

**CO M M E R CI A L REF RI G E RA TI ON**

A N T I - S W E A T H E A T E R CO N T RO LS

SWCR001-02

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# MEASURE NAME

Anti-Sweat Heater Controls

# STATEWIDE MEASURE ID

SWCR001-02

# TECHNOLOGY SUMMARY

This measure is defined as anti-sweat heater (ASH) controls based on humidity to prevent condensation (“sweating”) on the glass surface of refrigerated display cases. ASHs are electric resistance heaters installed at the following locations on a refrigerated display case:

* Case mullion to prevent condensation on metal surfaces
* Door frame to prevent condensation on metal surfaces
* Glass edge to prevent condensation on the glass

The relative humidity in a grocery store is closely related to the outdoor dew point (DP) temperature. Condensation develops when the air temperature drops to the DP temperature. On warmer days when a customer opens a refrigerated display case glass door, warm moist air will come into contact with the cold glass surface and condensation will develop on the surface of the glass door. ASHs will evaporate this moisture from the glass surface, door frame, and mullion of the cases.

In standard installations, the ASHs operate at full power, 100% of the time. ASH controls, however, monitor the DP temperature of ambient air and adjust the duty cycle of the ASHs accordingly. For example, when the air is dry and the DP temperature is low, the ASHs will operate at a low-duty cycle and the glass door surface will become cold because condensation will not form. In contrast, when the air is humid and the DP temperature is high, the ASHs will operate at 100% duty cycle to keep the glass door surface warm and above the DP temperature. Between these extremes, the controls will adjust the ASH duty cycle according to the measured DP temperature.

Some of the heat generated by ASHs will add load on the refrigeration system. Therefore, any reduction in ASH power will reduce the ASH electric demand *and* lower refrigeration loads. As a result, compressor run time and therefore energy consumption are reduced. Note, however, there will be a penalty incurred from the increased space heating energy use.

# MEASURE CASE DESCRIPTION

The measure case is defined as anti-sweat heater (ASH) controls for reach-in display freezers and coolers. This measure includes two ASH control measure offerings based upon the refrigeration temperature of the display case:

Measure Case Specification

|  |  |
| --- | --- |
| Measure Offering ID | Description |
| SWCR001A | Low-temperature (freezer, case temperature below 32 F) display case ASH controls |

|  |  |
| --- | --- |
| Measure Offering ID | Description |
| SWCR001B | Medium- temperature (cooler, case temperature at or above 32 F) display case ASH controls |

# BASE CASE DESCRIPTION

The base case specification for each measure offering is a standard, fixed anti-sweat heater (ASH) for reach-in low-temperature freezer, case temperature below 32 F) and medium-temperature (cooler, case temperature at or above 32 F) display case that operates at full power, 100% of the time.

# CODE REQUIREMENTS

Federal and state standards that pertain to anti-sweat heater (ASH) controls are specified below.

Applicable State and Federal Codes and Standards

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Date |
| CA Appliance Efficiency Regulations – Title 20 (2019) | Section 1605.1(a)(5)(C)(2) | January 1, 2019 |
| CA Building Energy Efficiency Standards – Title 24 | None. | n/a |
| Federal Standards | None. | n/a |

Section 1605.1(a)(5)(C)(2) of the California Appliance Efficiency Regulations (Title 20)[[1]](#footnote-1) addresses “Walk-in Coolers and Freezers with Transparent Reach-in Doors” as follows:

*(5) Walk-In Coolers with Transparent Reach-in Doors and Walk-In Freezers with Transparent Reach-In Doors. In addition to the design standards in Section 1605.1(a)(4), walk-in coolers equipped with transparent reach-in doors and walk-in freezers equipped with transparent reach-in doors and manufactured on or after January 1, 2009 shall also meet the following design standards:*

*(C) If the appliance has an anti-sweat heater*

*1. without antisweat heat controls, the appliance shall have a total door rail, glass, and frame heater power draw of not more than 7.1 watts per square foot (W/ft2) of door opening (for freezers) and 3.0 watts per square foot (W/ft2) of door opening (for coolers);*

