**Work Paper PGECOFST103**

**Commercial Griddle**

**Revision # 6**

**Pacific Gas & Electric Company**

**Customer Energy Solutions**

**Commercial Griddle- Electric and Gas**

**Measure Codes FS002, FS003**

# At-a-Glance Summary

|  |  |  |
| --- | --- | --- |
| **Applicable Measure Codes:** | **FS002** | **FS003** |
| **Measure Description:** | Commercial Griddle (Electric) | Commercial Griddle (Gas) |
| **Energy Impact Common Units:** | Griddle Per Foot | Griddle Per Foot |
| **Base Case Description:** | Source: PG&E Calculations Existing Electric Griddle | Source: PG&E Calculations Existing Gas Griddle |
| **Base Case Energy Consumption:** | Source: PG&E Calculations 5,904 kWh/yr | Source: PG&E Calculations 417 Therms/yr |
| **Measure Energy Consumption:** | Source: PG&E Calculations 4,578 kWh/yr | Source: PG&E Calculations 291 Therms/yr |
| **Energy Savings (Base Case – Measure)** | Source: PG&E Calculations 1,326 kWh/yr per foot | Source: PG&E Calculations 126 Therms/yr per foot |
| **Costs Common Units:** | Source: PG&E Calculations  Griddle | Source: PG&E Calculations Griddle |
| **Base Case Equipment Cost ($/unit):** | Source: PG&E Calculations $750 | Source: PG&E Calculations $1,026 |
| **Measure Equipment Cost ($/unit):** | Source: PG&E Calculations $1,008 | Source: PG&E Calculations $1,312 |
| **Measure Incremental Cost ($/unit):** | Source: PG&E Calculations $286 | Source: PG&E Calculations $258 |
| **Effective Useful Life (years):** | 12 years -- Source: [www.Deeresources.com](http://www.Deeresources.com) EUL | 12 years -- Source: [www.Deeresources.com](http://www.Deeresources.com) EUL |
| **Program Type:** | Replace on Burnout (ROB), and New Construction (NC). | Replace on Burnout (ROB), and New Construction (NC). |
| **Net-to-Gross Ratios:** | Source:  2014 DEER Com Default>= 2 yrs  0.6 | Source:  2014 DEER Com Default >= 2 yrs  0.6 |
| **Important Comments:** | Offering changed to per foot from an averaged 3 foot griddle | Offering changed to per foot from an averaged 3 foot griddle |

# Work Paper Approvals

The following Manager(s) approved this workpaper through the PG&E Electronic Data Routing System under Routing Requisition # \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |
| --- |
|  |
| **Grant Brohard**  Manager, Technical Product Support |
| **Carolyn Weiner**  Manager, Appliance Products |

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision 0** | **12/11/2007** | **Original work paper: Commercial Griddles PGECOFST103.doc** | **David Zabrowski (Fisher-Nickel, Inc.)** |
| **Revision 1** | **6/1/2009** | **Changes to EUL, NTG language and references, costs updated** | **David Zabrowski, Lauren Mills (Fisher-Nickel, inc.), Steve Blanc PG&E** |
| **Revision 2** | **2/10/2010** | **Updated pricing and incremental cost, Changes to align with new Energy Star specification, Update to DEER 2009-11 NTG file** | **David Zabrowski (Fisher-Nickel, inc.), Steve Blanc PG&E** |
| **Revision 3** | **7/15/2010** | **Updated NTG, EUL and savings analysis, updated measure codes per 2010-2012 Program** | **Charlene Spoor PG&E** |
| **Revision 4** | **5/2/2012**  **8/22/2012** | **Updated NTG and savings analysis, updated measure codes for 2013-2014**  **Updated BLD, CZ and VIN to ANY per READI requirements** | **Kong Sham (Fisher Nickel inc.)**  **Charlene Spoor (PG&E)**  **Charlene Spoor (PG&E)** |
| **Revision 5** | **4/7/2014** | **Updated to new template and noted DEER14 values** | **Charlene Spoor (PG&E)** |
| **Revision 6** | **10/8/2014** | **New measure codes, measure changed to rebate per foot** | **Charlene Spoor (PG&E)** |

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# Section 1. General Measure & Baseline Data

## 1.1 Product Measure Description & Background

This work paper documents the rationale for the Energy Efficient Commercial Griddle (Electric and Gas) measures as listed in the Commercial Food Service Catalog. The Commercial Food Service Catalog is part of Pacific Gas and Electric Company’s Customer Energy Efficiency Program. PG&E offers incentives to non-residential customers for installing qualifying lighting, refrigeration, air-conditioning, food service, and agricultural equipment.

