Work Paper SCE17CC017

**Revision 0**

**Southern California Edison**

**Refrigerated Chef Bases**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | FS-20263, FS-20265, FS-20267, FS-20269 |
| **Measure Description** | High Efficiency Refrigerated Chef Bases in Commercial Kitchens |
| **Base Case Description** | Standard Practice Refrigerated Chef Bases |
| **Units** | Each |
| **Energy Savings** | Refer to Excel Calculation Attachment 1. |
| **Full Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1. |
| **Incremental Measure Cost ($/unit)** | Refer to Excel Calculation Attachment 1. |
| **Effective Useful Life** | 12.0 years (DEER EUL ID: Cook-GDRef) |
| **Measure Installation Type** | Replace-on-Burnout (ROB) and New Construction (NEW) |
| **Net-to-Gross Ratio** | 0.60 (DEER NTGR ID: Com-Default>2yrs) |
| **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 | 04/02/2018 | Ram Dharmarajan/ Akhilesh Reddy Endurthy (Lincus, Inc.) | * Original Work Paper for 2018 Program Year. |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |

Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper details the installation of high efficiency refrigerated chef bases in commercial kitchens. Refrigerated chef bases are used to keep ingredients or prepared meals close to the cooking station, making food prep more efficient. Cooking equipment, like griddles and char broilers, are kept on top of these commercial chef bases. The base case is an existing or new chef base consuming the maximum allowable daily energy consumption (MDEC) for commercial refrigeration equipment listed in the Title 10 of Electronic Code of Federal Regulations (CFR) 79 FR 17732, Mar 28, 2014 [Attachment 8]. The measure case is categorized based upon the Chef Base exterior lengths typically available in the market and tiered based upon the energy consumption as shown below:

• Exterior Length between 35 – 54 inches and Energy Consumption less than 1.36 kWh/day.

• Exterior Length between 55 – 73 inches and Energy Consumption less than 1.61 kWh/day.

• Exterior Length between 74 – 89 inches and Energy Consumption less than 1.83 kWh/day.

• Exterior Length between 90 – 120 inches and Energy Consumption less than 2.13 kWh/day.

Base, Standard and Measure Cases

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | High Efficiency Refrigerated Chef Bases |
| Existing Condition | Standard Refrigerated Chef Bases |
| Code/Standard | Industry Standard Practice Baseline |
| Industry Standard Practice (ISP) | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
| n/a |  | FS-20263 |  | Installation of High Efficiency Refrigerated Chef Bases with an exterior length between 35 - 54 inches and energy consumption less than 1.36 kWh/day |
| n/a |  | FS-20265 |  | Installation of High Efficiency Refrigerated Chef Bases with an exterior length between 55 - 73 inches and energy consumption less than 1.61 kWh/day |
| n/a |  | FS-20267 |  | Installation of High Efficiency Refrigerated Chef Bases with an exterior length between 74 - 89 inches and energy consumption less than 1.83 kWh/day |
| n/a |  | FS-20269 |  | Installation of High Efficiency Refrigerated Chef Bases with an exterior length between 90 - 120 inches and energy consumption less than 2.13 kWh/day |

**Eligibility Requirements**

* The installed chef base must have a lower MDEC value than listed for commercial refrigeration equipment beginning January 1, 2010 listed in 79 FR 17732 [Attachment 8].
* The measures in this workpaper are eligible for all 16 climate zones (CZs).
* Program implementation shall collect measure data for use in updating future versions of this workpaper. The program data collected should include the following:
  + Manufacturer, model number and serial number of installed equipment
  + Measure equipment costs and, if available, installation costs
  + Pre-existing equipment information, if replacing existing equipment
  + Customer surveys and distributor survey (if mid-stream delivery channel is utilized)

## 1.2 Technical Description

Refrigerated Chef Bases are found in almost all commercial kitchens. These appliances are designed to support heavy and/or hot cooking equipment on the top and refrigerated compartments underneath for quick and easy access to various refrigerated products. They range from approximately three feet to over eight feet in exterior length. The refrigerated compartment can be equipped with drawers or doors depending on a customer’s desired specifications. Typical chef bases operate using a conventional vapor compression refrigeration cycle charged with R-404a or R-290 propane.

