



FOOD SERVICE
FRYER, COMMERCIAL
SWFS011-03

C O N T E N T S

Measure Name	2
Statewide Measure ID.....	2
Technology Summary	2
Measure Case Description	3
Base Case Description.....	3
Code Requirements	4
Normalizing Unit	4
Program Requirements.....	4
Program Exclusions.....	6
Data Collection Requirements	6
Use Category.....	6
Electric Savings (kWh).....	6
Peak Electric Demand Reduction (kW)	8
Gas Savings (Therms)	10
Life Cycle.....	12
Base Case Material Cost (\$/unit)	13
Measure Case Material Cost (\$/unit).....	13
Base Case Labor Cost (\$/unit)	14
Measure Case Labor Cost (\$/unit)	14
Net-to-Gross (NTG)	14
Gross Savings Installation Adjustment (GSIA)	14
Non-Energy Impacts	15
DEER Differences Analysis.....	15
Revision History	16

MEASURE NAME

Fryer, Commercial

STATEWIDE MEASURE ID

SWFS011-03

TECHNOLOGY SUMMARY

Commercial fryers are among the most common appliances in commercial food service facilities. All fryers share a common basic design. The fry vat contains enough oil so that the cooking food is essentially supported by displacement of the oil rather than by the bottom of the vessel. Two fryer attributes width and energy-input rating – suggest the approximate amount of food a fryer can prepare within a given period, which is one of the most important factors in choosing the proper fryer for a kitchen.

Large vat fryers have fry pots ranging from 18 x 14 inches to 34 x 34 inches; the most common is the 18 x 18-inch size. Large vat fryers are becoming more common in restaurants as they replace smaller (14 inch) fryers to increase production capability while maximizing the available space in the kitchen.

This technology category has historically been driven by the lowest first cost and traditionally has not incorporated energy-efficient features. Recent advances in fryer design, however, have increased fryer operational efficiency as well as safety. Energy-efficient commercial fryers reduce energy consumption primarily through advanced burner and heat exchanger design, advanced controls, and insulation. ENERGY STAR®-rated fryer models enable the differentiation between high-efficiency and standard-efficiency models. ENERGY STAR-qualified fryers offer shorter cook times and higher production rates, and frypot insulation reduces standby losses resulting in a lower idle energy rate.

This measure specification follows the American Society for Testing and Materials (ASTM) Standard Test Method for the Performance of Open Deep Fat Fryers (F1361)¹ and the ASTM Standard Test Method for the Performance of Large Vat Fryers (F2144)² for calculation of energy use and demand, based on testing in an approved and qualified laboratory.

¹ American Society for Testing and Materials (ASTM). 2013. *ASTM F1361, Standard Test Method for the Performance of Open Deep Fat Fryers*. West Conshohocken (PA): ASTM International.

² American Society for Testing and Materials (ASTM). 2016. *ASTM 2144-09, Standard Test Method for the Performance of Large Vat Fryers*. West Conshohocken (PA): ASTM International.

MEASURE CASE DESCRIPTION

The measure case specification represents the performance characteristics of equipment that meets or exceeds the ENERGY STAR certification requirements (See Program Requirements). The measure case specification accounts for idle energy rate, cooking efficient rate, and production capacity of a commercial fryer. The measure case specification values represent the average values of the analysis with the tested equipment data, ENERGY STAR certified product list, and the qualifying product list for California foodservice equipment rebate programs (2020). The data from these sources of commercial gas fryers were compiled and analyzed in 2020; the results of which were summarized by The Southern California Gas Company (SCG) in a memo and supplemental attachment.^{3, 4}

Measure Case Specification

Fryer Type	Idle Energy Rate	Cooking Energy Efficiency	Production Capacity (lb/hr)	Preheat Energy	Source
Electric	0.682 kW	86%	62	1.56 kWh	The Southern California Gas Company (SCG). 2020. "Update Plan_Fryer_11092020.xlsx"
Gas- Tier 1	7,571 Btu/hr	52%	63	10,278 Btu	
Gas- Tier 2	3,957 Btu/hr	61%	69	9,182 Btu	

BASE CASE DESCRIPTION

The base case specification represents the performance characteristics of equipment that does not meet ENERGY STAR certification requirements. Since commercial fryers are not covered by state or national codes, there is little incentive for equipment manufacturers to test their baseline equipment. Therefore, the baseline efficiency was determined from equipment tested by the Food Service Technology Center (FSTC) and Food Service Testing Lab (FSTL, SCG), updated in 2019⁴.