***Catalog Description –***

**FS002:** The electric griddle must meet ENERGY STAR® specifications or 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 F12751.

**FS003:** The tested griddle must meet ENERGY STAR® specifications or have a tested heavy load cooking energy efficiency of ≥38% and an idle energy rate ≤ 2,650 Btu/h per ft² of cooking surface utilizing ASTM Standard F12751.

***Program Restrictions and Guidelines***

***Terms and Conditions***

This measure includes new commercial electric or gas griddles that are ENERGY STAR® qualifiedor meet the qualifications listed in Table 1. ENERGY STAR® maintains an updated list of qualifying products and specifications at www.energystar.gov. Consult with the manufacturer or manufacturer’s representative to determine if a non-ENERGY STAR® qualified model meets the efficiency requirements in Table 1.Used or rebuilt equipment is not eligible. Customers must provide proof that the appliance has a cooking-energy efficiency that meets the requirements. The rebate is downstream provided to the customer at the time of sale upon receipt of application and invoice. This is not a Direct install program.

**Table 1 Energy Efficiency Requirements for Commercial Griddles.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Code** | **Griddle Type** | **Cooking-Energy Efficiency\*** | **Idle Energy Rate** |
| FS002 | Electric Griddles | ≥ 70% | ≤ 355 watts per ft² |
| FS003 | Gas Griddles | ≥ 38% | ≤ 2,650 Btu/h per ft² |

\*Based on the heavy-load test in ASTM F1275.1

***Market Applicability***

This measure is applicable to any commercial cooking application, including (but not limited to) casual dining and quick service restaurants, hotels, motels, schools, colleges and recreational facilities.

## 1.2 Product Technical Description

Commercial griddles are used throughout the hospitality industry, typically occupying a central position on the short order line. Its 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, are better controlled, and provide higher production rates. Energy-efficient commercial electric griddles reduce energy consumption primarily through application of advanced controls and improved temperature uniformity. Energy efficient commercial gas griddles reduce energy consumption primarily through advanced burner design and controls. This measure is focused on electric and gas “flat” (single sided) griddles. Griddle performance is determined by applying the ASTM Standard Test Method for the Performance of Griddles (F1275) 1. The ASTM standard test method is considered to be the industry standard for quantifying the efficiency and performance of griddles.

## 1.3 Measure Application Type

The DEER Measure Cost Data Users Guide found on [www.deeresources.com](http://www.deeresources.com) under *DEER2014 Database Format* hyperlink, DEER2014, spreadsheet *SPTdata\_format-V0.97.xls*, defines the terms as follows:

Table 2 Measure Application Type[[1]](#endnote-1)

*Identifies the measure application type in the Measure Implementation table in DEER2014.*

|  |  |  |
| --- | --- | --- |
| **Code** | **Description** | **Comment** |
| ER | Early retirement | *measure applied while existing equipment still viable, or retrofit of existing equipment* |
| ROB | Replace on Burnout | *measure applied when existing equipment fails or maintenance requires replacement* |
| NC | New Construction | *measure applied during construction design phase as an alternative to a code-compliant standard design* |

## Since there are no EM&V studies on the useful life of griddles and it is standard practice in the commercial foodservice industry to purchase equipment only when it is needed (e.g., replacement or additional capacity), this measure is focused on ROB and NC applications only.

***1.4 Product Base Case and Measure Case Data***

## 1.4.1 DEER Base Case and Measure Case Information

The 2014 DEER database does not contain information on energy use or savings or equipment costs for an energy-efficient electric or gas griddle measure. The only reference in DEER for Commercial cooking equipment is for Estimated Useful Life.

**Table 3 Deer Use and Technology Table**



**Hours of Operation:**

This measure would follow the hours of operation for quick serve and full serve restaurants as noted in the ASTM standards. For this measure the annual hours of operation are considered 4380.

12 hrs/day \* 365 day/yr = 4380

**Base Case Costs and Measure Case Costs**

The base case and measure case costs are calculated and found in section 1.4.4.

**Net-to-Gross Assumption:**

As noted in Section 1.1, the rebate is downstream provided to the customer at the time of sale upon receipt of application and invoice. This is not a Direct Install program.