## 1.3 Installation Types and Delivery Mechanisms

The program/install types for the above measures are:

* New Construction (NEW)
* Replace on Burnout (ROB)

The delivery method that is available for these measures is:

* Financial Support - Down-Stream Incentive – Deemed

The measure is offered as a ROB and a NEW install type but only one solution code has been used for both the install types. This is because the savings and the costs are the same in both cases.

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 |
| New Construction (NEW/NC) | Above Code or Standard | N/A | EUL | N/A |

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. |
| Mid-Stream Programs | *See Mid-Stream Incentive in the Incentive Method Descriptions table.* |
| Partnership | The program implements projects through a partnership between the utility and an institutional, government, or community-based organization. |

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. |
| Mid-Stream Incentive  Mid-Stream Buy Down | The program gives a financial incentive to a midstream market actor (distributor, vendor, or retailer) to encourage the promotion of efficient measures. Buy Down means that the incentive is required to be passed down to the end-use customer. |
| On-bill Finance – Loan (OBF) | The program offers financing for the cost of an efficient measure as part of the utility bill. This can be an add-on option to an existing program or can serve as an organizing principle for its own program. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

The 2017 Database for Energy Efficient Resources (DEER) does not contain Refrigerated Chef Base measures.

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Work paper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | No |
| DEER Base Case | No |
| DEER Measure Case | No |
| DEER Building Types | Yes |
| DEER Operating Hours | No |
| DEER eQUEST Prototypes | No |
| DEER Version | N/A |
| Reason for Deviation from DEER | Both the current and previous versions of DEER do not contain this measure. |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI v.2.4.7 tool. The relevant NTG values for the measures in this work paper are in the table below.

Net-to-Gross Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 | 0.60 |

**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 in the table below were obtained using the DEER READI tool v.2.4.7.

Gross Savings Installation Adjustment

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

**Effective and Remaining Useful Life**

The Effective Useful Life (EUL) and the Remaining Useful Life (RUL) values were obtained using the DEER2014 values in READI tool v.2.4.7. DEER does not have an exact EUL definition for chef bases technology, thus commercial reach-in refrigerator/freezer is used as the closest match since the primary components are similar to chef bases. The relevant EUL and RUL values used for the measure in this work paper are in the table below.

Effective Useful Life

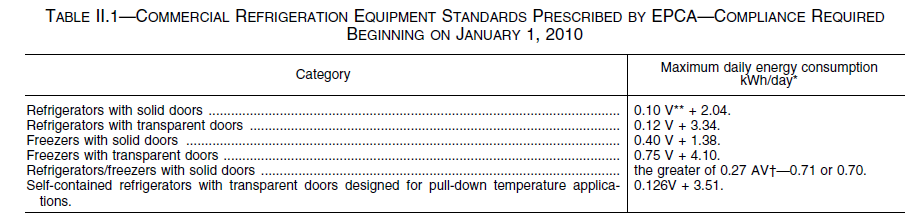
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| Cook-GDRef | Commercial Reach-in Refrigerator/ Freezer | Com | ComRefrig | 12 | N/A |

### 1.4.2 Codes and Standards Analysis

The Federal Register 79 FR 22281, April 21, 2014 [Attachment 9] defines chef bases or griddle stand as “*commercial refrigeration equipment that is designed and marketed for the express purpose of having a griddle or other cooking appliance placed on top of it that is capable of reaching temperatures hot enough to cook food.*”

This document further states that “*To clearly differentiate ‘‘chef bases’’ and ‘‘griddle stands’’ from conventional types of commercial refrigeration equipment that are currently covered by energy conservation standards, DOE proposed to establish a definition for ‘‘chef base’’ and/or ‘‘griddle stand’’ based on the unique operation of chef bases and griddle stands, which are designed to provide food-safe temperatures in extremely warm environments in excess of 200 °F, and thus are designed with uniquely robust refrigeration systems.*”

79 FR 17732 [Attachment 8]lists the MDEC (kWh/day) for various commercial refrigeration equipment with compliance beginning January 1, 2010; and also proposes energy standards with compliance required from March 27, 2017. The below table is an extract from 79 FR 17732 [Attachment 8] for compliance required beginning January 1, 2010.



