eTRM

best in class

FOOD SERVICE

COMMERCIAL ICE MACHINE

SWFS006-01

CONTENTS

Measure Name ... 2
Statewide Measure ID ... 2
Technology Summary ... 2
Measure Case Description ... 2
Base Case Description ... 3
Code Requirements ... 4
Normalizing Unit ... 5
Program Requirements ... 5
Program Exclusions ... 7
Data Collection Requirements ... 7
Use Category ... 7
Electric Savings (kWh) ... 7
Peak Electric Demand Reduction (kW) ... 9
Gas Savings (Therms) ... 10
Life Cycle ... 10
Base Case Material Cost ($/unit) ... 11
Measure Case Material Cost ($/unit) ... 12
Base Case Labor Cost ($/unit) ... 12
Measure Case Labor Cost ($/unit) ... 12
Net-to-Gross (NTG) ... 13
Gross Savings Installation Adjustment (GSIA) ... 13
Non-Energy Impacts ... 13
DEER Differences Analysis ... 14
Revision History ... 15

MEASURE NAME

Commercial Ice Machine

STATEWIDE MEASURE ID

SWFS006-01

TECHNOLOGY SUMMARY

Commercial automated ice machines are used to produce a variety of ice types used in the food service, food preservation, hotel, and healthcare industries. Ice machines are classified into three primary equipment types—self-contained units (SCU), ice making heads (IMH), and remote condensing units (RCU) – depending on whether the ice-making mechanism and the condensing unit are contained in a single package and whether the unit has an integrated or modular storage bin. Commercial ice machines are further categorized by the method of ice production. Batch type ice makers utilize alternating freezing and harvesting cycles and produce solid (cube) type ice. Continuous machines generate ice flakes by scraping the formed ice off the evaporator plate. Flake ice can be harvested and used as loose flakes or compressed into chewable ice nuggets.

Ice machines are installed and operated in a variety commercial building types, including office buildings, restaurants and bars, grocery and retail, laboratories and health care, lodging, schools, and amusement parks. Ranging from cube, to nugget and flake-type machines, they collectively represent one of the largest classifications of commercial food service equipment.

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 810, Performance Rating of Automatic Commercial Ice-Makers[1] is the industry standard for estimating commercial ice maker energy use. Commercial ice machine performance ratings are based upon the amount of ice that can be produced in a 24-hour period (referred to as the "ice harvest rate"). AHRI Standard 810 measures production capacity, energy consumption, and water consumption at a 90 °F ambient air temperature, with a 70 °F water supply temperature (90/70). Manufacturers commonly market ice machines based on tests conducted at a 70 °F ambient air temperature and a 50 °F water supply temperature (70/50). While model numbers are based on the 70/50 tests, both values are generally reported on the manufacturer specification sheets.

Ice machines use a substantial amount of energy to freeze water and maintain the ice as separate cubes. The energy use of a commercial ice machine varies from product to product, depending on the condenser and the type of ice produced. Reductions in energy use are possible with the use of high-efficiency motors in condenser fans and compressors, thicker insulation, and reduced evaporator thermal cycling.

MEASURE CASE DESCRIPTION

This measure includes batch type machines (which include cubed and half cubed ice machines) and continuous machines (which include flake and nugget ice machines). The ENERGY STAR thresholds differ

[1] Air-Conditioning, Heating, and Refrigeration Institute (AHRI). 2016. *AHRI Standard 810 (I-P): 2016 Standard for Performance Rating of Automatic Commercial Ice-Makers.* Arlington (VA): AHRI.

for each type. The measure case efficiency specifications are based upon the ENERGY STAR Version 3.0 Program Requirements for Automatic Commercial Ice Makers.[2] Note that only air-cooled machines (self-contained, ice maker heads, or remote condensing) are eligible.

