**Work Paper PGE3PREF118**

**Efficient Condenser: Air-Cooled to Evap**

**Revision # 2**

**PECI**

**EnergySmart Grocer**

**Refrigerated Case Evap Cooled Condenser**

**Measure Codes R109, RF003**

**EnergySmart Grocer, PECI**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Applicable Measure Codes:** | **R109, RF003** |
| **Measure Description:** | Replace multiplex air-cooled condenser with evaporative condenser |
| **Energy Impact Common Units:** | CAP TONS (Capacity Cooling Tons) |
| **Base Case Description:** | Source: DEER 2005  Multiplex air cooled condenser of vintage-dependent size, efficiency and SCT setpoint |
| **Base Case Energy Consumption:** | Source: DEER 2008 generated through MAS Control v3.00.19  The base case energy consumption varies by climate zone and vintage. |
| **Measure Energy Consumption:** | Source: DEER 2008 generated through MAS Control v3.00.19  The energy efficient measure energy consumption varies by climate zone and vintage |
| **Energy Savings (Base Case – Measure)** | Source: DEER 2008 generated through MAS Control v3.00.19  The energy efficient savings varies by climate zone and vintage. |
| **Costs Common Units:** | Design cooling tons |
| **Base Case Equipment Cost ($/unit):** | Source: DEER 2008  Varies |
| **Measure Equipment Cost ($/unit):** | Source: DEER 2008  Varies |
| **Gross Measure Cost ($/unit)** | Source: DEER 2008  Varies |
| **Measure Incremental Cost ($/unit):** | Source: DEER 2008  Varies |
| **Effective Useful Life (years):** | Source: DEER 2008  15 years |
| **Measure Application Type:** | Early Retirement (ER)  Replace on Burnout (ROB) |
| **Net-to-Gross Ratios:** | Source: DEER2008  0.6 |
| **Important Comments:** |  |

# 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**  Principal, CES Products and Programs |

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision #** | **Date** | **Section by Section Description of Revisions** | **Author (Company)** |
| **Revision 0** | 04/07/2008 | Original work paper | Jeremy Litow, PECI |
| **Revision 1** | 06/04/2012 | Updated to PG&E 2013-2014 format  Updated cost data to reflect DEER 2008  Updated EUL to reflect DEER 2008 | Laura Konstin, PECI |
| **Revision 2** | 05/14/2014 | Updated 2014 weather files.  Updated format per PG&E guidelines . | Eric Mullendore, PECI  Ioana Anghel, PECI |

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# Section 1. General Measure & Baseline Data

Replace multiplex air-cooled condenser with evaporative condenser.

## 1.1 Product Measure Description & Background

***Program Restrictions and Guidelines***

***Terms and Conditions:***

**Requirements:**

* Must replace an existing air-cooled condenser with an evaporative condenser.
* New evaporative condenser must be sized at less than or equal to 25°F TD above ambient wet bulb.
* For early retirement claims: The condenser must be in working order with no signs of replacement in the 12 months following the project application date.

**Additional Details:**

* Measure can take place for both multiplex and single compressor systems.

This measure is only available in dry climates (California Energy Commission Climate Zones CZ09, CZ10, CZ11, CZ12, CZ13, CZ14, CZ15) or an equal climate zone to one that applies.

***Market Applicability:*** This is a early retirement measure as well as a replace on burnout measure that is applicable to existing air-cooled condensers in the grocery sector in a downstream rebate program. The rebate encourages the grocer to replace their existing equipment a more energy efficient alternative.

This paper contains savings for the grocery building type, 5 building vintage categories and 15 California climate zones.

## 1.2 Product Technical Description

This DEER measure replaces an existing air-cooled condenser with an evaporative condenser.