However, 79 FR 22281 [Attachment 9] clarifies that chef bases were not considered in 79 FR 17732 [Attachment 8] and hence energy conservation code does not apply. This document further states that “Chef bases and griddle stands are also designed to provide food-safe temperatures in extremely hot environments, and thus are designed with uniquely robust refrigeration systems. These refrigeration systems require larger compressors to provide more cooling capacity for the storage volume than equipment with compressors that are appropriately sized for more typical ambient temperatures. As a result, this equipment consumes more energy than similarly sized, standard Commercial Refrigeration Equipment (CRE) models.”

ENERGY STAR Program Requirements Product Specification for Commercial Refrigerators and Freezers Eligibility Criteria Version 4.0[Attachment 10] also excludes chef bases in-line with 79 FR 22281 [Attachment 9]. Title 20 and Title 24 do not apply to this measure.

When test results from the SCE ET study [Attachment 5, 6 and 7] were compared with the MDEC (kWh/day) from Table II.1 in the 79 FR 17732 [Attachment 8], it was observed that product A and B are more efficient than the federal allowable consumption whereas products C, D, E and F are less efficient.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Product Mfg** | **Product Tag** | **Refrigerant** | **Refrigerated Volume (ft3)** | **Energy use intensity (EUI) (kWh/day/ft3)** | **Maximum EUI as per Federal Code (kWh/day/ft3)** |
| **Mfg #1** | **A** | **R-134a** | **15.3125** | **0.112** | **0.232** |
| **Mfg #2** | **B** | **R-404a** | **9.84** | **0.217** | **0.306** |
| Mfg #3 | C | R-134a | 15.81 | 0.260 | 0.229 |
| Mfg #4 | D | R-404a | 13.95 | 0.317 | 0.246 |
| Mfg #5 | E | R-404a | 15.18 | 0.480 | 0.234 |
| Mfg #6 | F | R-134a | 13.78 | 0.601 | 0.247 |

While 79 FR 17732 [Attachment 8]has updated the compliance requirements for commercial refrigeration equipment beginning March 27, 2017, SCE recommends using the compliance requirements beginning January 1, 2010 for this measure baseline due to the following reasons:

* The compliance requirements do not apply to chef bases. Hence, the product manufacturers are not regulated by any standards and have products with varying energy use intensities as listed in the table above. Pacific Gas and Electric Company (PG&E) in conjunction with the Food Service Technology Center (FSTC) conducted a study on chef bases at the FSTC laboratory facilities. The test results verified that the presence of hot cooking loads in the form of a gas griddle or gas char broiler on top of the chef base did not affect the holding energy rate, drawer temperature, and the energy usage. The findings from these tests were used as the basis to use the Federal regulations code for commercial refrigeration equipment as the baseline for this work paper.
* Based on the test results from the ET study, 5 out of the 7 tested chef bases were found to be exceeding the 2010 EUI requirements [Attachments 5, 6 and 7]. This finding is used as the basis for determining the appropriate baseline in the absence of established ISP or code.
* A major manufacturer of chef bases in California, has all its models consuming more energy than the 2010 EUI. This fact supports that the baseline used in this workpaper is more stringent than the current industry standard practice in California.

In the following sections of the Work Paper, the federal compliance requirements beginning January 1, 2010 for the chef bases is called the standard practice baseline.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 10 of Electronic Code of Federal Regulations (CFR) | 79 FR 17732, Mar 28, 2014 [Attachment 8] | March 2014 |

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

### 1.5.1 ET15SCE1010 Chef Bases for Foodservice Applications [Attachment 5, 6 and 7]

Southern California Edison (SCE) conducted an Emerging Technology (ET) study (ET15SCE1010) [Attachment 5, 6 and 7] in accordance to ASHRAE 72 Method of Testing Open and Closed Refrigeration and Freezers standards on (6) chef base models, (3) with refrigerant R-404a and (3) with R-134a and found the energy use intensity (kWh/day/ft3) varying between 0.11 and 0.60. The chef bases were monitored for 2 days each at 20 second time intervals.