*2. with anti-sweat heat controls, and the total door rail, glass, and frame heater power draw is more than 7.1 watts per square foot (W/ft²) of door opening (for freezers) and 3.0 watts per square foot (W/ft²) of door opening (for coolers], the anti-sweat heat controls shall reduce the energy use of the anti-sweat heater in a quantity corresponding to the relative humidity in the air outside the door or to the condensation on the inner glass pane.*

Since the 2005 publication, the Title 20 has pertained to antisweat heat controls when the frame heater power draw exceeds the stated. However, the unit of power draw has been changing over the years. In the 2005 version, the maximum frame heater power draw after which ASH controls are required are 40

W and 17 W per foot of door frame width for freezers and refrigerators, respectively. The 2019 version has been in place since 2008 publication.

The allowable frame heater power draw when ASH controls are not required by code has been used as the frame heater power per door in the baseline calculations. See Electric Savings section for further discussion.

# NORMALIZING UNIT

Linear feet (Len-ft.)

# PROGRAM REQUIREMENTS

*Measure Implementation Eligibility*

All combinations of measure application type, delivery type, and sector that are established for this measure are specified below. Measure application type is a categorization based on the circumstances and timing of the measure installation; each measure application type is distinguished by its baseline determination, cost basis, eligibility, and documentation requirements. Delivery type is the broad categorization of the delivery channel through which the market intervention strategy (financial incentives or other services) is targeted. This table also designates the broad market sector(s) that are applicable for this measure.

*Note that some of the implementation combinations below may not be allowed for some measure offerings by all program administrators.*

Implementation Eligibility

|  |  |  |
| --- | --- | --- |
| Measure Application Type | Delivery Type | Sector |
| Add-on Equipment | DnDeemDI | Com |
| Add-on Equipment | DnDeemed | Com |

The program should collect and verify the vintage of the building and the refrigeration multiplex system. The offerings are ineligible for multiplex systems majorly upgraded or installed after July 1, 2014 since the Title-24 code mandates the floating controls since July 1, 2014.

*Eligible Products*

The anti-sweat heater (ASH) controls measure offerings are specified in the Measure Case Description.

To qualify, the display case must be equipped with humidity-sensing controls that reduce the amount of power supplied to the heaters as the store dew point (DP) temperature decreases.

Typically, power reduction occurs when relative humidity levels reach 55% and lower. Power reduction should decrease by at least 2% for every percentage the humidity falls below 55%.

Equivalent technologies that can reduce or turn off ASHs based on the amount of condensation formed on the inner glass pane *may* also qualify.

*Eligible Building Types*

This measure is applicable for any existing commercial building type of any vintage, including (but not limited to) supermarkets, grocery stores, hotels, restaurants, and convenience stores.

*Eligible Climate Zones*

This measure is applicable in any California climate zone.

# PROGRAM EXCLUSIONS

This measure cannot be used in conjunction with the new refrigeration display case with doors.

This measure cannot be used in conjunction with the special doors with low/no anti-sweat heat on low- temperature display case.

# DATA COLLECTION REQUIREMENTS

Data collection requirements are to be determined.

# USE CATEGORY

Commercial refrigeration (ComRefrig)

# ELECTRIC SAVINGS (kWh)

The unit energy savings (UES) of anti-sweat heater (ASH) controls are based upon the installation of controllers on existing ASHs on low-temperature (case temperature below 32 F) and medium- temperature case temperature (at or above 32 F) display cases. The base case of this measure is an ASH that operates continuously at full power. The installation of ASH controls will reduce the ASH operating hours and therefore reduce the refrigeration cooling load and the space cooling load.

The measure offerings existed in the 2005 version of Database for Energy Efficient Resources (DEER) as measures D03-230 and D03-231.[[2]](#footnote-2) These original measures and energy prototypes were created for the 2005 version of DEER (DEER2005). However, these measures were not updated for the DEER2020 release, and the refrigeration end use in the corresponding DEER Grocery building prototypes has not been updated since DEER2005.

