Technical Resource Manual
Volume 1: Overview and User Guide

Ameren Missouri TRM – Volume 1: Overview and User Guide Revision Log

Revision	Date	Description
1.0	05/30/2018	Initial version filed for Commission approval.

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1.1 Ameren Missouri-TRM Development

1.1.1 Building upon the foundation of the Missouri Statewide TRM

In 2017, the Missouri Department of Economic Development - Division of Energy ("DE") led the development of a statewide Technical Reference Manual, funded by a US Department of Energy ("DOE") grant, facilitated through contract with Vermont Energy Investment Corporation ("VEIC"), and supported by 14 formal, cost-share partners, including Ameren Missouri, Kansas City Power & Light Company, Spire, Inc., Empire District Electric Company, Summit Natural Gas of Missouri, Inc., Missouri American Water Company, Missouri Public Utilities Alliance, Missouri Energy Initiative, Renew Missouri, Sierra Club, Natural Resources Defense Council, Department of Natural Resources, Office of Public Counsel, and Public Service Commission Staff. Although consensus could not be reached on all issues, the active support of these 14 partners led to significant agreement on many aspects of a statewide Technical Reference Manual, which has provided value for the Company's MEEIA 2019-2024 filing. The statewide Technical Reference Manual was developed for use by investor-owned utilities and as an available resource for other independent utilities, program administrators, and evaluators. Due to the regulatory and legal roles of the Public Service Commission and the Office of Public Counsel, those two partners actively monitored the development of - but did not take a position on - the actual content of the statewide Technical Reference Manual. Ameren Missouri has chosen to use the statewide Technical Reference Manual as the foundation for this Technical Resource Manual ("TRM").[1] To create a transparent and clear path from Ameren Missouri-TRM-2019-21 to the actual savings calculations for prescriptive measures, Ameren Missouri created Excel-based workbooks that detail the algorithms and associated input values with formulas intact. This will be beneficial to provide direct insight into the assumptions used and updates to those input assumptions based on future evaluation results.

1.2 Ameren Missouri-TRM Organizational Structure

1.2.1 Overall Organization

For ease of use and update, the Ameren Missouri-TRM is published in three volumes:

Volume 1: Overview and User Guide (this Volume)

Volume 2: Commercial and Industrial Measures

Volume 3: Residential Measures

Information within Volumes 2 and 3 of the Ameren Missouri-TRM is organized in a way to help facilitate its access and use. The structure within these technical documents follows a two-level format, each of which becomes a major heading in the Table of Contents. These levels are designed to define and clarify what the measure is and where it is applied.

Level 1: Measure Category

- This level of organization represents most of the major categories for which an efficient alternative exists. The following table gives examples of the categories to be found in the Ameren Missouri-TRM.

[1] References generally to the TRM Ameren Missouri is submitting with its MEEIA 2019-21 filing will be designated as the "Ameren Missouri-TRM." References to the measure TRM portion addressing measure descriptions will be referred to as the "Ameren Missouri-TRM-2019-21."

Categories in the Ameren Missouri-TRM

Commercial and Industrial Market Sector	Residential Market Sector
Agricultural	Appliances
Appliances	Consumer Electronics
Compressed Air	Hot Water
Consumer Electronics	HVAC
Food Service	Lighting
Hot Water	Miscellaneous
HVAC	Motors
Lighting	Shell
Miscellaneous	
Motors	
Refrigeration	
Shell	

Level 2: Measure and Technology

Within a particular market, end-use, and measure (e.g., LED Lighting), the Ameren Missouri-TRM is not further divided by implementation or delivery methodology. For example, the characterization of an LED installed through any residential pathway – upstream lighting, direct install, efficiency kits, hard-to-reach populations, etc. – is provided in one residential measure document, with lookup tables for the appropriate distinctions in program delivery.

Intended to help answer the question, "What technology defines the measure?", this organizational approach seeks to capture the common information about a measure regardless of implementation or delivery mechanism. Within the measure, the organization provides those additional assumptions relevant to the program options. In addition, characterizations are also designed to be agnostic on which fuel the measure is designed to save – electricity or natural gas. By organizing the Ameren Missouri-TRM this way, measures that save on both fuels are captured in one place and defined with formulas and variables that allow visibility into the various fuel savings values. The intended end result is to create a categorization process for the Ameren Missouri-TRM that is easier to use and to maintain.