Measure Case Specification for Commerical Ice Makers – ENERGY STAR V3.0 Program Requirements for Batch Type Automatic Commercial Ice Makers

Equipment Type	Daily Ice Harvest Rate (lbs. ice/24 hrs.)	Maximum Daily Energy Use (kWh/100 lbs. ice)	Max. Daily Potable Water Use Limit (gal/100 lbs of ice)
Ice Maker Head (IMH)	H < 300	9.20 – 0.01134 x H	20
	300 ≤ H < 800	6.49 – 0.0023 x H	
	800 ≤ H ≤ 1500	5.11 – 0.00058 x H	
	1500 ≤ H ≤ 4000	4.24	
Remote Condensing Unit (RCU)	H < 988	7.17 – 0.00308 x H	20
	988 ≤ H ≤ 4000	4.13	
Self-Contained Unit (SCU)	H < 110	12.57 – 0.0399 x H	25
	110 ≤ H < 200	10.56 – 0.0215 x H	
	200 ≤ H ≤ 4000	6.25	

Measure Case Specification for Commerical Ice Makers – ENERGY STAR V3.0 Program Requirements for Continuous Type Automatic Commercial Ice Makers

Equipment Type	Daily Ice Harvest Rate (lbs. ice/24 hrs.)	Maximum Daily Energy Use (kWh/100 lbs. ice)	Max. Daily Potable Water Use Limit (gal/100 lbs of ice)
Ice Maker Head (IMH)	H < 310	7.90 – 0.005409 x H	15
	310 ≤ H < 820	7.08 – 0.002752 x H	
	820 ≤ H ≤ 4000	4.82	
	H < 800	7.76 – 0.00464 x H	
Remote Condensing Unit (RCU)	800 ≤ H ≤ 4000	4.05	15
	H < 200	12.37 – 0.0261 x H	
Self-Contained Unit (SCU)	200 ≤ H < 700	8.24 – 0.005429 x H	15
	700 ≤ H ≤ 4000	4.44	
	H < 310	7.90 – 0.005409 x H	

BASE CASE DESCRIPTION

The base case measure is defined by the minimum energy efficiency requirements of the California Appliance Efficiency Regulations (Title 20). See Code Requirements.

[2] ENERGY STAR. (n.d.) "ENERGY STAR® Program Requirements Product Specification for Automatic Commercial Ice Makers: Eligibility Criteria Version 3.0."

CODE REQUIREMENTS

This measure is governed by the California Appliance Efficiency Regulations (Title 20),[3] detailed below. Note that the federal regulations[4] align with the state Title 20 regulations.

Applicable State and Federal Codes and Standards

Code	Applicable Code Reference	Effective Dates
CA Appliance Efficiency Regulations – Title 20 (2016)	Section 1605.1(3)(B)	January 28, 2018
CA Building Energy Efficiency Standards – Title 24	None.	n/a
Federal Standards	10 CFR 431.136	January 28, 2018

Title 20 Energy Efficiency Requirements for Air-Cooled Batch Type Commercial Ice Machines (Effective January 28, 2018)

Equipment Type	Daily Ice Harvest Rate (lbs. ice/24 hrs.)	Maximum Daily Energy Use (kWh/100 lbs. ice)	Daily Potable Water Use Limit (gal/100 lbs of ice)
Ice Maker Head (IMH)	H < 300	10 – 0.01233 x H	n/a
	300 ≤ H < 800	7.05 – 0.0025 x H	
	800 ≤ H < 1500	5.55 – 0.00063 x H	
	1500 ≤ H < 4000	4.61	
Remote Condensing, Not Remote Compressor Unit (RC)	50 ≤ H < 1000	7.97 – 0.00342 x H	n/a
	1000 ≤ H < 4000	4.55	
Self-Contained Unit (SCU)	H < 110	14.79 – 0.0469 x H	n/a
	110 ≤ H < 200	12.42 – 0.02533 x H	
	200 ≤ H < 4000	7.35	

Title 20 Energy Efficiency Requirements for Air-Cooled Continuous Commercial Ice Machines (Effective January 28, 2018)