## 1.3 Measure Application Type

The DEER Measure Cost Data Users Guide found on [www.deeresources.com](http://www.deeresources.com) under *DEER2011 Database Format* hyperlink, DEER2011 for 13-14, spreadsheet *SPTdata\_format-V0.97.xls*, defines the terms as follows:

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

*Identifies the measure application type in the Measure Implementation table in DEER2011.*

|  |  |  |
| --- | --- | --- |
| **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* |

## 1.4 Product Base Case and Measure Case Data

### 1.4.1 DEER Base Case and Measure Case Information

The data modeled using MASControl v3.00.19 includes: demand, electric, and interactive gas energy savings. DEER 2008 cost data includes: equipment unit costs, equipment incremental costs, and equipment useful life.

The original measures and energy models were created with DEER 2005. Measure information was updated in DEER 2008. The MAS Control tool that ran the batch simulations with the new 2014 T24 weather files appear to have pulled from the D08 version of the measure. We therefore cited the DEER 2008 measure with the update generated through most up to date version of MAS Control.

**Delta Wattage Assumption (ΔW):**

EUL Electric Savings **(ΔW):**

* The EUL electric savings were downloaded from DEER using MASControl v3.00.19, they match the intended measures

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Electric Savings Watts** | **Deer units** | **DEER Version** | **Impact IDs** |
| GRO | 75 | Z01 | 250.40470 | ton | 2008 | D03-211 |
| GRO | 75 | Z02 | 534.92870 | ton | 2008 | D03-211 |
| GRO | 75 | Z03 | 273.57140 | ton | 2008 | D03-211 |
| GRO | 75 | Z04 | 398.11100 | ton | 2008 | D03-211 |
| GRO | 75 | Z05 | 209.33300 | ton | 2008 | D03-211 |

**Therms Savings Assumption (ΔTh)**

EUL Gas Savings **(ΔTh):** The gas savings were downloaded from DEER MASControl v3.00.19; they match the intended measures and express interactive effects only. Intuitively gas savings do not seem applicable to this measure. However, DEER models report a very small impact in therms. We understand these negligible impacts to be noise in eQuest models and not represent significant changes in facility energy use

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Interactive Only?**  **Yes / No** | **Gas Savings Therms** | **Deer units** | **DEER Version** | **Impact IDs** |
| GRO | 75 | Z01 | Yes | 0.26228 | ton | 2008 | D03-211 |
| GRO | 75 | Z02 | Yes | 0.19856 | ton | 2008 | D03-211 |
| GRO | 75 | Z03 | Yes | 0.22962 | ton | 2008 | D03-211 |

**Base Case Costs and Measure Case Costs**

The Base Case, Measure Case and Incremental costs were downloaded from DEER directly; they match the intended measures for climate zones and building types and ages.

**Replace on Burnout (ROB):**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Costs ($)** | | |  |  |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Base Case** | **Measure Case** | **IMC** | **DEER Version** | **Impact IDs** |
| GRO | ALL | ALL | $893.52 | $748.93 | ($144.59) | DEER 2008 | D03-211 |

**Early Retirement (ER):**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Costs ($)** | | |  |  |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Base Case** | **Measure Case** | **IMC** | **DEER Version** | **Impact IDs** |
| GRO | ALL | ALL | $0.00 | $748.93 | $748.93 | DEER 2008 | D03-211 |

**Net to Gross Value:**

**From DEER 2011 4.01**

The table below summarizes all applicable DEER based Net-to-Gross ratios for programs that may be used by this measure.

Table 2 DEER Net-to-Gross Ratios

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **DEER Spreadsheet** | |
| Program Approach | NTG | File name | Cell Number |
| EnergySmart Grocer | 0.60 | DEER2011\_NTGR\_2012-05-16 | T56 |

**Effective Useful Life / Remaining Useful Life:**

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

**Replace on Burnout (ROB):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **EUL (yrs)** | **RUL (yrs)** | **DEER Version** | **Impact IDs** |
| GRO | ALL | ALL | 15 | N/A | DEER 2008 | D03-211 |

**Early Retirement (ER):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **EUL (yrs)** | **RUL (yrs)** | **DEER Version** | **Impact IDs** |
| GRO | ALL | ALL | 5 | 10 | DEER 2008 | D03-211 |

**In service rate:**

The in service rate is not listed in DEER 2011 for measure D03-227. PECI estimates the ISR for this measure to be 1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **In service rate** | **DEER Version** | **Impact IDs** |
| GRO | ALL | ALL | 1 | N/A | D03-211 |

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

The measure in this work paper is not governed by either state or federal codes and standards.