Further, information presented for each measure is standardized and may reflect either default/deemed or customer-specific values. Many of the measures may require the user to select the appropriate input value from a list of inputs for a given parameter in the savings algorithm. Where the Ameren Missouri-TRM asks the user to select the input, look-up tables of allowable values are provided. For example, a set of input parameters may depend on building type, and although a range of values may be given for each parameter, only one value is appropriate for any specific building type. If no table of alternative inputs is provided for a particular parameter, then the single deemed value will be used, unless the measure has a custom allowable input. Section 2.3 below provides further information on measure characterization content.

1.2.2 Measure Code Specification

Developing measure codes helps to uniquely identify each measure in the Ameren Missouri-TRM. Codes are designed to reflect the organization of the Ameren Missouri-TRM and the needs of the Ameren Missouri-TRM users. As Ameren Missouri works with its implementation contractors to complete final design of its MEEIA 2019-21 programs, it will create Measure Code Specifications to uniquely identify individual measures within the Ameren Missouri-TRM. It is important to define Measure Code Specifications for the implementation teams in a manner that both fits the implementation needs and allows

appropriate characterization within the data tracking system.

1.2.3 Components of Ameren Missouri-TRM 2019-21 Measure Characterizations

Each measure characterization uses a standardized format that includes at least the following components:[2]

DESCRIPTION

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

DEFINITION OF EFFICIENT EQUIPMENT

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

DEFINITION OF BASELINE EQUIPMENT

Clear definition of the efficiency level of the baseline equipment used to determine delta savings, including any standards or ratings (if appropriate). If there is more than one definition of baseline equipment required for an individual measure – such as a measure that can be offered through "time of sale" or "early replacement" – the measure will clearly identify this and state the criteria to be used to determine the delta savings in each case.

DEEMED LIFETIME OF EFFICIENT EQUIPMENT

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

DEEMED MEASURE COST

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

LOADSHAPE

The appropriate loadshape to apply to electric savings is provided. The Ameren Missouri-TRM 2019-21 does not define loadshapes for gas-saving measures.

COINCIDENCE FACTOR

Coincidence factors represent the fraction of connected load expected to be coincident with a particular system peak period, on a diversified basis, and is based on the ratio of the system coincident peak to annual energy by end use. Coincidence factors are provided for summer peak periods. These are also referred to as "kW factors" in the deemed savings tables.

CALCULATION OF ENERGY SAVINGS

Algorithms are provided, followed by list of assumptions with their definitions.

If there are no input variables, there will be a finite number of output values. These will be identified and listed in a table. Algorithms may be included in any or all of the following:

[2] Measures that have a higher level of complexity may have additional components, but also follow the same format, flow, and function.

- **Electric Energy Savings**

  Electric energy savings characterizations are different depending on the measure.

- **Summer Coincident Peak Demand Savings**

  Summer Coincident Peak Demand characterizations are different depending on the end-use category.

- **Natural Gas Savings**

  Natural gas energy savings characterizations are different depending on the measure.

- **Water Impact Descriptions and Calculation**

  Water Impact characterizations are different depending on the measure.

DEEMED O&M COST ADJUSTMENT CALCULATION

Only required if the operation and maintenance ("O&M") cost for the efficient case is different than the baseline.

MEASURE CODE

Measure Code Specifications will be designed with implementation teams in a manner that both fits the implementation needs and allows appropriate characterization within the data tracking system.

1.2.4 Program Delivery

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

Care has been taken to clearly define in the measure's description the types of program delivery that the measure characterization is designed to support. However, there are no universally accepted definitions for a particular program type, and the description of the program type(s) may differ by measure. Nevertheless, program delivery types can be generally defined according to the following table. These are the abbreviations and definitions used in the measure descriptions in Ameren Missouri-TRM Volumes 2 and 3. When necessary, individual measure descriptions may further refine and clarify these definitions of program delivery type.