Base Case Specification

Fryer Type	Idle Energy Rate	Cooking Energy Efficiency	Production Capacity (lb/hr)	Preheat Energy	Source
Electric	0.873 kW	84%	69	1.75 kWh	The Southern California Gas Company (SCG). 2020. "Update Plan_Fryer_11092020.xlsx"
Gas	12,847 Btu/hr	37%	58	16,609 Btu	

³ The Southern California Gas Company (SCG). 2020. "SWFS011-03 Commercial Fryer WPP- 11032020.zip"

⁴ The Southern California Gas Company (SCG). 2020. "Update Plan_Fryer_11092020.xlsx."

CODE REQUIREMENTS

This measure is not governed by either state or federal codes and standards.

Applicable State and Federal Codes and Standards

Code	Applicable Code Reference	Effective Date
CA Appliance Efficiency Regulations – Title 20	None.	n/a
CA Building Energy Efficiency Standards – Title 24	None.	n/a
Federal Standards	None.	n/a

This measure specification follows the American Society for Testing and Materials (ASTM) Standard Test Method for the Performance of Open Deep Fat Fryers (F1361)⁵ and the ASTM Standard Test Method for the Performance of Large Vat Fryers (F2144)⁶ for calculation of energy use and demand, based on testing in an approved and qualified laboratory.

NORMALIZING UNIT

Each (fryer).

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.

⁵ American Society for Testing and Materials (ASTM). 2013. *ASTM F1361, Standard Test Method for the Performance of Open Deep Fat Fryers*. West Conshohocken (PA): ASTM International.

⁶ American Society for Testing and Materials (ASTM). 2016. *ASTM 2144, Standard Test Method for the Performance of Large Vat Fryers*. West Conshohocken (PA): ASTM International.

Implementation Eligibility for Investor-Owned Utilities

Measure Application Type	Delivery Type	Sector
Normal replacement	UpDeemed	Ag
Normal replacement	UpDeemed	Ind
Normal replacement	UpDeemed	Com
Normal replacement	DnDeemed	Ag
Normal replacement	DnDeemed	Ind
Normal replacement	DnDeemed	Com
Normal replacement	DnDeemDI	Ag
Normal replacement	DnDeemDI	Ind
Normal replacement	DnDeemDI	Com
New construction	UpDeemed	Ag
New construction	UpDeemed	Ind
New construction	UpDeemed	Com
New construction	DnDeemed	Ag
New construction	DnDeemed	Ind
New construction	DnDeemed	Com
New construction	DnDeemDI	Ag
New construction	DnDeemDI	Ind
New construction	DnDeemDI	Com

Eligible Products

This measure includes new commercial fryers that are ENERGY STAR-qualified⁷ or meet the qualifications in the Measure Case Description.

Eligibility Requirements

Fuel Type	Fryer Type	Heavy-Load Cooking Efficiency	Idle Energy Rate	Source
Electric	Standard	≥ 83%	≤ 800 Watts	ENERGY STAR. 2015. "ENERGY STAR® Program Requirements for Commercial Fryers: Version 3.0." Effective October 1, 2016.
	Large Vat	≥ 80%	≤ 1,100 Watts	
Gas- Tier 1	Standard	≥ 50%	≤ 9,000 Btu/h	
	Large Vat	≥ 50%	≤ 12,000 Btu/h	
Gas- Tier 2	Standard/ Large Vat	≥ 60%	≤ 6,100 Btu/h	Frontier Energy Memo. 2020. "GasFryerTierAnalysis-R1"

⁷ ENERGY STAR. 2015. "ENERGY STAR® Program Requirements for Commercial Fryers: Version 3.0." Effective October 1, 2016

Eligible Building Types and Vintages

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

Eligible Climate Zones

This measure is applicable in all California climate zones.

