of [Table 12](#) in TRM volume 3 and is recommended to determine assumptions for energy savings calculations.

**Table 8. Midstream Assumptions by Lamp Type**

Lamp type	AOH	Coincidence factors					ISR
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	
General Service Lamp	3,748	0.69	0.69	0.73	0.73	0.71	0.98
Pin-based Lamp	3,744	0.67	0.67	0.72	0.72	0.68	0.98
Directional/Reflector	3,774	0.78	0.79	0.78	0.79	0.82	1.00
LED Tube	3,522	0.74	0.75	0.84	0.84	0.76	1.00
High Bay Fixture	3,796	0.78	0.79	0.83	0.84	0.80	1.00
Garage	7,884	1.00	1.00	1.00	1.00	1.00	1.00
Outdoor	3,996	0.67	0.71	0.61	0.75	1.00	1.00

The interactive effects should be standardized across all commercial midstream lamp types. All locations should be considered refrigerated air, see Table 9 below ([Table 11](#) from volume 3 of the TRM is unchanged by this guidance).

**Table 9. Deemed Energy and Demand Interactive HVAC Factors**

Space conditioning type	Energy interactive HVAC factor	Demand interactive HVAC factor
Refrigerated air	1.05	1.10
Evaporative cooling	1.02	1.04
Med. temperature refrigeration (33°F to 41°F)	1.25	1.25
Low temperature refrigeration (-10°F to 10°F)	1.30	1.30
None (unconditioned/uncooled)	1.00	1.00

### 3.5 DATA MODEL

With the goal of easing the interpretation of the TRM by database and tracking system developers, the EM&V team worked with EUMMOT and Texas eTRM providers (i.e., Frontier Energy, ANB Systems) to develop a standard data model that outlines common data collected for each prescriptive measure. As of TRM 8.0, the data model is for all residential measures in Volume 2. A data model for Volume 3 commercial measures may be completed in the future.

For example, the current data model for an ENERGY STAR® clothes dryer includes weather zone, unit type (front-loading, top-loading, compact), capacity (standard, compact), quantity installed, and date of purchase.

A benefit of a standard data model is to improve program and project analytics across service providers and implementers. A standard data model will also standardize project collection forms (e.g., on-site inspection forms) and reduce time cleaning large data sets.

For more information, please contact an EUMMOT representative.