1.2.4.1 Program Delivery Types

Program	Attributes
TOS Time of Sale	**Definition:** A program in which the customer is given an incentive to purchase or install higher-efficiency equipment than if the program had not existed. This may include retail rebate (coupon) programs, upstream buy-down programs, online store programs, or contractor-based programs as examples. **Baseline** = Federal standard, code or other (explained) baseline equipment **Efficient Case** = New, premium efficiency equipment above federal and state codes and standard industry practice **Example:** LED lamp rebate
NC New Construction	**Definition:** A program that intervenes during building design to support the use of more efficient equipment and construction practices. **Baseline** = Building code, Federal standard or baseline study **Efficient Case** = The program's level of building specification **Example:** Building shell and mechanical measures
RF Retrofit	**Definition:** A program that upgrades existing equipment before the end of its useful life **Baseline** = Existing equipment or the existing condition of the building or equipment. A single baseline applies over the measure's life. **Efficient Case** = New, premium efficiency equipment above federal and state codes and standard industry practice **Example:** Air sealing and insulation
EREP Early Replacement	**Definition:** A program that replaces existing equipment before the end of its expected life. **Baseline** = Dual; it begins as the existing equipment and shifts to new baseline equipment after the expected life of the existing equipment is over **Efficient Case** = New premium efficiency equipment above federal and state codes and standard industry practice **Example:** Refrigerators, freezers
ERET Early Retirement	**Definition:** A program that retires duplicative equipment before its expected life is over. **Baseline** = The existing equipment, which is retired and not replaced **Efficient Case** = Zero because the unit is retired **Example:** Appliance recycling
DI Direct Install	**Definition:** A program where measures are installed during a site visit. **Baseline** = Existing equipment **Efficient Case** = New, premium efficiency equipment above federal and state codes and standard industry practice **Example:** Lighting and low-flow hot water measures
KITS Efficiency Kits	**Definition:** A program where measures are provided free of charge to a customer in an Efficiency Kit. **Baseline** = Existing equipment **Efficient Case** = New, premium efficiency equipment above federal and state codes and standard industry practice **Example:** Lighting and low-flow hot water measures
DR Demand Response	**Definition:** A program where customers are given an incentive to take actions in order to reduce load during specific event times. **Baseline** = Base load absent of the program. **Efficient Case** = Observed load during program event **Example:** Residential air-conditioner cycling

1.3 General Assumptions

Sources cited within the Ameren Missouri-TRM have been chosen based on two priorities: geography and age. Whenever possible, it has incorporated Missouri-specific information into each measure characterization.

When Ameren Missouri or region-specific evaluations or data were not available, best-practice research and data from other jurisdictions was used. In every case, the most recent, well-designed, and best-supported studies have been used to support the Ameren Missouri-TRM, and only if appropriate have conclusions been generalized for practical application to the Missouri programs.

General Savings Assumptions

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

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

1.3.1 Algorithms and Variables

Many of the measures in the Ameren Missouri-TRM require the user to select the appropriate input value from a list of inputs for a given parameter in the savings algorithm. Where the Ameren Missouri-TRM asks the user to select the input, look-up tables of allowable values are provided. For example, a set of input parameters may depend on building type, and while a range of values may be given for each parameter, only one value is appropriate for any specific building type. If no table of alternative inputs is provided for a particular parameter, then the single deemed value will be used, unless the measure has a custom allowable input.

1.3.1.1 Custom Value Use in Measure Implementation

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

1.3.2 Net-to-Gross

In using the measure-specific information in the Ameren Missouri-TRM, it is important to note that savings outputs do not include net-to-gross (NTG) calculations.