In 2019, Southern California Edison (SCE) updated the refrigeration end use in the DEER prototypes.[[3]](#footnote-3)

These updated DEER protypes are referred to as modified DEER2020 prototypes.

MASControl3 (released September 30, 2018), an updated version of the measure analysis software for DEER2020, was used to generate energy usage and savings for the Grocery building prototypes.

MASControl3 uses the DOE-2.2-R52o simulation engine and provides processing scripts for computing DEER peak demand and applying vintage weights.

Assumptions

The following assumptions were established for the calculations of the energy (and demand) impacts of ASH controls:

1. *This measure applies to fixtures with single and multiplex compressor systems.* The DEER2020 prototype building models were generated for a Grocery prototype with multiplex refrigeration systems for the reach-in refrigerated display cases. Single-compressor systems are less efficient than multiplex-compressor systems. According to the 2004-2005 DEER Update Study,[[4]](#footnote-4) single- compressor systems were typically designed prior to 1980. It is assumed that the generated energy savings are applicable to display cases with single-compressor systems.
2. *This measure applies to fixtures located inside a space that has space heating and space cooling.* The unit energy savings is represented per linear foot of the display case. The resulting savings include refrigeration load reduction and space cooling load reduction, as well as increase to the space heating energy consumption. Since the heat gain to a display case primarily depends upon the temperature maintained for the display case and the surrounding space temperature, it is assumed that the building types would not have significant impact on the energy savings. Thus, the resulting savings for the Grocery prototype is applied to all other applicable building types.

Base Case and Measure Case Simulations

The building energy simulation tool DOE-2.2-R52o was used to derive base case and measure case unit energy consumption.[[5]](#footnote-5) The configuration files for DOE-2.2-R52o (.inp files) for the modified DEER protypes were taken for all vintages from 1975 to 2020 and for all 16 California climate zones. (These files are executable using eQuest Refrigeration module build 7175.) These modified DEER prototypes have higher HEATER-KW/DOOR than the allowable code requirement when ASH controls are not required, as carried over from original DEER prototypes. Since 2005, Title 20 has required ASH controls if the door power exceeds the allowable power limit. Hence the HEATER-KW/DOOR was updated for vintages 2007 and thereafter.

As stated in the Code Requirements section, the 2005 California Appliance Efficiency Regulations (Title

20) allowed total door rail, glass, and frame heater power draw of no more than 40 W and 17 W per foot of door frame width for freezers (low-temperature) and coolers (medium-temperature), respectively. In the 2008 update and until the 2019 update, the power draw was specified as 7.1 W and 3 W per square foot of door opening. Note, however, that the door power in eQuest must be input as kW/door. Because of the variation of the units among code changes and eQuest input, a conversion was required to convert W/ft2 to kW/door.

The DEER prototypes assume 2.6 feet length per door of refrigeration units, as per the comments in the

DEER prototype definition files.[[6]](#footnote-6) Using this length and assuming that the code requirements for heater power did not change from 2005 to 2008, the height of the door and the code HEATER-KW/DOOR was calculated.[[7]](#footnote-7)

|  |  |  |
| --- | --- | --- |
| Vintage | HEATER-KW/DOOR:  Low-Temperature Case | HEATER-KW/DOOR:  Medium-Temperature Case |
| 1975 - 2003 | 0.2136 | 0.0850 |
| 2007 - present | 0.1003 | 0.0424 |

The DEER prototype, when configured for this measure, defines the following refrigerated cases with doors:

|  |  |
| --- | --- |
| Low-temperature Case | Medium-temperature Case |
| LT\_FF1ReachinCase LT\_FF2ReachinCase LT\_ICReachinCase | MT\_DeliPasta MT\_Meat3 MT\_Dairy1 MT\_Dairy2 |

The base case is defined as a standard air-cooled or evaporative cooled multiplex refrigeration system (depending on climate zone) with fixed ASH controls, and maximum power rating as defined above. In particular, the following keyword applies to all cases included in the scope of the measure:

HEATER-CTRL = FIXED

The measure case is defined below; the following keywords apply to all measure offerings.

|  |  |  |
| --- | --- | --- |
| Input Component | All cases starting with LT | All cases starting with MT |
| HEATER-CTRL | HUMIDITY-RATIO | HUMIDITY-RATIO |
| MAX-HUMIDITY-RAT | 0.0111 | 0.0111 |
| MIN-HUMIDITY-RAT | 0.0054 | 0.0054 |
| MAX-HEATER-CTRL | 0.9000 | 0.9000 |
| MIN-HEATER-CTRL | 0.4000 | 0.0000 |

Batch processing was performed to simulate the baseline and measure energy usage for all climate zones and vintages. For vintages 2011 and earlier, batch processing was performed with MASControl3. Since nonresidential technology codes for these measures were not distributed with MASControl3, the following technology codes were created: (they have the same effect as similar technology codes from DEER2005).

GrocRefg-FixtDoors-LowTemp-FxdAntiSwt GrocRefg-FixtDoors-LowTemp-HmdAntiSwt GrocRefg-FixtDoors-MedTemp-FxdAntiSwt GrocRefg-FixtDoors-MedTemp-HmdAntiSwt

For vintages 2013 and after, the configuration files for DOE-2.2-R52o (.inp files) were expanded files and the batch processing was performed using a custom script.

Unit Energy Savings

Once the base case and measure case model simulations of energy consumption were completed, the total energy savings were calculated as the difference between the modeled total (whole building) energy consumption of the base case and measure case models, as shown below. The UES values (kWh/yr per len-ft.) were calculated by dividing the total energy savings by the total line-up length of each refrigerated display case.[[8]](#footnote-8)

The DEER2020 vintage weights[[9]](#footnote-9) for the grocery building types (“Gro”) were then applied to compute the weighted average value across all vintages 1975 to 2020 for the vintage “Ex” (existing) for each climate zone. In cases where multiple IOUs have territory in one climate zone, vintage weights were summed before creating the weighted average.

*where:*

*ESTotal Line-Up = Total energy savings for the entire line-up (kWh)*

*EC = Modeled energy consumption of the base case and measure case units (kWh)*

*UESLen-ft = Unit energy savings (kWh/Len-ft)*

*LengthTotal Line-Up = Length of the total door line-up*

*Doors = Number of doors in line-up*

*LengthDoor = Typical door length (ft)*

The total linear feet used to normalize the energy savings was obtained from the building model and can be found in the table below. To determine the total number of doors per case, LTConfig and MTConfig were set to “DOORS” in the prototypes. The refrigerated display cases with doors were defined as “SINGLE-DECK-DOORS” and “MULTI-DECK-DOORS” in DOE-2R.

Electric UES and Peak Demand Reduction Inputs

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Base Case Model | Measure Case Model | Source |
| Modeled energy consumption and demand | *Varies by climate zone* | | Southern California Edison (SCE). 2020. “SWCR001-02 eQuest Support Files.zip.” |
| Number of Doors – low-temperature display case | 109 | 109 | Southern California Edison (SCE). 2020. “SWCR001-012 Energy impact calculations.xlsx.” See “Doors and length” tab. |
| Number of Doors – med-temperature display case | 78 | 78 |
| Typical door length (ft) | 2.6 | 2.6 |
| Length of total door line-up  – low-temperature display case (ft) | 283.4 | 283.4 |
| Length of total door line-up  – medium-temperature display case (ft) | 202.8 | 202.8 |

# PEAK ELECTRIC DEMAND REDUCTION (kW)

The peak demand reduction estimates of this measure are based upon modeled energy use and savings values that reflect updated refrigeration use in the Database for Energy Efficient Resources (DEER) Grocery building prototypes. See Electric Savings for an explanation of this methodology.