PROGRAM EXCLUSIONS

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 annual electric unit energy saving (UES) is calculated as the difference between the baseline and measure case unit energy consumption (UEC).

Annual Electric Unit Energy Consumption

The daily electric UEC (baseline or measure case) is equal to the sum of the energy required for cooking, preheat, and idle modes of fryer operation. These calculations and the inputs are provided below.

$$UEC_DAY = \text{cooking energy} + \text{idle energy} + \text{preheat energy}$$

Cooking energy is a function of the pounds of food cooked per day, the energy absorbed per pound of food product during cooking, and the measured heavy load cooking energy efficiency.

$$\text{cooking energy} = \left[\frac{LBFOOD \times EFOOD}{EFFICIENCY \times Btu/kWh} \right]$$

LBFOOD = Estimated pounds of food cooked per day (lb)

EFOOD = ASTM energy to food ratio, the energy absorbed by food during cooking (Btu/lb)

EFFICIENCY = Measured heavy load cooking efficiency (% , decimal format)

Btu/kWh = Btu to kWh conversion factor

Preheat energy is calculated as the product of the assumed number of preheats per day and the energy required per preheat mode.

$$\text{preheat energy} = (nP \times EP)$$

nP = Estimated number of preheats per day (#)

EP = Measured preheat energy (kWh)

Idle energy is a function of the idle energy rate, operating hours per day, and production capacity; idle energy does not include preheat time.

$$\text{idle energy} = \left[\text{IDLERATE} \times \left(\text{EHOUR} - \frac{\text{LBFOOD}}{\text{PC}} - (nP \times \text{TP}/\text{MinHr}) \right) \right]$$

<i>IDLE RATE</i> =	<i>Measured idle energy rate (kW)</i>
<i>EHOUR</i> =	<i>Estimated operating hours per day (hrs)</i>
<i>LBFOOD</i> =	<i>Estimated pounds of food cooked per day (lbs)</i>
<i>PC</i> =	<i>Measured production capacity (lbs/hr)</i>
<i>nP</i> =	<i>Estimated number of preheats per day (#)</i>
<i>TP</i> =	<i>Estimated preheat time (min)</i>
<i>MinHr</i> =	<i>Constant, 60 minutes per hour (min)</i>

The **annual UEC** is calculated as the daily UEC multiplied by the number of operating days per year.

$$\text{UEC_YEAR} = \text{UEC_DAY} \times \text{EDAYS}$$

<i>UEC_DAY</i> =	<i>Daily unit energy consumption (kWh)</i>
<i>EDAYS</i> =	<i>Estimated operating days per year (days)</i>

Annual Electric Unit Energy Savings

The **annual UES** is calculated as the difference between the baseline and measure case annual UEC.

$$\text{UES}_{\text{YEAR}} = [\text{UEC_YEAR}_{\text{Base}} - \text{UEC_YEAR}_{\text{Measure}}]$$

<i>UEC_YEAR</i> =	<i>Annual UEC, baseline or measure (kWh/year)</i>
<i>UES_YEAR</i> =	<i>Annual UES (kWh/year)</i>

Note that for measures implemented through investor-owned utility (IOU) portfolios, Decision 11-07-030 stipulated an adjustment to the UES: “Energy Division believes that operating hours, food production rates and baseline efficiencies contribute to overly optimistic UES calculations and recommend a 30% reduction in UES values.” These operating characteristics were investigated and revised in 2019 and incorporated into the UEC calculation,³ thus the 30% reduction factor is excluded from the UES calculation.