Equipment Type	Daily Ice Harvest Rate (lbs. ice/24 hrs.)	Maximum Daily Energy Use (kWh/100 lbs. ice)	Daily Potable Water Use Limit (gal/100 lbs of ice)
Ice Maker Head (IMH)	H < 310	9.19 – 0.00629 x H	n/a
	310 ≤ H < 820	8.23 – 0.0032 x H	
	820 ≤ H < 4000	5.61	
Remote Condensing, Not Remote Compressor Unit (RC)	H < 800	9.7 – 0.0058 x H	n/a
	800 ≤ H < 4000	5.06	
Self-Contained Unit (SCU)	H < 200	14.22 – 0.03 x H	n/a
	200 ≤ H < 700	9.47 – 0.00624 x H	
	700 ≤ H < 4000	5.1	

[3] California Energy Commission (CEC). 2017. *2016 Appliance Efficiency Regulations.* CEC 140-2017-002. Section 1605.1(3)(B).

[4] Code of Federal Regulations at 10 CFR 431.136.

Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 810, Performance Rating of Automatic Commercial Ice-Makers,[5] is considered the industry standard for estimating commercial ice machine energy use. The AHRI test data was used to estimate the energy consumption of the base case and measure case equipment. AHRI 810 references the ASHRAE 29 Standard for test condition details.

NORMALIZING UNIT

Each (ice machine).

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 for Investor-Owned Utilities

Measure Application Type	Delivery Type	Sector
Normal replacement	NonUpStrm	Ag
Normal replacement	NonUpStrm	Ind
Normal replacement	NonUpStrm	Com
Normal replacement	PreRebDown	Ag
Normal replacement	PreRebDown	Ind
Normal replacement	PreRebDown	Com
Normal replacement	DirInstall	Ag
Normal replacement	DirInstall	Ind
Normal replacement	DirInstall	Com
Normal replacement	PreRebUp	Ag
Normal replacement	PreRebUp	Ind
Normal replacement	PreRebUp	Com
New construction	NonUpStrm	Ag
New construction	NonUpStrm	Ind
New construction	NonUpStrm	Com
New construction	PreRebDown	Ag
New construction	PreRebDown	Ind

[5] Air-Conditioning, Heating, and Refrigeration Institute (AHRI). 2016. *AHRI Standard 810 (I-P): 2016 Standard for Performance Rating of Automatic Commercial Ice-Makers.* Arlington (VA): AHRI.

Measure Application Type	Delivery Type	Sector
New construction	PreRebDown	Com
New construction	DirInstall	Ag
New construction	DirInstall	Ind
New construction	DirInstall	Com
New construction	PreRebUp	Ag
New construction	PreRebUp	Ind
New construction	PreRebUp	Com

Eligible Products

Program qualifying ice machines are defined by equipment type and daily ice harvest rate. The efficiency specifications must meet the requirements listed in the Measure Case Description for batch and continuous machines, per the ENERGY STAR V3.0 Program Requirements for Automatic Commercial Ice Makers.[6]

Additional qualifying criteria include:

- The ice machine must meet the energy efficiency specifications listed the Measure Case Description.
- The entire AHRI-tested ice making system must be purchased.
- Remote machines must be purchased with qualifying remote condenser or remote condenser/compressor unit.
- Only air-cooled machines (self-contained, icemaker heads, or remote condensing) are eligible.

Program Qualifying Ice Machines

Equipment Type	Daily Ice Harvest Rate (lbs. ice/day)
Ice Maker Head (IMH)	< 300
	300 - 799
	800 - 1,499
	≥ 1,500
Remote Condensing Unit (RCU)	< 988
	≥ 988
Self-Contained Unit (SCU)	< 110
	110 - 199
	≥ 200

Eligible Building Types and Vintages

This measure is applicable for any building type and any vintage.

[6] ENERGY STAR. (n.d.) "ENERGY STAR® Program Requirements Product Specification for Automatic Commercial Ice Makers: Eligibility Criteria Version 3.0."

Eligible Climate Zones

This measure is applicable in any California climate zone.

PROGRAM EXCLUSIONS

Water-cooled ice machines and used or rebuilt equipment are not eligible.