The energy consumption data for all six chef bases was compared with the maximum federal code requirement as per 79 FR 17732 [Attachment 8]. Two chef bases from manufacturers exceed the standard practice baseline by 31% and 52%, respectively. The remaining four were tested between 14% to 143% below the standard practice baseline. In summary, test results showed a wide range of energy performance between six manufacturers. This is likely due to the fact that Chef Bases are not subject to any Federal or any State codes/Regulations.

If financial incentives/rebates are provided for energy efficient chef bases, the market will steer towards designing and producing more efficient chef bases.

### 1.5.2 Food Service Technology Center (FSTC) Test Reports [Attachment 11]

Pacific Gas and Electric Company (PG&E) in conjunction with the Food Service Technology Center (FSTC) conducted a study on chef bases at the FSTC laboratory facilities. The goal of this testing was to determine if a hot cooking load placed on top of the chef bases affect the energy consumption, compressor run time, and holding capacity. The results suggest that there is little to no significant impact to the performance of chef bases. The links to the test reports are listed in [Attachment 11] at the end of the workpaper.

## 1.6 Data Quality and Future Data Needs

Based on SCE ET study [Attachment 5, 6 and 7] and market research, there are only two manufacturers who manufacture chef bases which are more efficient than the standard practice baseline specified above. While all their products are above the standard practice baseline, they are not available in all the tiers of efficiency improvement over the standard practice baseline. For example, size category 1 products are only available between 43% to 69% efficiency above the standard practice baseline. The measure offering is classified into only one tier, >50% efficient than the standard practice baseline. It is hoped that, once this measure is offered, more manufacturers will make efficient products, which will allow to increase the granularity in the efficiency tiers. Two to three years after offering this measure, when more data of the installed chef bases is available, more efficiency tiers with short range of efficiency improvement can be created. This will increase the accuracy in the savings and costs estimates.

# Section 2. Calculation Methodology

The measures in this work paper are not in DEER 2017 or previous DEER versions. The baseline energy usage is determined from 79 FR 17732 [Attachment 8],compliance required beginning January 1, 2010 for Refrigerators with solid doors. The measure is offered in one tier, >50% efficient than the standard practice baseline.

## 2.1 Electric Energy Savings Calculation

The step-by-step calculation methodology is as follows:

1. The refrigerated chef bases are typically categorized based on the outside length ranging from 36” to 120”. The height and depth are constant for a range of products from each manufacturer. Additionally, among different manufacturers, there is a minimal variation in the height and depth. Of the (6) chef bases from different vendors considered in the SCE ET study, the coefficient of variation in refrigerated height and depth are 9.31% and 7.24% respectively. Hence, this work paper considers length as the primary independent parameter and categorizes the chef bases into four sizes similar to the products in the market. The average refrigerated ‘height X depth’ is calculated for the (6) chef bases, which is later used to calculate the volume of the chef bases.
2. As per the 79 FR 17732, The Daily Energy Consumption (DEC) for Refrigerators with solid doors is given by the equation below.

where V is the chilled compartment volume in cubic feet.

1. Each model has a similar difference between the outside length and the inside refrigerated length (L). Using the constant difference and outside length, the average refrigerated inside length (L) is calculated for each size category.
2. The average refrigerated volume for each size category is calculated using the average refrigerated inside length from Step 3 and average refrigerated ‘height X depth’ from Step 1.
3. Using Step 2, the Baseline Daily Energy Consumption (BDEC) is calculated. For a 60-inch refrigerated length, the BDEC is calculated as follows.

where 3.04 sq.ft. is the typical inside ‘height X depth’ for chef bases in the market.

1. SCE ET Study tested the chef bases complying with ASHRAE 72 standards, where the products were monitored for 2 days at 20 second intervals. The DEC is calculated using the average kW when the compressor is “ON” and multiplied by number of hours the compressor is “ON”. When compared with the standard practice baseline DEC from Step 2, two chef bases from manufacturers exceeded the standard practice baseline by 31% and 52% respectively. The energy usage for all the products offered by these two manufacturers and their cost data is gathered. While all the products are above standard practice baseline, they are not available in all efficiency tiers. For example, size category 1 products are only available between 43% to 69% efficiency above standard practice baseline. This measure offering is classified as, >50% better than the standard practice baseline.
2. The MDEC is calculated using the mid-point energy use reduction times the Baseline DEC (BDEC) from the above step as shown in the table below.