1.3.3 Baseline Assumptions

The concept and definition of the baseline is a key element of every measure characterization and is directly related to the program delivery type. Without a clear definition of the baseline, the savings algorithms cannot be adequately specified and subsequent evaluation efforts would be hampered. As a result, each measure has a detailed description (and in many cases, specification) of the specific baseline that should be used to calculate savings. Baselines in the Ameren Missouri-TRM fall into one of the following categories, and are organized within each measure characterization by the program delivery type to which it applies:

1. Building Code: As defined by the minimum specifications required under applicable local codes or applicable federal standards.
2. Existing Equipment: As determined by the most representative (or average) example of equipment that is in the existing stock. Existing equipment baselines apply over the equipment's remaining useful life. In addition, existing equipment applies when there is a shift in technology used, as is the case when an efficient ASHP replaces CAC/Electric Furnace technology.
3. New Equipment: As determined by the equipment that represents standard practice in the current market environment or that has been specified for individual measure use. New equipment baselines apply over the effective useful life of the measure.

1.3.3.1 Shifting Baseline Assumptions

The Ameren Missouri-TRM anticipates the effects of changes in efficiency codes and standards on certain measures. When these changes occur, a shift in the baseline is usually required. This complicates the measure savings estimation somewhat, and will be handled in future versions of the TRM by describing the choice of and reasoning behind a baseline change. In this initial version, a shifting baseline assumption may apply to early replacement measures as well as several lighting measures.

1.3.4 Summer Peak Period Definition (kW)

Summer peak coincidence factors ("CF") can be found within each measure characterization.

1.3.5 Use of O&M Costs

Some measures specify an O&M parameter that describes the incremental O&M cost savings expected over the measure's lifetime. When estimating the cost effectiveness of these measures, it is necessary to calculate the net present value ("NPV") of O&M costs over the life of the measure, which requires an appropriate discount rate. The utility's weighted average cost of capital ("WACC") is the most commonly used discount rate used in this context.

The WACC will vary over time. As a result, the Ameren Missouri-TRM does not specify the NPV of the O&M costs. Instead, the necessary cost and timeline information required to calculate the NPV is included. An example is provided below to demonstrate how to calculate the NPV of O&M costs.

EXAMPLE

Baseline Case: O&M costs equal $150 every two years.

Efficient Case: O&M costs equal $50 every five years.

Given this information, the incremental O&M costs can be determined by discounting these cash flows in the Baseline Case and the Efficient Case separately using the applicable WACC. Then the NPV of the incremental O&M costs is calculated by subtracting one NPV from the other. This value is used in each utility's cost-effectiveness screening process.

The effect of O&M costs for those measures that include baseline shifts resulting in multiple component costs and lifetimes cannot be calculated by this standard method. In only these cases, the O&M costs are presented as annual levelized equivalent cost (i.e., the annual payment that results in an equivalent NPV to the actual stream of O&M costs) and utilities should apply their own real discount rate to determine NPVs.

1.4 Glossary

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

Building Types: Sixteen commercial and industrial ("C&I") building prototypes were modeled using DOE/EnergyPlus for the Ameren Missouri-TRM. The building types are based on the DOE Commercial Reference Buildings developed by DOE, National Renewable Energy Laboratory ("NREL"), Pacific Northwest National Laboratory (PNNL), and Lawrence Berkeley National Laboratory ("LBNL"). Detailed descriptions and variable calculations for each building prototype can be found on the Missouri Division of Energy TRM's website. Note: for C&I modeling efforts, Typical Meteorological Year ("TMY3") weather data is used as it is a designed input of energy modeling.

The following list provides a high-level definition for each C&I building type offered in the Ameren Missouri-TRM and follows DOE reference building documentation. For additional information about the prototype models and the associated inputs, please refer to https://energy.gov/eere/buildings/commercial-reference-buildings.

Building Type Name	Floor Area (ft2)	Number of Floors	CBECS #	Weighting
Large Office	498,588	12	1,251	0.5%
Medium Office	53,628	3	12,394	5.3%
Small Office	5,500	1	62,691	26.9%
Warehouse	52,045	1	70,785	30.4%
Stand-alone Retail	24,962	1	27,814	11.9%
Strip Mall	22,500	1	2,538	1.1%
Primary School	73,960	1	8,820	3.8%
Secondary School	210,887	2	7,070	3.0%
Supermarket	45,000	1	3,110	1.3%
Quick Service Restaurant	2,500	1	5,385	2.3%
Full Service Restaurant	5,500	1	12,080	5.2%
Hospital	241,351	5	747	0.3%
Outpatient Health Care	40,946	3	9,892	4.2%
Small Hotel	43,200	4	8,051	3.5%
Large Hotel	122,120	6	404	0.2%
Midrise Apartment*	33,740	4		0.0%