DATA COLLECTION REQUIREMENTS

Data collection requirements are to be determined.

USE CATEGORY

Food service (FoodServ)

ELECTRIC SAVINGS (kWh)

The methodology to calculate unit energy savings (UES) is based on the difference in unit energy consumption (UEC) between a base case ice machine that meets the Title 20 minimum standards and a measure case (energy efficient) machine of the same size that meets the ENERGY STAR Version 3.0 program requirements.

Unit Energy Consumption

The calculation of the daily UEC of an ice machine (baseline or measure case) is a function of energy usage per 100 pounds of ice, the ice harvest rate, and duty cycle.

$$Daily\ UEC = \frac{Daily\ Ice\ Usage}{100} \times Energy\ Usage$$

$$Daily\ Ice\ Usage = IHR\ \times Duty\ Cycle$$

Energy Usage =	*Calculated normalized energy use (kWh/100 lbs ice), as per Title 20 for base case unit and as per ENERGY STAR requirements for measure case unit*
IHR =	*Ice Harvest Rate (lbs. of ice produced in 24 hours)*
Duty Cycle =	*Percentage of operation time (%)*

$$Annual\ UEC = \ Daily\ UEC\ \times OpDays$$

Daily UEC = Daily unit energy consumption (kWh)

OpDays = Operating days per year (days)

Unit Energy Savings

As shown below, the average UES is weighted based upon the share of sales of continuous and batch machines, based on the percent of the ENERGY STAR market data. ENERGY STAR ice machine sales data for 2016[7] shows that 14% of all ENERGY STAR Version 2.0 ice machines sold were continuous machines. Continuous machines account for 15% of the SCU, 10% of the IMH, and 25% of RCU units sold in 2016.

$$UES_{Wtd} = [Mkt\ Pentration_{continuous} \times UES_{continuous}] + [(1 - Mkt\ Pentration_{continuous}) \times UES_{batch}]$$

where:

Mkt Penetration = Share of units sold of each ice machine type (batch and continuous). Calculated as (1-Mkt Penetration % of Continuous model)

Since the bins are not identical between the batch and continuous categories, **Error! Reference source not found.** depicts how the bins are combined in the weighted result of the UES for each of the “measure offering bins.”

Figure 1. Alignment of Ice Harvest Rates of Batch and Continuous Categories

	Self-Contained Unit (SCU)				Ice Making Head (IMH)				Remote-Condensing Unit (RCU)	
Batch Category Ice Harvest Rate (lbs./day)	< 110	110-199	≥ 200		< 300	300-799	800-1,499	≥ 1,500	< 988	≥ 988
Continuous Category Ice Harvest Rate (lbs./day)	< 200		200-700	> 700	< 310	310-820	➢ 820		< 800	> 800
Measure Offering Bins	**< 110**	**110-199**	**≥200**		**< 300**	**300-799**	**800-1,499**	**≥ 1,500**	**<988**	**≥ 988**

Inputs and Assumptions

The inputs and assumptions to calculate the UES for batch and continuous ice machines are specified below.

[7] The reference for this data is unknown.

UEC Inputs - Batch

Equipment Type	Ice Harvest Rate Bin (lbs/day)	Ice Harvest Rate (lbs/day)	Market Penetration	Duty Cycle [8]
Ice Maker Head (IMH)	< 300	250	90%	75%
	300 - 799	450		
	800 - 1,499	1,000		
	≥ 1,500	1,750		
Remote Condensing Unit (RCU)	< 988	700	75%	
	≥ 988	1,500		
Self-Contained Unit (SCU)	< 110	75	85%	
	110-199	150		
	≥ 200	250		

UEC Inputs - Continuous

Equipment Type	Ice Harvest Rate Bin (lbs/day)	Ice Harvest Rate (lbs/day)	Market Penetration [9]	Duty Cycle [10]
Ice Maker Head (IMH)	< 300	250	10%	75%
	300 - 799	600		
	800 – 1,499	1,000		
	≥ 1,500	1,000		
Remote Condensing Unit (RCU)	< 988	600	25%	
	≥ 988	1,200		
Self-Contained Unit (SCU)	< 110	75	15%	
	110 - 199	75		
	≥ 200	250		

