Work Paper SCE13CC005

**Revision 3**

**Southern California Edison**

**Commercial Electric Griddles**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | FS-61445 |
| **Measure Description** | Energy efficient electric griddle |
| **Base Case Description** | Standard efficiency electric griddle |
| **Units** | Linear foot (width of griddle) |
| **Energy Savings** | Refer to Excel Calculation Attachment |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment |
| **Effective Useful Life** | Cook-ElecGriddle: 12 years |
| **Measure Installation Type** | Replace on Burnout (ROB) |
| **Net-to-Gross Ratio** | Com-Default>2yrs: 0.6 |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 4/30/12 | Ricson Chude/EEG | * Converted WPSCNRCC0005 into new workpaper template, and changed name to WorkPaper SCE13CC005. * Revised cost and savings based on PGECOFST103 |
| 1 | 6/5/2014 | Ricson Chude/SCE | -Work paper updated for the reporting period, effective 7/1/14 – 12/31/14. |
| 2 | 7/14/2014 | Jason Wang/SCE | -Updated units to per ft  -Removed Energy Star requirement |
| 3 | 1/19/2016 | Ajay Wadhera/Solaris | -New template update for 2016 program year  -WP effective from 1/1/2016 thru 12/31/2016  -Removed SCE building type  -No value modifications |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |
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Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the replacement of standard-efficiency commercial electric griddles with energy-efficient commercial electric griddles.

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | Energy efficient commercial electric griddle |
| Existing Condition | Standard efficiency commercial electric griddle |
| Code/Standard | N/A |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
| N/A | N/A | FS-61445 | N/A | Electric Griddle |

The measure case electric griddle must have a tested heavy load cooking energy efficiency of ≥70% and an idle energy rate ≤ 355 watts per ft² of cooking surface, utilizing ASTM Standard F1275 [147]. The griddle must also be listed on the Food Service Technology Center’s pre-approved list.

## 1.2 Technical Description

### Griddles are used throughout the hospitality industry, including casual dining and quick service restaurants, hotels, motels, schools, colleges and recreational facilities. Their versatility ranges from crisping and browning, to searing, and to warming or toasting. For a high production kitchen, the temperature uniformity of the griddle surface is important to assure that the food is evenly cooked.

### Recent advances in griddle design have produced equipment that exhibits greater uniformity, is better controlled, and provides higher production rates. Energy-efficient commercial electric griddles reduce energy consumption primarily through application of advanced controls and improved temperature uniformity. This measure is focused on electric “flat” (single sided) griddles.

## 1.3 Installation Types and Delivery Mechanisms

The install type is ROB (Replace-on-Burnout).

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Replace on Burnout (ROB) | Above Code or Standard | N/A | EUL | N/A |

The delivery method is Financial Support - Down-Stream Incentive – Deemed.

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Down-Stream Incentive | The customer installs qualifying energy efficient equipment and submits an incentive application to the utility program. Upon application approval, the utility program pays an incentive to the customer. Such an incentive may be deemed or customized. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **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 does not contain this measure |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| Com-Default>2yrs | All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years | Com | Any | Any | 0.6 |

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Installation Rate**

The IR values were obtained using the DEER READI tool. The relevant IR values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1 |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| Cook-ElecGriddle | Griddle - Electric | Com | FoodServ | 12 | 4 |

### 1.4.2 Codes and Standards Analysis

**California Title 24 2013:** These measures do not fall under Title 24 of the California Energy Regulations.

**California Title 20 2014:** State of California Title 20 Appliance Efficiency Regulation [422] has a category for cooking appliances, but griddles are not included.

### ASTM Standards: ASTM Standard Test Method for the Performance of Griddles (F1275) is applicable for estimating energy use and cooking performance. It was used to estimate the energy consumption of the base case and measure equipment.

**Federal Standards:** These measures do not fall under Federal DOE or EPA Energy Regulations

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| ASTM | F1275 | January 1, 2008 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

### 1.5.1 Non-DEER Study Review

No Non-DEER studies are used in this work paper.

## 1.6 Data Quality and Future Data Needs

N/A

# Section 2. Calculation Methodology

## 2.1 Electric Energy Savings Estimation Methodologies

This work paper uses ASTM Standard Test Method for thePerformance of Griddles (F1275) for calculation of energy use and demand, based on testing in approved and qualified laboratories. In the absence of mandatory regulations for testing commercial griddles, there is little incentive on the part of equipment manufacturers to have their baseline equipment tested. Therefore, the ASTM performance parameters for baseline equipment were drawn from a sample of economy grade equipment tested by the Food Service Technology Center and is summarized in table below.

Baseline ASTM Test Results for Commercial Griddles

|  |  |  |  |
| --- | --- | --- | --- |
| **Griddle Type** | **Idle Energy Rate** | **Cooking-Energy Efficiency\*** | **Production Capacity\*** |
| Electric Griddles | 400 W/sqft/h | 60% | 35 lb/h |

\* Based on the Heavy-load Hamburger Patties test in ASTM F1275.

The measure case data was drawn from the list of commercial griddles that have been tested by SCE and PGE testing laboratories. The lab-based test data was used to establish a measure case level that effectively differentiated between standard-efficiency models and energy-efficient models. The performance parameters used to determine the energy consumption for the measure case are summarized in table below.

Measure Case ASTM Test Results for Commercial Griddles

|  |  |  |  |
| --- | --- | --- | --- |
| **Griddle Type** | **Idle Energy Rate** | **Cooking-Energy Efficiency\*** | **Production Capacity\*** |
| Electric Griddles | 294 W/sqft/h | 75% | 49 lb/h |

\* Based on the Heavy-load Hamburger Patties test in ASTM F1275.