Inputs and Assumptions

The inputs for the calculation of the UES of an electric fryer are specified below. The CPUC issued disposition, “Non-standard Disposition for the commercial electric and gas Fryer workpaper SWFS011-01,”⁸ required the collection and analysis of secondary source test data. Electric fryers represent a smaller share of the market segment than gas fryers and, thus baseline data in both a lab and field

⁸ Biermayer, P. (CPUC, Energy Division). 2019. “Non-standard Disposition for commercial electric and gas fryer workpaper SWFS011-01.” Memorandum to Chan Paek (SoCalGas). January 4.

context is scarce. Measure case assumptions were further updated in 2019 based on the findings of the 2019 analysis per CPUC review comments from November 2019⁹. These assumptions remain in the 2020 updated worksheet analysis, as the electric commercial fryer had no updates or changes.

The assumed hours and days of operation are calculated from on-site monitored data and responses from surveys as shown in the referenced source.

Electric UEC Inputs

Parameter	Base Case Model	Measure Case Model	Source
Number of Preheats per Day (#/day)	1	1	The Southern California Gas Company (SCG). 2020. "Update Plan_Fryer_11092020.xlsx",
Preheat Time (minutes)	9.2	8.9	
Fryer Size (inches)	14.3	12.4	
Preheat Energy (kWh)	1.75	1.56	
Idle Energy Rate (kW)	0.873	0.682	
Heavy Load Cooking Energy Efficiency (%)	84%	86%	
Production Capacity (lbs/hr)	69.4	62.1	
Pounds of Food Cooked per Day	111	111	
ASTM Energy to Food (kWh/lb)	0.167	0.167	
Operating Hours/Day	12	12	
Operating Days/Year	351	351	

A sample calculation of the daily baseline electric UEC is provided below.

$$UEC_{DAY} = \text{cooking energy} + \text{idle energy} + \text{preheat energy}$$

$$\text{Cooking energy} = \left[\frac{111 \times 570 \times \frac{1}{3412.14}}{0.84} \right] = 22.10 \text{ kWh/day}$$

$$\text{Idle energy} = \left[0.873 \times \left(12 - \frac{111}{69.4} - (1 \times 9.2/60) \right) \right] = 8.94 \text{ kWh/day}$$

$$\text{Preheat energy} = (1 \times 1.75) = 1.75 \text{ kWh/day}$$

$$UEC_{DAY} = 22.10 + 8.94 + 1.75 = 32.80 \text{ kWh/day}$$

PEAK ELECTRIC DEMAND REDUCTION (KW)

The actual contribution to building peak demand may vary significantly depending on its usage pattern in relation to that of other electric equipment in the facility (operating schedule, appliance ON time, etc.). The probability of an appliance drawing its average rate during the period that the peak period is

⁹ The Southern California Gas Company (SCG). 2020, "Foodservice comment responses_SCG_11092020.xlsx", Response to CPUC's review comments.

significantly higher than for any other input rate for that appliance. Therefore, it has been assumed that the probable contribution to building peak demand is equal to the combination oven average demand.

Peak Demand Reduction Calculation

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 weekdays¹⁰ at a constant load throughout the day. The average and peak demand reduction calculations utilize the measured data of base case and measure case fryers specified for Electric Savings. The average demand (baseline or measure case) is equal to the annual unit energy consumption (UEC) divided by the assumed annual hours of operation.

$$Demand_{avg} = \frac{UEC_YEAR_{kWh}}{EDAYS \times EHOURL}$$

$UEC_YEAR =$ Annual UEC, baseline or measure (kWh/year)
 $EDAYS =$ Estimated operating days per year (days)
 $EHOURL =$ Estimated operating hours per day (hrs)

The average demand reduction is the difference between the baseline and measure case average demand. The estimated peak demand reduction is calculated as 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

Note that for measures implemented through investor-owned utility (IOU) portfolios, Decision 11-07-030 stipulated an adjustment to the UES: “Energy Division believes that operating hours, food production rates and baseline efficiencies contribute to overly optimistic UES calculations and recommend a 30% reduction in UES values.”¹¹ These operating characteristics were investigated and revised in 2019 and incorporated into the UEC calculation,³ thus the 30% reduction factor is excluded from the UES calculation.