PEAK ELECTRIC DEMAND REDUCTION (KW)

Commercial ice machines often have high compressor duty cycles compared to other commercial food service appliances. An ice harvest cycle usually ranges between 10 and 20 minutes and ice machines usually run several consecutive harvest cycles. The probability of the ice machine operating at full input rate during peak periods is high, as reported in an emerging technologies study conducted by Fisher-

[8] Fisher-Nickel, Inc. 2012. Emerging Technologies (ET) Energy-Efficient Foodservice-Scaled Field Placement. Food Service Technology - Efficient Ice Machines and Load Shifting. Prepared for Pacific Gas and Electric Company. ET Project Number: ET12PGE3151. Page 6.

[9] The reference for this data is unknown.

[10] Fisher-Nickel, Inc. 2012. *Emerging Technologies (ET) Energy-Efficient Foodservice-Scaled Field Placement. Food Service Technology - Efficient Ice Machines and Load Shifting.* Prepared for Pacific Gas and Electric Company. ET Project Number: ET12PGE3151. Page 6.

Nickel.[11] Thus, it is assumed that this measure operates within the Database of Energy Efficient Resources (DEER) peak period of 4 p.m. to 9 p.m. on weekdays[12] at a constant load throughout the day.

The **average demand** (baseline or measure case) is calculated as the daily average UEC divided by operating hours per day. The average demand reduction estimation is derived from tests conducted under AHRI Standard 810, the inputs for which are included in Electric Savings.

$$Demand_{avg} = \frac{UEC\_DAY}{EHOUR}$$

UEC_DAY = *Daily UEC, baseline or measure (kWh/year)*
EHOUR= *Estimated operating hours per day (hrs)*

The **peak demand reduction** is calculated as the difference between the baseline and measure case average demand (the average demand reduction) multiplied by the coincident demand factor (CDF).

$$PeakDemandReduction = [(Demand_{avg,base} - Demand_{avg,measure}) \times CDF]$$

$Demand_{avg} =$ *Average demand, base or measure case (kW)*
CDF = *Coincident demand factor*

Inputs and Assumptions

The table below provides the inputs for the calculation of peak demand reduction of a commercial ice machine.

Peak Demand Reduction Inputs

Parameter	Value	Source
Coincident Demand Factor (CDF)	0.90	Itron, Inc. 2005. *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study - Final Report.* Prepared for Southern California Edison. Pages 3-15 to 3-17, Table 3-14.

GAS SAVINGS (THERMS)

Not applicable.

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. EUL is often, but not always, derived from measure persistence or retention studies. 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

[11] Fisher-Nickel, Inc. 2012. *Emerging Technologies (ET) Energy-Efficient Foodservice-Scaled Field Placement. Food Service Technology - Efficient Ice Machines and Load Shifting.* Prepared for Pacific Gas and Electric Company. ET Project Number: ET12PGE3151.

[12] California Public Utilities Commission (CPUC). 2018. *Resolution E-4952.* October 11. Op 1.

remained in service and operational had the program intervention not caused the replacement or alteration.

The EUL specified for commercial ice makers is specified below. The EUL specified for gas and electric commercial fryers are specified below. Note that RUL is only applicable for add-on and accelerated replacement measures and not applicable for this measure.

Effective Useful Life and Remaining Useful Life

Parameter	Value	Source
EUL (yrs)	10.0	The original source for this value is unknown.
RUL (yrs)	n/a	n/a

BASE CASE MATERIAL COST ($/UNIT)

The base case material cost for equipment *delivered via direct install* is equal to $0.

The estimated base case equipment cost for *all other delivery types* was based on recent retail list cost data from major online retailers as of August 7, 2017.[13] Equipment prices were compiled from several sources including, but not limited to: AutoQuotes, Webrestaurant Store, and Katom. Since equipment pricing in food service is competitively sensitive and prices vary widely according to buying volume and other factors, the sources cannot be listed explicitly.