Table below shows the calculation results for 3-foot electric griddles based on data obtained from applying the ASTM F1275 test method.

Commercial Electric Griddle Calculations

|  |  |  |
| --- | --- | --- |
| **Performance**  **(3 ft Griddle Size)** | **Baseline Model** | **Avg. Efficient Model** |
| Nominal width (ft) | 3 | 3 |
| Preheat Time (min) | 15 | 15 |
| Preheat Energy (kWh) | 4.00 | 2.00 |
| Number of Preheats per Day | 1 | 1 |
| Normalized Idle Energy Rate (watts per ft²) | 400 | 294 |
| Idle Energy Rate (kW) | 2.40 | 2.13 |
| Heavy Load Cooking Energy Efficiency (%) | 60% | 75% |
| Production Capacity (lbs/hr) | 35 | 49 |
| Operating Hours/Day | 12 | 12 |
| Operating Days/Year | 355 | 355 |
| Pounds of Food Cooked per Day | 100 | 100 |
| ASTM Energy to Food (kWh/lb) | 0.139 | 0.139 |
| Daily Energy Consumption (kWh) | 48.5 | 37.6 |
| Average Demand (kW) | 4.0 | 3.1 |
| Estimated Demand Reduction (kW) (Applied 0.9 DEER CDF) | **-** | 0.81 |
| **Estimated Demand Reduction (kW/ft)** | **-** | **0.27** |
| Annual Energy Consumption (kWh) | 17,218 | 13,348 |
| Estimated Energy Savings (kWh/yr) | - | 3,870 |
| **Estimated Energy Savings (kWh/yr/ft)** | **-** | **1,290** |

**Daily Energy Consumption Calculation and Definitions**

EDAY = (LBFOOD x EFOOD) ÷ EFFICIENCY + [IDLERATE x (TON - LBFOOD/PC – nP x TP/60)] + nP x EP

Where:

|  |  |
| --- | --- |
| EDAY = | Calculated Daily Energy Consumption (kWh/day) |
| LBFOOD = | Estimated Pounds of Food Cooked per Day |
| EFOOD = | ASTM Energy to Food (kWh/lb) = kWh/pound of energy absorbed by food product during cooking per ASTM F1275 |
| EFFICIENCY = | Measured Heavy Load Cooking Energy Efficiency % |
| IDLE RATE = | Calculated Idle Energy Rate (kW) |
| TON = | Estimated Operating Hours/Day |
| PC = | Estimated Production Capacity (lbs/hr) |
| TP = | Estimated Preheat Time (min) |
| nP = | Estimated Number of preheats/Day |
| EP = | Calculated Preheat Energy (kWh) |

See Attachment 2 for all calculations. See Attachment 1 for a complete list of savings.

## 2.2. Demand Reduction Estimation Methodologies

A griddle’s actual contribution to a building’s 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 building peak is set is significantly higher than for any other input rate for that appliance. Therefore, it has been assumed that the probable contribution to the building’s peak demand is equal to the appliance’s average demand.

A coincidence factor of 0.9 from DEER 2005 [26] is applied to demand reduction; since griddles are not specifically addressed, the 0.9 from other foodservice measures is used. See Section 2.1 for final values.



Figure 1 DEER 2005 Cooking Coincidence Factor

# Section 3. Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Assembly | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Education - Primary School | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Education - Secondary School | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Education - Community College | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Education - University | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Health/Medical - Hospital | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Health/Medical - Nursing Home | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Lodging - Hotel | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |
| Office - Large | DEER:Indoor\_Non-CFL\_Ltg | NON\_RES |

# Section 4. Costs

High-efficiency griddles typically have a higher list price than standard efficiency griddles. However, high-efficiency designs are often bundled with other features such as all stainless steel construction and high quality components and controls. In addition to lower operating costs, high-efficiency griddles exhibit better uniformity and higher production rates that increase their cost-effectiveness. For example, an energy efficient, 3-foot griddle can produce as much as a 4-foot Baseline model.

## 4.1 Base Case Cost

Base case costs are calculated by applying an industry-standard 50% discount to manufacturer published list prices. It is assumed that the labor cost is the same in base and measure cases, so only equipment costs are presented here.

Equipment prices for this work paper were compiled from a number of sources including quotes, equipment sales representatives, and manufacturer sources. Since equipment pricing in food service is closely held information and prices vary widely according to buying volume and other factors, the sources for prices cannot be listed explicitly. Table below shows the base case cost for this technology.

**Base Case Cost**

|  |  |  |
| --- | --- | --- |
| **Griddle Type** | **Baseline Unit Price** | **Baseline Unit Cost per ft** |
| Electric Griddle | $4,501 | $750.33 |

## 4.2 Measure Case Cost

Table below shows the measure case cost for this technology.

**Measure Case Cost**

|  |  |  |
| --- | --- | --- |
| **Griddle Type** | **Energy Efficient Unit Price** | **Energy Efficient Unit Cost per ft** |
| Electric Griddle | $6,049 | $1,008.33 |

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| ROB | (MEC + MLC) – (BEC + BLC) | (MEC + MLC) – (BEC + BLC) | N/A |
| NEW/NC |
| RET/ER | (MEC + MLC) – (BEC + BLC) | MEC + MLC | (MEC + MLC) – (BEC + BLC) |
| REF | (MEC + MLC) – (BEC + BLC) | MEC + MLC | N/A |
| REA | MEC + MLC | MEC + MLC | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

**Full and Incremental Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| Electric Griddle | ROB | $258 | $258 | N/A |

# Attachments

1. 

1. 

# References



[26]

[147]

[422]