MASControl3, the measure analysis software for DEER2020, was used to generate energy usage and savings for the Grocery building prototypes. MASControl3 uses the DOE-2.2-R52o simulation engine with the eQuest Refrigeration interface and provides processing scripts for computing DEER peak demand and applying DEER2020 vintage weights. The scripts for the 4 p.m. to 9 p.m. peak period[[10]](#footnote-10) were used to generate the peak demand reduction.

# GAS SAVINGS (Therms)

Gas unit energy savings (UES) were derived using the methodology presented in the Electric Savings section.

# LIFE CYCLE

Effective useful life (EUL) is an estimate of the median number of years that a measure installed through a program is still in place and operable. Remaining useful life (RUL) is an estimate of the median number of years that a technology or piece of equipment replaced or altered by an energy efficiency program would have remained in service and operational had the program intervention not caused the replacement or alteration. The RUL is only applicable to the first baseline period for a retrofit measure with an applicable code baseline.

The methodology to calculate the RUL conforms with Version 5 of the Energy Efficiency Policy Manual, which recommends “one-third of the effective useful life in DEER as the remaining useful life until further study results are available to establish more accurate values.”[[11]](#footnote-11) This approach provides a reasonable RUL estimate without the requiring any a priori knowledge about the age of the equipment being

replaced.[[12]](#footnote-12) Further, as per Resolution E-4807, the California Public Utilities Commission (CPUC) revised add-on equipment (AOE) measures so that the EUL of the measure is equal to the lower of the RUL of the modified system or equipment or the EUL of the add-on component.[[13]](#footnote-13)

The EUL and RUL established for ASHs on low- and medium temperature display case doors are specified below.

Effective Useful Life and Remaining Useful Life

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | ASH controls on low-temp display case doors | ASH controls on med-temp  display case doors | Source |
| EUL (years) –  new display case w/ doors | 12.0 | 12.0 | California Public Utilities Commission (CPUC), Energy Division. 2014. “DEER2014-EUL-table- update\_2014-02-05.xlsx” |
| EUL (Years) – ASH controls | 12.0 | 12.0 | California Public Utilities Commission (CPUC), Energy Division. 2014. “DEER2014-EUL-table- update\_2014-02-05.xlsx” |
| RUL (Years) –  host display case w/ doors | 4.0 | 4.0 | California Public Utilities Commission (CPUC), Energy Division. 2013. *Energy Efficiency Policy Manual Version 5*. Page 32. |

# BASE CASE MATERIAL COST ($/UNIT)

Insofar as anti-sweat heater (ASH) controls is an add-on equipment (AOE) measure, the base case assumes that the existing refrigerated display cases are not equipped with anti-sweat heater (ASH) controls. Therefore, the base case cost is $0.

# MEASURE CASE MATERIAL COST ($/UNIT)

The measure case material costs of anti-sweat heater (ASH) controls were drawn from the Incremental Cost Study conducted by Navigant Consulting, Inc. for the Northeast Energy Efficiency Partnership (NEEP).[[14]](#footnote-14) [[15]](#footnote-15) This study was commissioned by the NEEP Evaluation, Measurement and Verification Forum Research Subcommittee to investigate and update incremental costs for measures commonly included in

energy efficiency programs. The study goal was to determine baseline and efficient measure costs for a series of energy efficiency prescriptive measures of interest to the Subcommittee as well as the incremental costs of moving from base case to efficient measures.

Phase 4 of the Navigant Incremental Cost Study included ASH controls. The average controller cost was derived from a total of 212 cost data points collected through contractor interviews, program data extracts, and invoices provided by NEEP member Program Administrators. The Incremental Cost study is based on country-wide data points; the points were weighed relative to the California market using the 2020 RS Means City Cost Index. Additionally, the RS Means Historical Cost Index was used to scale the pricing from 2015 to 2020.

The average controller cost was divided by the average number of doors per controller and length of the door (2.6 ft) to derive the average measure cost per unit length[[16]](#footnote-16).