Note: To help determine the appropriate building type to use as a reference to a specific project, the user should take into consideration the predominant use type, size of the building/project, and the HVAC systems that serve the project. Where a project is defined by multiple uses or systems, it may be appropriate to utilize floor-area weighted averages of model outputs (e.g., EFLH) based on the distribution of those use types in the project under consideration. For example, if the user is defining EFLHs for a system or measure that impacts both retail and office spaces within a 75,000 square ft., 5-story building, then they may consider an area-weighted average EFLH from Medium Office and Stand Alone Retail.

Coincidence Factor: CFs represent the fraction of connected load expected to be coincident with a particular system peak period on a diversified basis, and is based on the ratio of the system coincident peak to annual energy by end use. CFs are provided for summer peak periods. These are also referred to as "kW factors" in the deemed savings tables.

Commercial & Industrial: The market sector that includes measures that apply to any of the building types defined in the Ameren Missouri-TRM, which includes multifamily common areas and public housing.[3]

Connected Load: The maximum wattage of the equipment under normal operating conditions.

Deemed Value: A value that has been assumed to be representative of the average condition of an input parameter.

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

Demand Response: Measures that decrease peak demand or shift demand to off-peak periods.

End-use Category: A general term used to describe the categories of equipment that provide a service to an individual or building. See Section 2, Level 1: End-use Category Table for a list of the end use categories that are incorporated in the Ameren Missouri-TRM.

Energy Efficiency: Measures that reduce the amount of electricity or natural gas required to achieve a given end use. "Energy Efficiency" also includes measures that reduce the total BTUs of electricity and natural gas needed to meet the end use or uses

Equivalent Full Load Hours ("EFLH"): The equivalent hours that equipment would need to operate at its peak capacity in order to consume its estimated annual kWh consumption (annual kWh/connected kW).

Evaluation: (Synonym, EM&V.) In the energy efficiency arena, impact evaluation is an investigation process to determine energy or demand impacts achieved through the program activities, including but not limited to savings verification, measure research, and program research.

High Efficiency: General term for technologies and processes that require less energy, water, or other inputs to operate.

Incremental Costs: A calculated difference in equipment or technology cost between a base equipment model and the more efficient model. Incremental costs can be as little as $0, indicating that there is no expected cost difference between baseline and efficient technologies. Cost of labor or other installation related costs is not considered in incremental costs.

Lifetime: The number of years (or hours) that the new high efficiency equipment is expected to function. These are generally based on engineering lives, but sometimes are adjusted based on expectations about frequency of removal, remodeling, or demolition. Two important distinctions fall under this definition: Effective Useful Life ("EUL") and Remaining Useful Life ("RUL").

> **EUL** –Based on the manufacturer's rating of the effective useful life; how long the equipment will last. It is an estimate of the median number of years that the measures installed under a program are still in place and operable.
>
> **RUL** – Applies to retrofit or replacement measures. For example, if an existing working refrigerator is replaced with a high efficiency unit, the RUL is an assumption of how many more years the existing unit would have lasted. As a general rule, the RUL is usually assumed to be 1/3 of the EUL.

Load Factor ("LF"): The fraction of full load (wattage) for which the equipment is typically run.

Measure Cost: The incremental (for time of sale measures) or full cost (both capital and labor for retrofit

[3] Measures that apply to the multi-family and public housing building types describe how to handle tenant versus master metered buildings.

measures) of implementing the High Efficiency equipment.