***Title 20:***

This measure does not fall under Title 20 of the California Energy Regulations. Title 20, Section 1601, p. 1; covers new appliances sold or offered for sale in California, but does not apply to condensers.

***Title 24:***

Title 24 does not apply. T24 p. 151 Exception to Section 120.6(b)1 - T24 is not invoked if THR is not increased and less than 25% of both attached compressors and display cases are new.

***Federal Standards:***

This measure does 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 M&V or other studies which apply to these measures. Information on the base and measure case is found in the other sub-sections of 1.4.

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

There are no further data or calculations provided for the support of the measures in this workpaper.

### 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. Additionally, if a measure is assigned a DEER08 load shape, i.e. the load shape starts with “DEER:” the TOU assigned to that measure should also be zero.

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Input Variable** | **Variations** | **Base Case 1 Average Value** | **Base Case 2 Average Value** | **Measure Case Average Value** | **Reference Section** |
| **Electric Savings** | CZ, BV | 1,436.31 | *682.94* | *N/A* | *Section 1.4.1* |
| **Gas Savings** | CZ, BV, IE | 0.22103 | -0.00360 | *N/A* | *Section 1.4.1* |
| **Hours of operation** | N/A | N/A | N/A | *N/A* | N/A |
| **Full Cost** | ER, ROB | $748.93 | $748.93 | N/A | *Section 1.4.1* |
| **Incremental Cost** | ER, ROB | $748.93 | -$144.59 | N/A | *Section 1.4.1* |
| **EUL /RUL** | ER, ROB | 5 | 15 | N/A | *Section 1.4.1* |
| **NTG** | One | 0.6 | 0.6 | N/A | *Section 1.4.1* |
| **ISR** | Yes | 1.0 | 1.0 | N/A | *Section 1.4.1* |
| **TOU Factor** | *A/C projects only* | N/A | N/A | N/A | *Section 1.4.5* |

# Section 2. Calculation Methods

The data modeled using MASControl v3.00.19 includes: demand, electric, and interactive gas energy savings. DEER 2008 cost data includes: equipment unit costs, equipment incremental costs, and equipment useful life.

# Section 3. Load Shapes

The PG&E E3 Calculator “Measure Electric End Use Shape” for both the base case load shape and measure load shape is Commercial Refrigeration.

## 3.1 Base Case Load Shapes

The PG&E E3 Calculator “Measure Electric End Use Shape” for both the base case load shape and measure load shape is Commercial Refrigeration.

## 3.2 Measure Load Shapes

The PG&E E3 Calculator “Measure Electric End Use Shape” for both the base case load shape and measure load shape is Commercial Refrigeration.

# Section 4. Base Case & Measure Costs

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure Application Type** | **Measure Life Basis** | **First Baseline Period Full Measure Cost (RUL)** | **Second Baseline Period Full Measure Cost (EUL – RUL)** |
| ***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 following Transaction type is appropriate to this measure. The Base Case Costs are:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Base Case Cost** |
| D03-211 | ROB | Existing | $624.71 | $268.81 | $0.00 | $893.52 |
| D03-211 | ER | Existing | $0.00 | $0.00 | $0.00 | $0.00 |

*All costs are noted as $ per measure unit*

## 4.2 Measure Case Costs

The following Measure Application Type is appropriate to this measure. The Measure Case Costs are:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Measure Case Cost** |
| D03-211 | ROB | Existing | $480.12 | $268.81 | $0.00 | $748.93 |
| D03-211 | ER | Existing | $480.12 | $268.81 | $0.00 | $748.93 |