Inputs and Assumptions

The table below provides the inputs for the calculation of peak demand reduction of a commercial electric fryer.

¹⁰ California Public Utilities Commission (CPUC). 2018. *Resolution E-4952*. October 11. Op 1.

Demand Reduction Inputs

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

GAS SAVINGS (THERMS)

The annual gas unit energy saving (UES) is calculated as the difference between the measure case and baseline annual unit energy consumption (UEC).

Annual Gas Unit Energy Consumption

As shown below, the daily gas UEC (baseline or measure case) is equal to the sum of the energy required for cooking, preheat, and idle modes of fryer operation. These calculations and the inputs are provided below.

$$UEC_DAY = \text{cooking energy} + \text{idle energy} + \text{preheat energy}$$

Cooking energy is a function of the pounds of food cooked per day, the energy absorbed per pound of food product during cooking, and the measured heavy load cooking energy efficiency.

$$\text{cooking energy} = \left[\frac{LBFOOD \times EFOOD}{EFFICIENCY} \right]$$

LBFOOD = Estimated pounds of food cooked per day (lbs)

EFOOD = ASTM energy to food ratio, the energy absorbed by food product during cooking (Btu)

EFFICIENCY = Measured heavy load cooking efficiency (% , decimal format)

Preheat energy is calculated as the product of the assumed number of preheats per day and the energy required per preheat mode.

$$\text{Preheat energy} = (nP \times EP)$$

nP = Estimated number of preheats per day (#)

EP = Measured preheat energy (Btu)

Idle energy is a function of the idle energy rate, operating hours per day, and production capacity; idle energy does not include preheat time.

$$\text{Idle energy} = \left[IDLERATE \times \left(EHOUR - \frac{LBFOOD}{PC} - (nP \times TP/60) \right) \right]$$

IDLE RATE = Measured idle energy rate (Btu)

EHOUR = Estimated operating hours per day (hrs)

LBFOOD = Estimated pounds of food cooked per day (lbs)

PC = Measured production capacity (lbs/hr)

nP = Estimated number of preheats per day (#/day)

TP = Estimated preheat time (min)

The **annual UEC** (baseline or measure) is calculated as the daily UEC multiplied by the number of operating days per year.

$$UEC_{YEAR} = \frac{UEC_{DAY} \times EDAYS}{BtuTherm}$$

UEC_{DAY} = Calculated daily energy consumption (Btu/day)
 $EDAYS$ = Estimated operating days per year (days)
 $BtuTherm$ = Btu to therm conversion factor

Annual Gas Unit Energy Savings

The **annual gas UES** is calculated as the difference between the baseline and measure annual UEC.

$$UES_{YEAR} = [UEC_{YEAR_{Base}} - UEC_{YEAR_{Measure}}]$$

UEC_{YEAR} = Annual UEC, baseline or measure (therms/year)
 UES_{YEAR} = Annual UES (therms/year)

Note that for measures implemented through investor-owned utility (IOU) portfolios, Decision 11-07-030¹² stipulated a downward adjustment to the UES: “Energy Division believes that operating hours, food production rates and baseline efficiencies contribute to overly optimistic UES calculations and recommend a 30% reduction in UES values.” These operating characteristics were investigated and revised and incorporated into the UEC calculation,³ thus the 30% reduction factor is excluded from the UES calculation.

Inputs and Assumptions

The inputs for the calculation of the UES of an electric fryer are specified below. The CPUC issued disposition, “Non-standard Disposition for the commercial electric and gas Fryer workpaper SWFS011-01,”¹³ required the collection and analysis of secondary source test data. This data was collected from the FSTC and ENERGY STAR certified product database and combined with other data sources into a comprehensive spreadsheet to revise baseline and measure assumptions and to verify efficiency eligibility requirements.