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

Measure: An efficient technology or procedure that results in energy savings as compared to the baseline efficiency. There are three main measure types:

1) **Prescriptive Measures** - Measures or technologies offered through a standard (in contrast to custom) program for which partially or fully deemed input values are applicable:
    i. **Fully deemed measures -** Measures whose energy savings are expressed on a per unit basis in the Ameren Missouri-TRM and are not subject to change or choice by the Program Administrator.
    ii. **Partially deemed measures -** Measures whose energy savings algorithms are deemed in the Ameren Missouri-TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.
2) **Custom Measures –**Measures or technologies that, due to the complexity in the design and configuration of the particular measure in the energy efficiency project, may be subject to a more comprehensive custom engineering algorithm and financial analysis that more accurately characterize the energy efficiency savings within a project.
3) **Comparison group EM&V measures** – Measures that determine program savings based on the differences in electricity consumption patterns between a comparison group of the program participants, not a deemed savings value. Comparison group approaches include randomized control trials ("RCTs") and quasi-experimental methods using nonparticipants, and may involve simple differences or regression methods. Because the effects of implemented measures are reflected in the observed participant-comparison differences, separate verification is not required. These methods are generally used for planning purposes to estimate program-level savings, not facility- or project-level savings, and are therefore considered an evaluation method. *Note: The reference to and inclusion of Residential Peer Comparison Behavior Programs in the Ameren Missouri-TRM is an example of where comparison group EM&V values should be used to support program considerations, rather than deemed, alongside robust reference documentation for the sources of those values and the appropriate use of SEE Action[4] and UMP guidelines[5] as required for program evaluation/savings calculation*.

Measure research: An evaluation process focused on providing better/more granular data to facilitate updating measure-specific Ameren Missouri-TRM input values or algorithms.

Residential: The market sector that includes measures that apply only to detached residential buildings, duplexes, and applicable multi-family units.

Operation and Maintenance Cost Adjustments: The dollar impact resulting from differences between baseline and efficient case O&M costs.

Operating Hours ("HOURS"): The annual hours that equipment is expected to operate.

Program: The mode of delivering a particular measure or set of measures to customers. See Section 2.4.1 for a list of program descriptions that are presently operating in Missouri.

Program Research: An evaluation process that takes an alternative look into achieved program level

4 Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations; SEE Action (State and Local Energy Efficiency Action Network- EPA/DOE), 2012.
5 The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures; Residential Behavior Protocol, NREL/DOE, 2015.

savings across multiple measures. This may or may not be specific enough to inform future updates to the Ameren Missouri-TRM. Ex. Program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures.

Table 1 – Residential End-Use Category Monthly Shapes and Coincident Peak Factors

End-Use Energy Load Shapes

% Energy by Month

	Residential End-Use Load Shape									
Month	Building Shell RES	Cooling RES	Freezer RES	Heating RES	HVAC RES	Lighting RES	Miscellaneous RES	Pool Spa RES	Refrigeration RES	Water Heating RES
January	11.1297%	0.1200%	7.9579%	21.7905%	11.1297%	10.1182%	8.4893%	8.6451%	7.7053%	10.3527%
February	9.3077%	0.1100%	7.2518%	18.2135%	9.3077%	8.8441%	7.7366%	7.1145%	7.2169%	9.0720%
March	7.0042%	0.3130%	8.1080%	13.4833%	7.0042%	9.2879%	8.4863%	8.6052%	8.0272%	9.5543%
April	3.7116%	1.5047%	7.9918%	5.8486%	3.7116%	8.4645%	8.2144%	8.0702%	7.8752%	8.4799%
May	4.0888%	6.5410%	8.4083%	1.7144%	4.0888%	7.9393%	8.4847%	8.6052%	8.5646%	8.3600%
June	10.3973%	21.0823%	8.5730%	0.0510%	10.3973%	6.8508%	8.2122%	8.0702%	8.9112%	7.7065%
July	14.0100%	28.4780%	9.6095%	0.0006%	14.0100%	6.7864%	8.4883%	8.6451%	9.4239%	6.7712%
August	13.3207%	27.0766%	9.6095%	0.0009%	13.3207%	7.0565%	8.4840%	8.5653%	9.4212%	6.3688%
September	6.6759%	12.6605%	8.4277%	0.8809%	6.6759%	7.3792%	8.2136%	8.3032%	8.4971%	6.9373%
October	3.7011%	1.8472%	8.2582%	5.4962%	3.7011%	8.4539%	8.4869%	8.6052%	8.5653%	7.9644%
November	5.9593%	0.1444%	7.8465%	11.5899%	5.9593%	8.9880%	8.2122%	8.1088%	7.8717%	8.4752%
December	10.6937%	0.1222%	7.9579%	20.9301%	10.6937%	9.8312%	8.4915%	8.6619%	7.9204%	9.9577%

