Short Form Work Paper WPSDGENRCC0004

**Revision 3**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Commercial Ice Machines**

**December 28, 2016**

# SDG&E Commercial Oven-Electric and Gas

## Introduction

This short form workpaper documents (WP) the values adopted from PGE’s WP entitled “Commercial Ice Machines” (PGECOFST108 R5 Comm Ice Machines). SDG&E adopts all of the values in PGECOFST108 R5 Rack Oven, with some exceptions:

1. SDG&E currently has 7 offerings versus 5 offerings at PG&E. However, PG&E’s F200 and F201 combine the two extra offerings that SDG&E provides. The two extra offerings will reflect the combined savings of that to the Lead PA.

## Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 10/13/2014 | Charles Harmstead / SDGE | Converted to SDGE workpaper from PGE work paper. PGECOFST108 Revision 1 dated January 1, 2008 |
| 1 | 10/15/2010 | Lucie Sidibe/SDG&E | NTG was updated to reflect DEER 2008  Saving was corrected |
| 2 | 06/24/2012 | Peter Ford / SDGE | NTG was updated to reflect DEER 2011 (removed reference sentence from pg. v, August 28, 2012) |
| 2.1 | 06/30/2014 | Kyle Dunn / MWE2 LLC | INTERNAL REVISION ONLY – no material changes made  1. Updated to new workpaper format.  2. Generated calculation spreadsheet based on IOU statewide Calculation Template output, with additional columns and non-CZ cost factor adjustments.  3. Updated EUL ID and EUL per DEER 2014 |
| 4 | 12/28/16 | Kelvin Valenzuela/SDG&E | Adoption from PGE’s PGECOFST108 R5 Comm Ice Machines.docx for Ex-Ante impacts and cost-effectiveness values. |