The final cost analysis database included 171 models of base case ice machines. The equipment data recorded included numerous fields to characterize each model in the sample: supplier name, brand name, model type, model number, price, equipment type, ice harvest rate, measured energy use, potable water use, ice hardness factor, date the model became available on the market.

The data were analyzed, and average retail prices were derived for each ice machine type (IMH, RCU, SCU), and size (ice harvest rate) bin. The average retail price represents the average of batch and continuous retail prices, weighted by the market penetration of these categories. The average retail price for each ice machine category is based upon a normalized cost per pound of ice produced. In particular, the normalized cost per pound of ice was computed as the average retail price of all units in the sample divided by the average ice harvest rate of all units in the sample. This normalized price per pound of ice was then multiplied by the normalized ice machine size of each size category. The normalized average retail prices were then averaged to derive the average weighted retail price for each ice machine type.

The calculation of the average weighted retail ice machine cost is shown below.

$$Avg\ Retail\ Price_{Wtd} = [Avg\ Retail\ Price_{Batch} \times (1 - MktPentration)] + [Avg\ Retail\ Price_{Continuous} \times (MktPentration)]$$

$$Avg\ Retail\ Price_{Batch\ or\ Continuous} = \frac{AvgRetailPrice}{Average\ Ice\ Harvest\ Rate} \times Lbs.of\ Ice\ of\ Size\ Category$$

[13] Pacific Gas and Electric (PG&E). 2017. "Ice Machine Workpaper Pricing and IMCs 2017v3.xls."

MEASURE CASE MATERIAL COST ($/UNIT)

The measure case material cost for *all delivery types* was based on recent retail list cost data from major online retailers as of August 7, 2017.[14] Equipment prices were compiled from several sources including, but not limited to: Autoquotes, Webrestaurant Store, and Katom. Since equipment pricing in food service is competitively sensitive and prices vary widely according to buying volume and other factors, the sources cannot be listed explicitly.

The final cost analysis database included 23 models of ENERGY STAR V3.0[15] compliant ice machines. The equipment data recorded included numerous fields to characterize each model in the sample: supplier name, brand name, model type, model number, price, equipment type, ice harvest rate, measured energy use, potable water use, ice hardness factor, date the model became available on the market, and date the unit became ENERGY STAR-qualified. Note that due to the federal regulations effective on January 28, 2018 the manufacturers had not released all of their "market ready" models for 2018 and thus the price data utilized for this analysis was limited and only include models that meet the ENERGY STAR V3.0 criteria. This limitation resulted in a small sample size of measure case model price data that does not adequately represent all ice machine type or size categories.

The average price per pound of ice was computed as the average retail price of all units in the measure case sample divided by the average ice harvest rate of all units in the sample. This average price per pound of ice was then multiplied by the normalized ice machine size of each size category to compute the normalized price of a measure case ice machine. Because of the sample size limitations, the average percent increase of the normalized measure case ice machines compared to comparable base case ice machines was calculated and then applied to the normalized base case material cost to derive the normalized measure case costs for all size bins and ice machine types defined for this measure. Note that the average price increase was based only upon size (not type) to derive the cost for larger bins.

BASE CASE LABOR COST ($/UNIT)

The base case labor cost for equipment *delivered via direct install* is equal to $0.

For *all other delivery types*, the base case and measure case model installation costs are expected to be the same for the customer and thus were not estimated for the incremental cost analysis.

MEASURE CASE LABOR COST ($/UNIT)

The measure case labor cost for equipment *delivered via direct install* will be derived as the average installation cost submitted by one or more implementation contractors. The actual installation cost can vary by contractor, the date when the work occurred, and by the volume of each specific contractor's business. Contractor costs are confidential information and are based upon contractually agreed upon pricing as established in their purchase order with the program administrator. Therefore, the program administrator program tracking systems are the only source for the labor installation cost data. The

[14] Pacific Gas and Electric (PG&E). 2017. "Ice Machine Workpaper Pricing and IMCs 2017v3.xls."