Gas UEC Inputs

Parameter	Base Case Model	Measure Case Model- Tier 1	Measure Case Model- Tier 2	Source
Number of Preheats per	1	1	1	
Preheat Time (minutes)	7	7	7	

¹³ Biermayer, P. (CPUC, Energy Division). 2019. “Non-standard Disposition for commercial electric and gas fryer workpaper SWFS011-01.” Memorandum to Chan Paek (SoCalGas). January 4.

Parameter	Base Case Model	Measure Case Model- Tier 1	Measure Case Model- Tier 2	Source
Fryer Size (inches)	14	14	13	The Southern California Gas Company (SCG). 2020. "Update Plan_Fryer_11092020.xlsx"
Preheat Energy (Btu)	16,609	10,278	9,182	
Idle Energy Rate (Btu/hr)	12,847	7,571	3,957	
Heavy Load Cooking Energy Efficiency (%)	37%	52%	61%	
Production Capacity	58	63	69	
Pounds of Food Cooked	111	111	111	
ASTM Energy to Food (Btu/lb.)	570	570	570	
Operating Hours/Day	12	12	12	
Operating Days/Year	351	351	351	

A sample base-case calculation of daily UEC is provided below.

$$EDAY = \text{cooking energy} + \text{idle energy} + \text{preheat energy}$$

$$\text{Cooking energy} = \left[\frac{111 \times 570}{.37} \right] = 170,597 \text{ Btu}$$

$$\text{idle energy} = \left[12,847 \times \left(12 - \frac{111}{58} - (1 \times 7/60) \right) \right] = 128,124 \text{ Btu}$$

$$\text{preheat energy} = (1 \times 16,609) = 16,609 \text{ Btu}$$

$$EDAY = 170,597 + 128,124 + 16,609 = 315,330 \text{ Btu}$$

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 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)	12	Robert Mowris & Associates. 2005. <i>Ninth Year Retention Study of the 1995 Southern California Gas Company Commercial New Construction Program</i> . Prepared for Southern California Gas Company. Study ID Number 718A. California Public Utilities Commission (CPUC), Energy Division. 2003. <i>Energy Efficiency Policy Manual v 2.0</i> . Page 18 Table 4.1.
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.

For *all other delivery types of electric commercial fryers*, the base case material cost was calculated as the average of the manufacturer list prices for electric commercial fryers retrieved from the AutoQuotes online catalog for foodservice equipment and supplies.¹⁴ Because it is common knowledge that dealers do not pay the published list prices for equipment, it was necessary apply a discount factor to the AutoQuotes data to more accurately reflect the actual prices paid for the equipment. The discount factor of 50% was based upon professional judgement by Food Service Technology Center (FSTC) staff. Additional analysis to validate the reasonableness of this value was conducted by comparing AutoQuotes published prices with actual prices on invoices submitted through the Southern California Gas Company Instant Rebates! point-of-sale rebate program from 2015 through August of 2017.¹⁵ This verification revealed that a “list-to-actual” cost ratio for food service equipment of 50% is a reasonable average discount factor.

For *all other delivery types of gas commercial fryers*, the base case cost was updated based on a query of published prices from online equipment and supply dealers from Frontier Energy’s “Gas Fryer Tier Analysis”¹⁶ memo. A discount factor was not applied as these are published retail prices that reflect the typical price the customer would pay.

MEASURE CASE MATERIAL COST (\$/UNIT)

The measure case material cost for *all delivery types of electric commercial fryers* were calculated as the average of the manufacturer list prices for electric commercial fryers retrieved from the AutoQuotes online catalog for foodservice equipment and supplies.¹⁷ Because it is common knowledge that dealers do not pay the published list prices for equipment, it was necessary apply a discount factor to the AutoQuotes data to more accurately reflect the actual prices paid for the equipment. The discount factor of 50% was based upon professional judgement by Food Service Technology Center (FSTC) staff. Additional analysis to validate the reasonableness of this value was conducted by comparing AutoQuotes published prices with actual prices on invoices submitted through the Southern California Gas Company Instant Rebates! point-of-sale rebate program from 2015 through August of 2017.¹⁸ This verification revealed that a “list-to-actual” cost ratio for food service equipment of 50% is a reasonable average discount factor.