## Measure Summary

Table : Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for Commercial Ice Machines. The base energy consumption and measure energy consumption values are from PG&E’s workpaper, PGECOFST108, Revision 5. SDG&E further breaks down the size ranges for PG&E’s F200 and F201 to create two extra offerings, to have a total of 7 offerings versus PG&E only have 5 offerings. |
| **1.1 Measure & Baseline Data** | Measure:  402013 - Ice Machines 101-200 lbs/day  402014 - Ice Machines 201-300 lbs/day  402015 - Ice Machines 301-400 lbs/day  402016 - Ice Machines 401-500 lbs/day  402017 - Ice Machines 501-1000 lbs/day  402018 - Ice Machines 1001-1500 lbs/day  402019 - Ice Machines >1500 lbs/day |
| **1.2 Technical Description** |  |
| Measures | See Requirements |
| Code for All Measures | **California Title 20:** This measure does fall under Title 20 of the California Energy Regulations. Under this regulation, the following is required: all commercial ice machines manufactured on or after January 1, 2010 are required to meet the specifications outlined in the table below.    **Table 6 - Title 20 Energy Efficiency Requirements for Air-Cooled Commercial Ice Machines**   |  |  |  | | --- | --- | --- | | Equipment Type | Ice Harvest Rate  (lbs. ice/24 hrs.) | Maximum Energy Use  (kWh/100 lbs. ice) | | Ice Maker Head (IMH) | < 450 | 10.26 – 0.0086 × H a | | ≥ 450 | 6.89 – 0.0011 × H a | | Remote Condensing Unit (RCU) without remote compressor | < 1,000 | 8.85 – 0.0038 × H a | | ≥ 1,000 | 5.10 | | Remote Condensing Unit (RCU) with remote compressor | < 934 | 8.85 – 0.0038 × H a | | ≥ 934 | 5.30 | | Self-Contained Unit (SCU) | < 175 | 18.0 – 0.0469 × H a | | ≥ 175 | 9.80 |   a H = Ice Harvest Rate (IHR) for the commercial ice machine as determined by applying AHRI Standard 810.  **California Title 24:** This measure does not fall under Title 24 of the California Energy Regulations  **Federal Standards:** DOE has regulations for ice machine since 2010[[1]](#endnote-1) but the Title 20 regulations are more stringent and Title 20 is used as baseline.  **Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 810 (I-P):** AHRI Standard 810, Performance Rating of Automatic Commercial Ice-Makers, is considered the industry standard for estimating commercial ice machine energy use. The AHRI test data was used to estimate the energy consumption of the base case equipment. |
| Requirements | This specification covers machines generating 60 grams (2 oz.) or lighter ice cubes, as well as flaked, crushed, and fragmented ice makers.  Performance data is based on testing to Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 810[[2]](#endnote-2).  Only air-cooled machines (self-contained, icemaker heads, or remote condensing) are eligible.  The efficiency specifications must meet the requirements listed in Table 1.  Visit [ahrinet.org](http://www.ahrinet.org/Home.aspx) for product information and testing procedures.  To qualify, the entire AHRI tested Ice Making system must be purchased to qualify.  Remote machines must be purchased with qualifying remote condenser or remote condenser/compressor unit. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | Replace on Burn-out (ROB) |
| Delivery Mechanisms | Downstream Rebate – Deemed  NOTE: Measures are offered in the SDG&E Direct Install program yet require a customer co-pay and are treated as downstream deemed. |
| **1.4.1 DEER Data** |  |
| Net-to-Gross Ratio | Com-Default>2yrs |
| Effective and Remaining Useful Life | Cook-IceMach |
| **Section 2. Calculation Methodology** | DEER 2016 |
| Energy Savings/Peak Demand Reduction – All Measures | **Commercial Ice Machines 100-200 lbs/day (PG&E: F200) (SDG&E: 402013)**  Base Case Energy Consumption: Source: PG&E Calculations – 5,366 kWh/yr; 0.817 kW  Measure Energy Consumption: Source: PG&E Calculations – 4,561 kWh/yr; 0.694 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 805 kWh/yr; 0.123 kW x 0.90 (CDF) = 0.110 kW  **Commercial Ice Machines 201-300 lbs/day (PG&E: F200) (SDG&E: 402014)**  Base Case Energy Consumption: Source: PG&E Calculations – 5,366 kWh/yr; 0.817 kW  Measure Energy Consumption: Source: PG&E Calculations – 4,561 kWh/yr; 0.694 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 805 kWh/yr; 0.123 kW x 0.90 (CDF) = 0.110 kW  **Commercial Ice Machines 301-400 lbs/day (PG&E: F201) (SDG&E: 402015)**  Base Case Energy Consumption: Source: PG&E Calculations – 7,468 kWh/yr; 1.137 kW  Measure Energy Consumption: Source: PG&E Calculations – 6,351 kWh/yr; 0.967 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 1,117 kWh/yr; 0.170 kW x 0.90 (CDF) = 0.153 kW  **Commercial Ice Machines 401-500 lbs/day (PG&E: F201) (SDG&E: 402016)**  Base Case Energy Consumption: Source: PG&E Calculations – 7,468 kWh/yr; 1.137 kW  Measure Energy Consumption: Source: PG&E Calculations – 6,351 kWh/yr; 0.967 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 1,117 kWh/yr; 0.170 kW x 0.90 (CDF) = 0.153 kW  **Commercial Ice Machines 501-1000 lbs/day (PG&E: F202) (SDG&E: 402017)**  Base Case Energy Consumption: Source: PG&E Calculations – 12,462 kWh/yr; 1.897 kW  Measure Energy Consumption: Source: PG&E Calculations – 10,594 kWh/yr; 1.613 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 1,868 kWh/yr; 0.284 kW x 0.90 (CDF) = 0.256 kW  **Commercial Ice Machines 1001-1500 lbs/day (PG&E: F203) (SDG&E: 402018)**  Base Case Energy Consumption: Source: PG&E Calculations – 17,452 kWh/yr; 2.656 kW  Measure Energy Consumption: Source: PG&E Calculations – 14,851 kWh/yr; 2.260 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 2,601 kWh/yr; 0.396 kW x 0.90 (CDF) = 0.356 kW  **Commercial Ice Machines >1500 lbs/day (PG&E: F204) (SDG&E: 402019)**  Base Case Energy Consumption: Source: PG&E Calculations – 24,432 kWh/yr; 3.719 kW  Measure Energy Consumption: Source: PG&E Calculations – 20,791 kWh/yr; 3.165 kW  Energy Savings (Base Case – Measure): Source: PG&E Calculations – 3,641 kWh/yr; 0.554 kW x 0.90 (CDF) = 0.499 kW |
| **Section 3. Load Shapes** | SDG:35-OTI-OtherIndustrial-PROC\_OTH  Annual |
| **Section 4. Costs** |  |
| **Section 4.1 Base and Measure Costs** |  |
| Base Cost |  |
| 402013 | $2,464 (PG&E F200) |
| 402014 | $2,464 (PG&E F200) |
| 402015 | $2,407 (PG&E F201) |
| 402016 | $2,407 (PG&E F201) |
| 402017 | $4,312 (PG&E F202) |
| 402018 | $4,099 (PG&E F203) |
| 402019 | $7,191 (PG&E F204) |
| Measure Cost |  |
| 402013 | $2,775 (PG&E F200) |
| 402014 | $2,775 (PG&E F200) |
| 402015 | $2,673 (PG&E F201) |
| 402016 | $2,673 (PG&E F201) |
| 402017 | $4,561 (PG&E F202) |
| 402018 | $4,688 (PG&E F203) |
| 402019 | $8,130 (PG&E F204) |