*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 |

### 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.

This Measure Application Type is **ER** fora single baseline period, so the Full Measure Cost (FMC) is represented by the equation below (choose):

FMC = Measure Equipment Cost + Measure Labor Cost

FMC = $480.12 per ton + $268.81 per ton = $748.93 per ton

**OR**

This Measure Application Type is **ROB** for a single baseline period, so the Full Measure Cost (FMC) is represented by the equation below:

FMC = (Measure Equipment Cost + Measure Labor Cost) – (Base Case Equipment Cost + Base Case Labor Cost)

\*Note: We assume that, unless stated otherwise, the measure case labor and base case labor are assumed to be the same value reducing the equation to the following:

FMC = Measure Equipment Cost – Base Case Equipment Cost

FMC = ($480.12 per ton + $268.81 per ton) – ($624.71 per ton + $268.81 per ton) = $144.59 per ton

\*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

This Measure Application Type is **ER**, sothe Incremental Measure Cost (IMC) is represented by the appropriate equation below as there exists no base case with which to compare the measure to:

IMC = Measure Equipment Cost + Measure Labor Cost

Using this equation, the incremental measure cost for the measure in this workpaper is $748.93 per ton.

IMC *=* $480.12 per ton + $268.81 per ton = $748.93 per ton

This Measure Application Type is **ROB** the Incremental Measure Cost (IMC) is represented by the equation below as there exists no base case with which to compare the measure to:

IMC = (Measure Equipment Cost + Measure Labor Cost) – (Base Case Equipment Cost + Base Case Labor Cost)

Using this equation, the incremental measure cost for the measure in this workpaper is $748.93 per ton.

IMC *= (*$480.12 per ton + $268.81 per ton) – ($624.71 per ton + $268.81 per ton) = $144.59 per ton

**Summary Table for Section 4**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Measure ID** | **Measure Application Type** | **Base Case Total Cost** | **Measure Case Total Cost** | **Gross Measure Case Cost** | **Incremental Measure Cost** |
| D03-211 | ROB | $0 | $748.93 | $748.93 | $748.93 |
| D03-211 | ER | $893.52 | $748.93 | ($144.59) | ($144.59) |

# Appendix A: DEER Attributes

## Delta Wattage Assumptions

Electric Savings **(ΔW):**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Electric Savings Watts** | **Deer units** | **DEER Version** | **Impact IDs** |
| Grocery | 75 | Z01 | 250.40470 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z02 | 534.92870 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z03 | 273.57140 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z04 | 398.11100 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z05 | 209.33300 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z11 | 548.84710 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z12 | 551.87600 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z13 | 508.86260 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z16 | 227.92670 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z01 | 253.09169 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z02 | 541.58611 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z03 | 271.09573 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z04 | 394.50683 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z05 | 206.12184 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z11 | 539.37614 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z12 | 542.41346 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z13 | 496.43355 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z16 | 226.55314 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z01 | 177.28516 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z02 | 373.08228 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z03 | 178.35085 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z04 | 273.90749 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z05 | 147.52416 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z11 | 387.60521 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z12 | 384.70873 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z13 | 336.03194 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z16 | 170.81742 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z01 | 178.82002 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z02 | 415.74113 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z03 | 180.60067 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z04 | 301.34265 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z05 | 162.81013 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z11 | 415.22435 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z12 | 393.45878 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z13 | 371.96282 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z16 | 157.51023 | Design Cooling Tons | 2008 | d03-211 |