DEER 2014 does not specifically list commercial food service appliances, the default used for non residential measures is 0.6. Table 4 below summarizes all applicable DEER based Net-to-Gross ratios for programs that may be used by this measure.

Table 4 2014 DEER Net-to-Gross Ratios

|  |  |
| --- | --- |
|  |  |
| Program Approach | NTG |
| All Com-Default>=2yrs | 0.6 |

**Effective Useful Life:**

The Effective Useful Life estimates were downloaded directly from DEER, they match the intended measures for climate zones and building types and vintages.

**Table 5 DEER 2014 Effective Useful Life**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **EUL (yrs)** | **RUL (yrs)** | **DEER Version** | **Impact IDs** |
| **ANY** | **ANY** | **PG&E** | **12** | **N/A** | **DEER2014** | **Cooking Equipment** |
| **ANY** | **ANY** | **PG&E** | **12** | **N/A** | **DEER2014** | **Cooking Equipment** |

**In-service rate/first year installation rate**:

The in–service rate was not found in DEER or any supporting documentation. We have therefore assumed the ISR is 1.0 for all measures based on engineering judgment.

See Section 1.1 Terms and Conditions and Market Applicability to reference the type of program delivery mechanism and customer status used to determine this entry.

## 1.4.2 Codes & Standards Requirements Base Case and Measure Information

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

ASTM Standard Test Method for thePerformance 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.

***Title 20:*** This measure does not fall under Title 20 of the California Energy Regulations.

***Title 24:*** This measure does not fall under Title 24 of the California Energy Regulations.

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

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

## There are no specific EM&V studies identified that addressed the cooking measures in the commercial sector.

## 1.4.4 Assumptions and Calculations from other sources—Base and Measure Cases

This Work Paper uses ASTM Standard Test Method for thePerformance of Griddles (F1275) for calculation of energy use and demand, based on testing in an approved and qualified laboratory. 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 6.

The previous versions of the DEER database from 2011 and 2008 did not contain information on energy use or savings or equipment costs for an energy-efficient electric or gas griddle measure, with the exception of Estimated Useful Life.

The original version of this workpaper was developed with independent cost data for this measure rather than using the available 2005 DEER data. The DEER calculations used a linear savings estimate based on the average production kW and Btu/h inputs of a standard and energy efficient griddles over a 12-hour day. 365 days per year as the bases of their savings calculations. This Work Paper is based on the calculation methods in ASTM Standard Test Method for thePerformance of Griddles (F1275), which uses measured data under preheat, idle, and heavy-load cooking conditions. Savings calculations using this test method is detailed in Section 2 of this work paper.

**Table 6 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 |
| Gas Griddles | 3,500 Btu/sqft/h | 30% | 25 lb/h |

\*Based on the Heavy-load Hamburger Patties test in ASTM F1275.1

The measure case data was drawn from the list of commercial griddles that have been tested by IOU testing laboratories as of April 20, 2012. The complete list is in Appendix A and the averages are summarized in Table 7.

**Table 7 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 |
| Gas Griddles | 2,068 Btu/sqft/h | 46% | 49 lb/h |

\*Based on the Heavy-load Hamburger Patties test in ASTM F1275.1

***1.4.5 Time-of-Use Adjustment Factor***

We are required by CPUC decision 06-06-063 dated June 29, 2006 to apply time-of-use (TOU) adjustment factors on residential A/C and commercial A/C (packaged and split-system direct-expansion cooling) measures only. Since this is not an A/C measure, the TOU adjustment factor is 0.

The specific values and results are summarized in

Table

Table 8 TOU Adjustment Factors

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure** | ***kWAC*** | ***kWTotal*** | **%** |
| Commercial Cooking Equipment | 0 | 0 | 0 |

***1.5 Summary of Inputs for Savings Calculations***

The following table provides references to sections that document the inputs for calculation:

**Table 9 Summary of Inputs for Savings Calculations**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Input Variable** | **Variations** | **Base Case Electric Average Value** | **Base Case Gas Average Value** | **Measure Case Elec FS002 Average Value** | **Measure Case Gas FS003 Average Value** | **Reference Section** |
| **Electric Savings** | None | N/A | N/A |  | N/A | Section 1.4.1 |
| **Gas Savings** | None | N/A | N/A | N/A |  | Section 1.4.4 |
| **Hours of operation** | None | 4380 | 4380 | 4380 | 4380 | Section 1.4.1 |
| **Full Cost** | None | $750 | $1,026 | $1,008 | $1,312 | Section 1.4.4 |
| **Incremental Cost** | None | N/A | N/A | $258 | $286 | Section 1.4.4 |
| **EUL /RUL** | None | 12 | 12 | 12 | 12 | Section 1.4.1 |
| **NTG** | None | N/A | N/A | 0.6 | 0.6 | Section 1.4.1 |
| **ISR** | No | 1 | 1 | 1 | 1 | Section 1.4.1 |
| **TOU Factor** | *A/C projects only* | *0* | *0* | *0* | *0* | *Section 1.4.5* |

# Section 2. Calculation Methods

Table 10 Baseline by Measure Application Type

|  |  |  |  |
| --- | --- | --- | --- |
| ****Measure Application Type**** | ****Measure Life Basis**** | ****First Baseline Period: Energy Savings Baseline**** | ****Second Baseline Period: Energy Savings Baseline**** |
| ***ER* (early retirement)** | **EUL** | Customer Average Baseline | Code Baseline |
| ***ROB* (replace-on-burnout)** | **EUL** | Code Baseline | N/A |
| ***NC* (new construction)** | **RUL/EUL-RUL** | Code Baseline | N/A |

Notes:

* For ROB measures, First Baseline is the baseline for the full EUL. There is no second baseline.
* For ER measures, First Baseline Period is the period for the RUL(remaining useful life),defined by the CPUC as RUL=1/3 EUL. Second baseline period for ER is Code baseline for the period EUL-RUL.

## 2.1 Electric Energy Savings Estimation Methodologies

The industry standard for energy use and cooking performance of griddles is ASTM Standard Test Method for thePerformance of Griddles (F1275). Table 11 shows an example of the calculation results for electric griddles under ASTM F1275.

**Table 11. Commercial Electric Griddle Cost Effectiveness Example.**

|  |  |  |
| --- | --- | --- |
| **Performance** | **Baseline Model** | **Energy Efficient Model** |
| Preheat Time (min) | 15 | 15 |
| Preheat Energy (kWh) | 4.00 | 2.00 |
| Normalized Idle Energy Rate (watts per ft²) | 400 | 355 |
| 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 | 365 | 365 |
| Pounds of Food Cooked per Day | 100 | 100 |
| Electric Cost ($/kWh) | $0.13 | $0.13 |
| ASTM Energy to Food (kWh/lb) | 0.139 | 0.139 |
| Daily Energy Consumption (kWh) | 48.5 | 37.6 |
| Average Demand (kW) | 4.0 | 3.1 |
| Estimated Demand Reduction (kW) per foot | - | 0.3 |
| Annual Energy Consumption (kWh) | 17,713 | 13,735 |
| Estimated Energy Savings (kWh/yr) | - | 3,978 |
| Estimated Energy Savings (kWh/yr) per foot |  | 1,326 |
| Annual Energy Cost ($) | $2,303 | $1,786 |
| Estimated Cost Savings ($/yr) | - | $517 |
| Incremental Measure Costa | - | SEE APPENDIX A |
| Estimated Useful Life (EUL)b | 12 years | 12 years |
| Number of Preheats per Day | 1 | 1 |

a Incremental measure cost was determined through communications with local manufacturers and distributors to determine the retail cost to purchase a qualifying model over the baseline standard.

b The estimated useful life is based on the 2008 DEER EUL estimates.

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

## 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.

The demand reduction estimation is based on measured data for standard efficiency electric griddles and for high-efficiency griddles (≥ 70% cooking efficiency). The measured data are derived from tests conducted under ASTM Standard Test Method for thePerformance of Griddles (F1275).

ASTM F1275 provides standard conditions under which griddle energy use is measured. The estimated demand reduction of 900 Watts is based on data from tests of standard efficiency and high efficiency griddles. Applying a Coincidence Factor of 0.9 per the DEER methodology[[2]](#endnote-2), yields a Demand Savings of 810 Watts.

## 2.3. Gas Energy Savings Estimation Methodologies

The industry standard for energy use and cooking performance of griddles is ASTM Standard Test Method for thePerformance of Griddles (F1275). The Federal Energy Management Program for their energy efficient griddle purchasing recommendation also uses the ASTM calculation method.8 Table 12 shows an example of the calculation results under ASTM F1275.