1. Automatic commercial icemakers manufactured and distributed in commerce, as defined by [42 U.S.C. 6291(16)](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.gpo.gov_fdsys_pkg_USCODE-2D2010-2Dtitle42_html_USCODE-2D2010-2Dtitle42-2Dchap77-2DsubchapIII-2DpartA-2Dsec6291.htm&d=CwMFAg&c=hLS_V_MyRCwXDjNCFvC1XhVzdhW2dOtrP9xQj43rEYI&r=TlrXy5TrK8nTfd5c4pv-ow&m=kbvQp7ddvxCFGFI9sAEZDY-57F6aAIqCjUk3mYSFEp0&s=tvyzf4mTHbuDYF9v1CDEHVC1Wc1CpCOxcHy1LqI0sjg&e=), must meet the energy conservation standards specified in the Code of Federal Regulations at [10 CFR 431.136](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.ecfr.gov_cgi-2Dbin_text-2Didx-3FSID-3Da25116a0785a0c488243d01bddb84f90-26mc-3Dtrue-26node-3Dse10.3.431-5F1136-26rgn-3Ddiv8&d=CwMFAg&c=hLS_V_MyRCwXDjNCFvC1XhVzdhW2dOtrP9xQj43rEYI&r=TlrXy5TrK8nTfd5c4pv-ow&m=kbvQp7ddvxCFGFI9sAEZDY-57F6aAIqCjUk3mYSFEp0&s=Q3aky3FhAL4eUxr8o3DbDXk7HnBkuujEsLvFAi-up7o&e=)

   [http://www.ecfr.gov/cgi-bin/text-idx?SID=a25116a0785a0c488243d01bddb84f90&mc=true&node=se10.3.431\_1136&rgn=div8](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.ecfr.gov_cgi-2Dbin_text-2Didx-3FSID-3Da25116a0785a0c488243d01bddb84f90-26mc-3Dtrue-26node-3Dse10.3.431-5F1136-26rgn-3Ddiv8&d=CwMFAg&c=hLS_V_MyRCwXDjNCFvC1XhVzdhW2dOtrP9xQj43rEYI&r=TlrXy5TrK8nTfd5c4pv-ow&m=kbvQp7ddvxCFGFI9sAEZDY-57F6aAIqCjUk3mYSFEp0&s=Q3aky3FhAL4eUxr8o3DbDXk7HnBkuujEsLvFAi-up7o&e=) [↑](#endnote-ref-1)
2. Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 810 (I-P) 2016 *Performance Rating of Automatic Commercial Ice-Makers*, <http://www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_810_I-P-2016.pdf> [↑](#endnote-ref-2)