The measure case material cost for *all delivery types of gas commercial fryers* were calculated as the average of equipment costs based on a query of published prices from online equipment and supply dealers from Frontier Energy’s “Gas Fryer Tier Analysis”¹⁶ memo. A discount factor was not applied as these are published retail prices that reflect the typical price the customer would pay..

¹⁴ Food Service Technology Center (FSTC). 2016. “Fryer 2016 Price Updates.xlsx.”

¹⁵ Energy Solutions. 2017. “2016 IMC Analysis - For Cal TF (Energy Solutions).xls.”

¹⁶ Frontier Energy Memo. 2020. “GasFryerTierAnalysis-R1”

¹⁷ Food Service Technology Center (FSTC). 2016. “Fryer 2016 Price Updates.xlsx.”

¹⁸ Energy Solutions. 2017. “2016 IMC Analysis - For Cal TF (Energy Solutions).xls.”

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 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 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	Commercial Fryer – Electric	Commercial Fryer – Gas	Source
NTG – Commercial	0.60	0.60	Itron, Inc. 2011. <i>DEER Database 2011 Update Documentation</i> . Prepared for the California Public Utilities Commission. Page 15-4 Table 15-3.
NTG – Industrial	0.60	0.60	
NTG - Agriculture	0.60	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 Rate

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

NON-ENERGY IMPACTS

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

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	No
DEER Building Types	No
DEER Operating Hours	No
DEER eQUEST Prototypes	No
DEER Version	n/a
Reason for Deviation from DEER	DEER 2020 does not contain these measures.
DEER Measure IDs Used	n/a
NTG	Source: DEER 2011 / DEER 2016. NTG of 0.60 is associated with NTG ID: <i>Com-Default>2yrs, Ag-Default>2yrs, Ind-Default>2yrs</i>
GSIA	Source: DEER. The value of 1.0 is associated with GSIA ID: <i>Def-GSIA</i>
EUL/RUL	Source: DEER 2014 / 2016. The value of 12 years is associated with EUL ID: <i>Cook-GasFryer</i> and <i>Cook- ElecFryer</i> .

REVISION HISTORY

Measure Characterization Revision History

Revision Number	Revision Complete Date	Primary Author, Title, Organization	Revision Summary
01	12/31/2017	Jennifer Holmes Cal TF Staff	Draft of consolidated text for this statewide measure is based upon: PGECOFST102, Revision 6 (June 2016) SCE13CC004, Revision 2 (January 21, 2016) WPSDGENRCC0014, Revision 3.1 (June 27, 2014) SCE13CC004, Revision 1 (June 5, 2014) 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.
02	9/26/2019	Jaime Lopez- SoCalGas	Updates to the gas measure case, gas base cases as well as gas calculation assumptions were made to reflect direction given by CPUC in disposition “Non-standard Disposition for the commercial electric and gas Fryer workpaper SWFS011-01”
	12/14/2019	Chan Paek	Revised with reformulated baseline & measure characteristics and other findings per CPUC comments “Foodservice comment responses_SCG_11222019.xlsx” ⁹ and “Update Plan_Fryer_12142019.xlsx” ⁴
	01/14/2020	Chan Paek	A minor change to gas savings calculation in DataSpec r2.2 file. Daily energy consumption formula is corrected to refer to 7.0 minute preheat time instead of the 15 minutes.
03	12/04/2020	Andres Marquez	Addition of Tier 2 commercial gas fryer measure
	02/01/2021	Andres Marquez	Update of measure cost for gas fryers with 2020 retail data from Frontier’s “GasFryerTierAnalysis-R1”
	5/20/2021	Harpreet Singh PG&E	Adopt other measures for PG&E.
	06/09/2021	Kenny Liljestrom, SDG&E	Adopted SDG&E implementations for measure offering SWFS011C. No other changes to the workpaper or data.