**Table 12. Commercial Gas Griddle Cost Effectiveness Example.**

|  |  |  |
| --- | --- | --- |
| **Performance** | **Base Model** | **Energy Efficient Model** |
| Preheat Time (min) | 15 | 15 |
| Preheat Energy (Btu) | 21,000 | 15,000 |
| Normalized Idle Energy Rate (Btu/h per ft²) | 3,500 | 2,650 |
| Idle Energy Rate (Btu/hr) | 21,000 | 12,408 |
| Cooking-Energy Efficiency (%) | 32% | 46% |
| Production Capacity (lb/hr) | 25 | 49 |
| Operating Hours/Day | 12 | 12 |
| Operating Days/Year | 365 | 365 |
| Pounds of Food Cooked per Day | 100 | 100 |
| Gas Cost ($/therm) | $1.00 | $1.00 |
| ASTM Energy to Food (Btu/lb) | 475 | 475 |
| Daily Energy Consumption (Btu) | 341,746 | 238,835 |
| Annual Energy Consumption (therms)a | 1,247 | 872 |
| Estimated Energy Savings (therms/yr) | - | 376 |
| Annual Energy Cost ($) | $1,247 | $872 |
| Estimated Cost Savings ($/yr) | - | $376 |
| Incremental Measure Costb | - | SEE APPENDIX A |
| Estimated Useful Life (EUL)c | 12 years | 12 years |
| Number of Preheats/Day | 1 | 1 |

a 1 therm = 100,000 Btu.

b Incremental measure cost was determined through comparison of an average of published pricing listed in APPENDIX A.

c The estimated useful life is based on the 2008 DEER EUL estimates.

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

# *Section 3. Load Shapes*

Load Shapes are an important part of the life-cycle cost analysis of any energy efficiency program portfolio. The net benefits associated with a measure are based on the amount of energy saved and the avoided cost per unit of energy saved. For electricity, the avoided cost varies hourly over an entire year. Thus, the net benefits calculation for a measure requires both the total annual energy savings (kWh) of the measure and the distribution of that savings over the year. The distribution of savings over the year is represented by the measure’s load shape. The measure’s load shape indicates what fraction of annual energy savings occurs in each time period of the year. An hourly load shape indicates what fraction of annual savings occurs for each hour of the year. A Time-of-Use (TOU) load shape indicates what fraction occurs within five or six broad time-of-use periods, typically defined by a specific utility rate tariff. Formally, a load shape is a set of fractions summing to unity, one fraction for each hour or for each TOU period. Multiplying the measure load shape with the hourly avoided cost stream determines the average avoided cost per kWh for use in the life cycle cost analysis that determines a measure’s Total Resource Cost (TRC) benefit.

## 3.1 Base Case Load Shapes

The closest load shape chosen for this measure is the DEER:Indoor\_Non-CFL\_Ltg load shape. See Table 13 for a list of all Building Types and Load Shapes. See the KEMA report [31] for a more thorough discussion regarding the load shapes for this measure.

Table 13 Base Case Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **E3 Alt. Building Type** | **Load Shape** |
| Restaurant – Fast Food | NON\_RES | DEER:Indoor\_Non-CFL\_Ltg |

The base case load shape would be expected to follow a typical nonresidential foodservice end use load shape.

Commercial griddle load shapes differ among food service facilities (quick service, casual dining, hotels, college, schools, hospitals etc) depending on daily menu variations, hours of operation, serving periods, day-of-week, and facility location (city downtown, suburban mall, access to interstate highways, etc.). Consequently, applicable average TOU and hourly load shapes for griddles are unavailable. The ASTM Standard Test Method used to generate energy use data for evaluation against the Energy Star program is based on hours of use and food cooking condition (idle, light, and heavy). Generally, griddles are used to prepare food shortly before it is served, so loads tend to increase shortly before and during regular meal periods (breakfast, lunch, and dinner). Between meal periods griddle use tends to be either idle or light.

## 3.2 Measure Load Shapes

For purposes of the net benefits estimates in the E3 calculator, what is required is the load shape that ideally represents the *difference* between the base equipment and the installed energy efficiency measure. This *difference* load profile is what is called the Measure Load Shape and would be the preferred load shape for use in the net benefits calculations.

The measure load shape for this measure is determined by the E3 calculator based on the applicable nonresidential market sector and the foodservice end-use.

The electric demand profile for the high-efficiency electric griddle is expected to be the same as the Base Case. The profile will vary as explained in Section 3.1. The Measure Load Shape for the high-efficiency griddle will use less energy and have a slightly lower demand profile.