|  |  |  |
| --- | --- | --- |
| **Tier Definition** | **Mid-point Efficiency Above Standard Practice Baseline** | **MDEC (kWh/day)** |
| >50% better than standard practice baseline | 65% |  |

1. Perishable items are stored in the refrigerated chef bases, so the bases are in auto mode cycling “ON/OFF” as required. Hence, they typically operate 365 days a year. The annual energy savings are calculated using the equation below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Size Category** | **Measure** | **Baseline Energy Consumption (kWh/day)** | **Measure Case Tier (kWh/day range)** | **kWh/ day savings** | **Annual kWh savings** |
| 1 | FS-20263 | 2.73 | <1.36 | 1.77 | 646.69 |
| 2 | FS-20265 | 3.22 | <1.61 | 2.09 | 763.92 |
| 3 | FS-20267 | 3.66 | <1.83 | 2.38 | 869.13 |
| 4 | FS-20269 | 4.26 | <2.13 | 2.77 | 1010.41 |

## 2.2 Demand Reduction Calculation

1. To understand the measure case chef bases load (kW) during peak hours as compared to the average load, the ratio of the peak kW to the daily average kW is calculated for the tested chef base which is >50% above the standard practice baseline. The peak kW is the average kW between 2PM and 5PM, this data is available from the monitored test data in the ET study. The average kW is the average MDEC for each size divided by 24 (total available daily operating hours).

It is assumed that the ratio for the tested model, which is >50% efficient applies to all the products in this efficiency tier across the size categories. The following equations defines the peak kW ratio and how the peak kW is calculated using DEC.

)

Where Measure Peak kW ratio = 5.7917

Since the chef bases are located inside a conditioned environment, there is a minimal effect from the ambient weather on the peak kW. Hence, the 2PM-5PM kW from the SCE ET monitored period is assumed to be the peak kW during DEER peak hours.

1. There are no efficiency Tiers for the baseline. The following equations defines the baseline peak kW ratio and calculation formula.

Please refer to “SCE17CC017.0 - Refrigerated Chef Bases Workpaper Calculation Template - Final Version 6.7.5.xlsx” {Attachment 3] for the calculation template and “Savings Summary.xlsx” [Attachment 1] for the detailed calculation methodology. The energy savings are independent of climate zones and building type.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Size Category** | **Measure** | **Average Measure kW** | **Peak Measure kW (2 to 5 pm)** | **Average Baseline kW** | **Peak Baseline kW (2 to 5 pm)** | **Peak kW Reduction** |
| 1 | FS-20263 | 0.0398 | 0.2302 | 0.1136 | 0.6578 | 0.4276 |
| 2 | FS-20265 | 0.0470 | 0.2720 | 0.1342 | 0.7770 | 0.5051 |
| 3 | FS-20267 | 0.0534 | 0.3094 | 0.1526 | 0.8840 | 0.5746 |
| 4 | FS-20269 | 0.0621 | 0.3597 | 0.1775 | 1.0277 | 0.6680 |

# 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 this measure are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Restaurant - Fast-Food | Refrigeration | Fast\_Food\_Restaurant |
| Restaurant - Sit-Down | Refrigeration | Sit\_Down\_Restaurant |
| Hotel - Lodging | Refrigeration | Hotel\_Motel |
| Lodging - Motel | Refrigeration | Hotel\_Motel |
| Health/Medical - Hospital | Refrigeration | Hospital |
| Health/Medical - Nursing Home | Refrigeration | Medical\_Clinic |

# Section 4. Costs

The following is the step by step cost analysis:

1. The baseline equipment costs for various sizes were obtained from the manufacturers whose products were part of the SCE ET study and were less efficient than the standard practice baseline. The average baseline equipment cost for each size category is calculated.
2. Similarly, the measure equipment costs for various sizes were obtained from the manufacturers whose products were part of the SCE ET study and were more efficient than the standard practice baseline. The corresponding DEC (kWh/day) for these products were also obtained from the manufacturer specification sheets. The percentage improvement in efficiency over the standard practice baseline is calculated and is classified into an efficiency tier, >50% efficient above standard practice baseline, in line with the energy savings.
3. The Incremental Measure Cost (IMC) for each of the measure equipment is calculated by subtracting the average baseline cost for similar outside lengths.
4. Because of lack of market cost data for measure equipment across various size categories and efficiency tiers; it is assumed that IMC remains same across all size categories for an efficiency tier. The average IMC is calculated to be $1,390.0 for >50% efficiency tier. These are called adjusted IMC values.
5. The adjusted IMC calculated in the above step is added to the baseline equipment cost to get the adjusted Full Measure Cost (FMC).