[15] ENERGY STAR. (n.d.) "ENERGY STAR® Program Requirements Product Specification for Automatic Commercial Ice Makers: Eligibility Criteria Version 3.0."

program administrator will utilize the actual program cost to evaluate the cost-effectiveness of the measure.

For *all other delivery types*, a high efficiency model does not require additional installation labor compared to a base case model. Since this measure is applicable for normal replacement and new construction installations, the base case and measure case model installation costs are expected to be the same for the customer and thus were not estimated for the incremental cost analysis.

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 sector programs, as documented in the 2011 DEER Update Study conducted by Itron, Inc. These sector average NTGs ("default NTGs") are 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	Value	Source
NTG – Commercial	0.60	Itron, Inc. 2011. *DEER Database 2011 Update Documentation.* Prepared for the California Public Utilities Commission. Page 15-4 Table 15-3.
NTG – Industrial	0.60	
NTG – Agriculture	0.60	

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 Rates

Parameter	Value	Source
GSIA	1.0	California Public Utilities Commission (CPUC), Energy Division. 2013. *Energy Efficiency Policy Manual Version 5*. Page 31.

NON-ENERGY IMPACTS

The annual water savings associated with the installation of an energy efficient commercial ice machine were derived from water savings values developed by the Metropolitan Water District (MWD) in support of the quantification of embedded energy savings of water savings measures specified for the Water Energy Nexus (WEN) Calculator.[16]

Specifically, annual water savings were calculated as the MWD's estimated water savings per day multiplied by the assumed number of operating days per year. Inputs for this calculation are specified below.

$$UWS_{YEAR} = UWS_{Day} \times OpDays$$

UWS_{Year} = *Annual unit water savings (gal)*

UWS_{Day} = *Daily unit water savings (gpd)*

$OpDays$ = *Operating days per year (days)*

Annual Water Savings Inputs

Parameter	Value	Source
Daily unit water savings (gpd)	137.5	Metropolitan Water District (MWD). 2014. "MWD Water Savings Table 2014.xlsx"
Operating days per year (days)	365	Professional judgement.

DEER DIFFERENCES ANALYSIS

The table below summarizes the inputs and methods that are and are not based upon the Database for Energy Efficient Resources (DEER).

DEER Difference Summary

DEER Item	Comment / Used for Workpaper
Modified DEER methodology	No
Scaled DEER measure	No
DEER Base Case	No
DEER Measure Case	
DEER Building Types	
DEER Operating Hours	
DEER eQUEST Prototypes	
DEER Version	n/a
Reason for Deviation from DEER	DEER 2014 does not contain these measures.
DEER Measure IDs Used	n/a
NTG	Source: DEER 2016. NTG of 0.60 is associated with NTG ID: *Com-Default>2yrs*, *Ag-Default>2yrs*, *Ind-Default>2yrs*
GSIA	Source: DEER. The value of 1.0 is associated with GSIA ID: *Def-GSIA*

[16] California Public Utilities Commission (CPUC). 2015. *Decision 15-09-023 in the Order Instituting Rulemaking into Policies to Promote a Partnership Framework between Energy Investor Owned Utilities and the Water Sector to Promote Water-Energy Nexus Programs (R.13-12-011)*. September 17.

DEER Item	Comment / Used for Workpaper
EUL/RUL	Source: DEER 2014, 2016. The value of 10 years is associated with EUL ID: *Cook-IceMach*

REVISION HISTORY

Measure Characterization Revision History

Revision Number	Revision Complete Date	Primary Author, Title, Organization	Revision Summary and Rationale for Revision
01	12/31/2018	Jennifer Holmes Cal TF Staff	Draft of consolidated text for this statewide measure is based upon: PGECOFST108 Revision 6 (October 10, 2017) Consensus reached among Cal TF members.
	10/9/2018 10/30/2018	Jennifer Holmes Cal TF Staff	Completed final revisions for submittal of version 01.