Measure Material Costs

|  |  |
| --- | --- |
| Cost Description | Costs ($/Len-Ft) |
| Low-temperature display case with ASH controls | $76.92 |
| Medium-temperature display case with ASH controls | $43.27 |

# BASE CASE LABOR COST ($/UNIT)

Insofar as anti-sweat heater (ASH) controls is an add-on equipment (AOE) measure, the base case assumes that the existing refrigerated display cases are not equipped with anti-sweat heater (ASH) controls. Therefore, the base case labor cost is $0.

# MEASURE CASE LABOR COST ($/UNIT)

The labor installation costs for anti-sweat heater (ASH) controls were drawn from the Incremental Cost Study conducted by Navigant Consulting, Inc. for the Northeast Energy Efficiency Partnership (NEEP).[[17]](#footnote-17) [[18]](#footnote-18) This study was commissioned by the NEEP Evaluation, Measurement and Verification Forum Research Subcommittee to investigate and update incremental costs for measures commonly included in energy efficiency programs. The study goal was to determine baseline and efficient measure costs for a series of energy efficiency prescriptive measures of interest to the Subcommittee as well as the incremental costs of moving from base case to efficient measures.

Phase 4 of the Navigant Incremental Cost Study included ASH controls. The study involved data collection and calculation of the average ASH control labor costs of display case cooler and freezer doors. The Incremental Cost study is based on country-wide data points; the points were weighed relative to the California market using the 2020 RS Means City Cost Index. Additionally, the RS Means Historical Cost Index was used to scale the pricing from 2015 to 2020.

The average total installation costs were divided by the number of doors and length of the door (2.6 ft) to derive the average labor cost per unit length[[19]](#footnote-19).

Measure Labor Costs

|  |  |
| --- | --- |
| Cost Description | Costs ($/Len-Ft) |
| Low-temperature display case with ASH controls | $41.58 |
| Medium-temperature display case with ASH controls | $23.39 |

# NET-TO-GROSS (NTG)

The net-to-gross (NTG) ratio represents the portion of gross impacts that are determined to be directly attributed to a specific program intervention. These NTG values are based upon the average of all NTG ratios for all evaluated 2006 – 2008 commercial, industrial, and agriculture programs, as documented in the 2011 DEER Update Study conducted by Itron, Inc. This sector average NTG (“default NTG”) is applicable to all energy efficiency measures that have been offered through commercial, industrial, and agriculture sector programs for more than two years and for which impact evaluation results are not available.

Net-to-Gross Ratios

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | ASH controls on low-temp display case doors | ASH controls on med-temp  display case doors | Source |
| NTG – Commercial | 0.60 | 0.60 | Itron, Inc. 2011. *DEER Database 2011 Update Documentation.* Prepared for the California Public Utilities Commission. Page 15-4 Table 15-3. |

# GROSS SAVINGS INSTALLATION ADJUSTMENT (GSIA)

The gross savings installation adjustment (GSIA) rate represents the ratio of the number of verified installations of the measure to the number of claimed installations reported by the utility. This factor varies by end use, sector, technology, application, and delivery method. This GSIA rate is the current “default” rate specified for measures for which an alternative GSIA has not been estimated and approved.

Gross Savings Installation Adjustment Rate

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | ASH controls on low-temp display case doors | ASH controls on med-temp  display case doors | Source |
| GSIA | 1.0 | 1.0 | California Public Utilities Commission (CPUC), Energy Division. 2013. *Energy Efficiency Policy Manual Version 5*. Page 31. |

# NON-ENERGY IMPACTS

Non-energy impacts for this measure have not been quantified.

# DEER DIFFERENCES ANALYSIS

This section provides a summary of inputs and methods based upon the Database for Energy Efficient Resources (DEER), and the rationale for inputs and methods that are not DEER-based. The savings developed for this measure were based on the DEER 2014 prototype Grocery Store building models extracted from MASControl V3.00.20 software. DEER 2014 was a major update to the DEER 2011 version and incorporates changes based on the 2013 California Building Energy Efficiency Standards (Title 24).

The DEER 2014 database contained measures for anti-sweat heater (ASH) controls on low- and medium- temperature display cases (D03-230 and D03-231, respectively) which are incorporated in the prototype models.