The cost of Chef Bases from manufacturers whose products are above standard practice baseline were obtained from online vendors. Costs were also obtained for products below standard practice baseline from manufacturer/ vendor quotes. However, one manufacturer/ vendor did not respond with a quote and hence not considered in the final cost analysis.

The refrigerated chef bases are simple plug-in and remove appliances and do not have a significant labor cost. Hence, the labor cost is estimated to be $0 for this measure. Additionally, IMC would remain unaffected because the labor charges will be same for the base case and measure case units.

The attachment SCE17CC017.0 A4 lists the quotes and calculations for the FMC and IMC.

## 4.1 Base Case Cost

The table below shows the cost of the base case chef bases.

|  |  |  |  |
| --- | --- | --- | --- |
| **Solution Code** | **Install type** | **Base Equipment Cost ($)** | **Cost ID** |
| FS-20263 | NEW/ROB | $ 5,155.00 | SCE17CC0017\_00\_B001 |
| FS-20265 | NEW/ROB | $ 6,330.00 | SCE17CC0017\_00\_B002 |
| FS-20267 | NEW/ROB | $ 7,275.00 | SCE17CC0017\_00\_B003 |
| FS-20269 | NEW/ROB | $ 8,602.00 | SCE17CC0017\_00\_B004 |

## 4.2 Measure Case Cost

The table below shows the cost of the measure case chef bases.

|  |  |  |  |
| --- | --- | --- | --- |
| **Solution Code** | **Install type** | **Measure Equipment Cost ($)** | **Cost ID** |
| FS-20263 | NEW/ROB | $ 6,545.00 | SCE17CC0017\_00\_M001 |
| FS-20265 | NEW/ROB | $ 7,720.00 | SCE17CC0017\_00\_M002 |
| FS-20267 | NEW/ROB | $ 8,665.00 | SCE17CC0017\_00\_M003 |
| FS-20269 | NEW/ROB | $ 9,992.00 | SCE17CC0017\_00\_M004 |

## 4.3 Full and Incremental Measure Cost

The FMC is:

*FMC = (Measure Equipment Cost + Measure Labor Cost)*

The FMC can be found in the table below

**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 |

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** |
| FS-20263 | NEW/ROB | $ 1,390.00 | $ 6,545.00 | N/A |
| FS-20265 | NEW/ROB | $ 1,390.00 | $ 7,720.00 | N/A |
| FS-20267 | NEW/ROB | $ 1,390.00 | $ 8,665.00 | N/A |
| FS-20269 | NEW/ROB | $ 1,390.00 | $ 9,992.00 | N/A |

# Attachments

1. SCE17CC017.0 A1 – Savings Summary.xlsx
2. SCE17CC017.0 A2 – Cost Analysis.xlsx
3. SCE17CC017.0 A3 - Refrigerated Chef Bases Workpaper Calculation Template - Final Version 05042018 6.7.5.xlsx
4. SCE17CC017.0 A4 - Cost Analysis References.zip
5. SCE17CC017.0 A5 - Lab Test Data Detail.zip
6. SCE17CC017.0 A6 - Chef Base Test Results Summary Table.xlsx
7. SCE17CC017.0 A7 - ET15SCE1010 Chef Bases\_Report\_final2.pdf
8. SCE17CC017.0 A8 - Federal Register Vol.79 No. 60 Part III 17732 (March 28, 2014)
9. SCE17CC017.0 A9 - Federal Register Vol 79. No. 76 Part IV 22281 (April 21, 2014)
10. SCE17CC017.0 A10 - ENERGY STAR Program Requirements Product Specification for Commercial Refrigerators and Freezers Eligibility Criteria Version 4.0
11. SCE17CC017.0 A11 - Test Reports from Food Service Technology Center (FSTC)

Attachments 5, 6, and 7 are the SCE ET study.

# References



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