End-Use Energy to Coincident Peak Demand Factors

Building Shell RES	Cooling RES	Freezer RES	Heating RES	HVAC RES	Lighting RES	Miscellaneous RES	Pool Spa RES	Refrigeration RES	Water Heating RES
0.0004660805	0.0009474181	0.0001685722	0.0000000000	0.0004660805	0.0001492529	0.0001148238	0.0002354459	0.0001285253	0.0000887318

Table 2 – Commercial and Industrial End-Use Category Monthly Shapes and Coincident Peak Factors

End-Use Energy Load Shapes

% Energy by Month

	Business End-Use Load Shape												
Month	Air Comp BUS	Building Shell BUS	Cooking BUS	Cooling BUS	Ext Lighting BUS	Heating BUS	HVAC BUS	Lighting BUS	Miscellaneous BUS	Motors BUS	Process BUS	Refrigeration BUS	Water Heating BUS
January	8.5109%	10.7824%	8.6096%	0.0006%	10.6265%	21.0397%	10.7824%	9.3564%	8.5109%	8.5109%	8.5109%	8.3486%	10.8255%
February	7.7715%	9.1052%	7.8609%	0.0247%	8.2162%	17.7436%	9.1052%	7.2162%	7.7715%	7.7715%	7.7715%	7.6158%	9.1078%
March	8.6136%	7.1135%	8.1548%	0.7236%	7.0887%	13.1924%	7.1135%	7.8373%	8.6136%	8.6136%	8.6136%	8.3346%	8.5240%
April	7.9796%	4.1179%	7.2948%	2.1691%	6.8146%	5.9718%	4.1179%	7.6534%	7.9796%	7.9796%	7.9796%	8.0783%	7.2980%
May	8.5335%	4.4424%	8.6277%	6.2980%	8.1853%	2.6769%	4.4424%	9.4247%	8.5335%	8.5335%	8.5335%	8.5133%	7.9849%
June	8.1995%	10.6128%	8.3294%	21.3170%	6.7163%	0.4295%	10.6128%	7.5599%	8.1995%	8.1995%	8.1995%	8.4295%	7.2721%
July	8.4099%	14.2881%	8.5859%	29.0029%	8.6752%	0.2895%	14.2881%	9.6200%	8.4099%	8.4099%	8.4099%	8.7457%	7.4930%
August	8.4199%	13.3494%	8.5885%	27.0206%	6.9401%	0.3432%	13.3494%	7.7078%	8.4199%	8.4199%	8.4199%	8.7230%	7.5862%
September	8.2512%	5.7810%	8.3475%	10.8695%	8.2908%	0.9402%	5.7810%	8.1374%	8.2512%	8.2512%	8.2512%	8.3319%	7.5734%
October	8.5277%	3.8018%	8.6262%	1.9643%	10.0507%	5.5497%	3.8018%	9.4072%	8.5277%	8.5277%	8.5277%	8.4563%	8.2808%
November	8.2589%	6.2104%	8.3496%	0.6030%	8.7252%	11.5452%	6.2104%	7.6707%	8.2589%	8.2589%	8.2589%	8.1112%	8.6345%
December	8.5238%	10.3950%	8.6251%	0.0064%	9.6704%	20.2781%	10.3950%	8.4090%	8.5238%	8.5238%	8.5238%	8.3119%	9.4200%

End-Use Energy to Coincident Peak Demand Factors

	Air Comp BUS	Building Shell BUS	Cooking BUS	Cooling BUS	Ext Lighting BUS	Heating BUS	HVAC BUS	Lighting BUS	Miscellaneous BUS	Motors BUS	Process BUS	Refrigeration BUS	Water Heating BUS
	0.0001379439	0.0004439830	0.0001998949	0.0009106840	0.0000056160	0.0000000000	0.0004439830	0.0001899635	0.0001379439	0.0001379439	0.0001379439	0.0001357383	0.0001811545