The gas load profile for the high efficiency gas griddle is expected to be the same as the Base Case. The profile will vary as explained in Section 3.1. The Measure Load Shape for the high efficiency griddle will use less energy.

# Section 4. Base Case & Measure 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.

Equipment prices for these work papers were compiled from a number of sources including, Autoquotes, equipment sales reps and manufacturer sources. Since equipment pricing in food service is closely held information and prices vary widely according to buying volume and other factors, we cannot list the sources for prices specifically.

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Application Type** | **Measure Life Basis** | **First Baseline Period Full Measure Cost (RUL)** | **Second Baseline Period Full Measure Cost (EUL – RUL)** |
| ***NC (new construction)*** | EUL | Calculated as Incremental Measure Cost | N/A |
| ***ROB(replace on burnout)*** | EUL | Calculated as Incremental Measure Cost | N/A |
| ***ER (early retirement)*** | RUL/  EUL-RUL | Calculated as Full Gross Measure Cost | Calculated as Negative Full Gross Base Case Cost |

## 4.1 Base Case(s) Costs

The Base Case costs include only the equipment. High efficiency griddles require no additional labor or maintenance compared to base case griddles. Since this measure is applicable for ROB and NC installations, the installation and maintenance costs are expected to be the same for the customer. The estimated equipment cost is based on recent list cost data for electric and gas griddles and applying an industry-standard 50% discount to the manufacturer published list prices. 9-11

The following Measure Application Types are appropriate to these measures. The Base Case Costs are:

**Table 14 Base Case Costs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Base Case Cost** |
| FS002 | ROB /NC | Industry Practice | $750 | $0 | $0 | $750 |
| *FS003* | ROB / NC | *Inductry Practice* | *$1026* | *$0* | *$0* | *$1026* |

*All costs are noted as $ per measure unit*

## 4.2 Measure Case Costs

The Measure costs include only the equipment, as explained in Section 4.1. The estimated equipment cost is based on recent list cost data and applying an industry-standard 50% discount to the manufacturer published list prices (see Appendix B). 9-11

The following Measure Application Types are appropriate to these measures. The Measure Case Costs are:

**Table 15 Measure Case Costs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Measure Case Cost** |
| FS002 | ROB/ NC | Industry Practice | $1008 | $N/A | $N/A | $1008 |
| *FS003* | ROB/NC | *Industry Practice* | *$1312* | *$N/A* | *$N/A* | *$1312* |

*All costs are noted as $ per measure unit*

## 4.3 Incremental & Full Measure Costs

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Application Type** | **Full Measure Cost**  **(RUL Period/First Baseline)** | **Full Measure Cost**  **(EUL-RUL Period/ Second Baseline)** | **Incremental Measure Cost** |
| ER | Measure Equipment Cost  +Measure Labor Cost | (-1)x(Base Equipment Cost  + Base Labor Cost) | Measure Equipment Cost  – Base Case Equipment Cost |
| ROB | Measure Equipment Cost  – Base Case Equipment Cost | N/A | Measure Equipment Cost  – Base Case Equipment Cost |
| NC | Measure Equipment Cost  – Base Case Equipment Cost | N/A | Measure Equipment Cost  – Base Case Equipment Cost |

# *4.3.1 Full Measure Cost*

Full Measure Cost is the cost to install an energy efficient measure per the CPUC calculators. This definition implies a different meaning depending on the Measure Application type.

\*Note: Various complicated price fluctuations are not addressed in these equations, such as future costs due to inflation in labor, future costs due to deflation in material cost, and other variables that cannot be accurately described at this time.

# *4.3.2 Incremental Measure Costs*

Incremental Measure Cost is the premium cost to install an energy efficient measure over a standard efficiency measure or code baseline measure. While IMC has a straightforward definition depending on the Measure Application type, the equation does vary. Unit is considered 1 square foot.

Incremental measure costs are used in the analysis.

IMC = Measure Equipment Cost – Base Case Equipment Cost

*FS002: IMC = $ 1008 per (unit) -- $ 750 per (unit) = $ 258 per (unit)*

*FS003: IMC = $ 1312 per (unit) -- $ 1026 per (unit) = $ 857 286 per (unit)*

# 

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2. 8 2004-2005 Database for Energy Efficiency Resources (DEER) Update Study Final Report, pp. 3-15 to 3-18. [↑](#endnote-ref-2)