DEER Difference Summary

|  |  |  |
| --- | --- | --- |
| DEER Item | Comment / Used for Workpapers | |
| Modified DEER methodology | Yes | |
| Scaled DEER measure | No | |
| DEER Base Case | No | |
| DEER Measure Case | No | |
| DEER Building Types | | Yes |
| DEER Operating Hours | | Yes |
| DEER eQUEST Prototypes | | No |
| DEER Version | | DEER2020 |
| Reason for Deviation from DEER | | DEER2020 does not have these measures. DEER2020 prototypes are used to model the offerings. |
| DEER Measure IDs Used | | n/a |
| NTG | | The NTG value of 0.60 is associated with NTGR ID: *Com-Default>2yrs* |
| GSIA | | The GSIA value of 1.0 is associated with *Def-GSIA* |
| EUL/RUL | | Source: DEER2014. EUL and RUL values were drawn from “DEER2014- EUL-table-update\_2014-02-05.xlsx.” This source listed the EFUL of ASH Controls of 12 years as “CALMAC Workshop”  The EUL of 4 years is associated with EUL-ID: *GrocDisp-ASH.*  This RUL is equal to = 1/3 of 12 years, the EUL of the host display case with Doors, associated with EUL-ID: *GrocDisp-FixtDoors*. |

REVISION HISTORY

Measure Characterization Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision Number | Date | Primary Author, Title, Organization | Revision Summary and Rationale for Revision Effective Date and Approved By |
| 01 | 03/31/2018 | Jennifer Holmes Cal TF Staff | Draft of consolidated text for this statewide measure is based upon:  SCE17RN009 Revision 1 (October 13, 2017)  SCE17RN009, Revision 0 (February 15, 2017)  SCE13RN009 Revision 2 (February 2, 2016)  PGECOREF108 Revision 7 (November 8, 2016)  WPSDGENRRN0009 Revision 1.1 (May 21, 2015)  Consensus reached among Cal TF members. |
| 01 | 05/01/2019 | Akhilesh Endurthy Solaris-Technical | Updates for:   * DEER2020 updates for new peak period * Revised using modified DEER2020 prototypes for refrigeration end use. Considered prototypes for all vintages from 1975 to 2020 and used DEER2020 vintage weights. * The normalizing unit for costs was updated to be consistent with impacts. * The Delivery Types were updated for statewide workpaper. * The following values were checked against DEER2020 values and READI v2.5.1: EUL, NTG and GSIA. As a result, the values were unchanged. |
| 01 | 05/20/2019 | Jennifer Holmes Cal TF Staff | Revisions for submission of version 01 |
| 02 | 4/13/2021 | Stephen Brett Reno  TRC | Updated costing to 2020 values using RS Means Historical Cost Index and RS Means City Cost Index  Updated the typical door length and length of total door line-up used to normalize the UES and costs. |

1. California Energy Commission (CEC). 2019. *California Code of Regulations Title 20.* CEC-140-2019-002. January. [↑](#footnote-ref-1)
2. Itron, Inc. 2005. *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study - Final Report*. Prepared for Southern California Edison. [↑](#footnote-ref-2)
3. Solaris Technical, LLC. 2019. *2020 Commercial Refrigeration (Grocery) Prototypes Updates.* Prepared for Southern California Edison (SCE). March 1. [↑](#footnote-ref-3)
4. Itron, Inc. 2005. *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study - Final Report.* Prepared for Southern California Edison. [↑](#footnote-ref-4)
5. Southern California Edison (SCE). 2020. “SWCR001-02 eQuest Support Files.zip.” [↑](#footnote-ref-5)
6. Southern California Edison (SCE). 2019. “Commercial Refrigeration Input File GroRfg2.zip.” [↑](#footnote-ref-6)
7. Southern California Edison (SCE). 2020. “SWCR001-02 Energy impact calculations.xlsx.” See “Doors and length” tab. [↑](#footnote-ref-7)
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