## RUL Delta Wattage Assumptions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Grocery | 75 | Z01 | 135.60535 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z02 | 467.86648 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z03 | 184.59012 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z04 | 333.12323 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z05 | 96.57525 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z11 | 479.00017 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z12 | 474.72266 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z13 | 426.71115 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z16 | 132.48219 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z01 | 138.91927 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z02 | 466.85136 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z03 | 185.28068 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z04 | 324.33086 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z05 | 92.80042 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z11 | 474.95102 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z12 | 474.53784 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z13 | 418.57538 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z16 | 129.47540 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z01 | 131.36991 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z02 | 378.65544 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z03 | 180.22578 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z04 | 295.16401 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z05 | 100.91374 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z11 | 392.49146 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z12 | 390.90797 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z13 | 338.91852 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z16 | 130.90477 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z01 | 151.39905 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z02 | 417.85270 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z03 | 189.76214 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z04 | 302.85106 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z05 | 124.03636 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z11 | 415.61394 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z12 | 393.95225 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z13 | 374.41787 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z16 | 135.69090 | Design Cooling Tons | 2008 | d03-211 |

## Therms Savings Assumptions

Gas Savings **(ΔTh): Interactive Effect only?**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Building type | Bldg Vintage | Climate Zone | Interactive Only? | Gas Savings Therms | DEER units | DEER Version | Impact IDs |
| Yes / No |
| Grocery | 75 | Z01 | yes | 0.26228 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z02 | yes | 0.19856 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z03 | yes | 0.22962 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z04 | yes | 0.16735 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z05 | yes | 0.22444 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z11 | yes | 0.13341 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z12 | yes | 0.16450 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z13 | yes | 0.14823 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z16 | yes | 0.17138 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z01 | yes | 0.27037 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z02 | yes | 0.18178 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z03 | yes | 0.22437 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z04 | yes | 0.18585 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z05 | yes | 0.23349 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z11 | yes | 0.15063 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z12 | yes | 0.17088 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z13 | yes | 0.14199 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z16 | yes | 0.17063 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z01 | yes | 0.41745 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z02 | yes | 0.30434 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z03 | yes | 0.39391 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z04 | yes | 0.29586 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z05 | yes | 0.38185 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z11 | yes | 0.22121 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z12 | yes | 0.27256 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z13 | yes | 0.22131 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z16 | yes | 0.26745 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z01 | yes | 0.25809 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z02 | yes | 0.20665 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z03 | yes | 0.23006 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z04 | yes | 0.17719 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z05 | yes | 0.25189 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z11 | yes | 0.13180 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z12 | yes | 0.16962 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z13 | yes | 0.14902 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z16 | yes | 0.17705 | Design Cooling Tons | 2008 | d03-211 |

## RUL Therms Savings Assumptions

Gas Savings **(ΔTh): Interactive Effect only?**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Building type | Bldg Vintage | Climate Zone | Interactive Only? | Gas Savings Therms | DEER units | DEER Version | Impact IDs |
| Yes / No |
| Grocery | 75 | Z01 | yes | 0.00135 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z02 | yes | -0.00263 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z03 | yes | -0.00660 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z04 | yes | -0.00659 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z05 | yes | -0.01075 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z11 | yes | -0.00635 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z12 | yes | -0.01711 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z13 | yes | 0.00394 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 75 | Z16 | yes | -0.01244 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z01 | yes | 0.00272 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z02 | yes | -0.00262 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z03 | yes | -0.01706 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z04 | yes | -0.00659 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z05 | yes | -0.01080 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z11 | yes | -0.01392 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z12 | yes | -0.00394 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z13 | yes | -0.00261 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 85 | Z16 | yes | -0.02594 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z01 | yes | 0.00827 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z02 | yes | 0.00128 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z03 | yes | 0.00000 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z04 | yes | -0.00391 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z05 | yes | -0.00679 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z11 | yes | -0.00242 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z12 | yes | -0.00377 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z13 | yes | 0.00123 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 96 | Z16 | yes | -0.01114 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z01 | yes | 0.01269 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z02 | yes | 0.01177 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z03 | yes | 0.00272 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z04 | yes | -0.00400 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z05 | yes | 0.00415 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z11 | yes | -0.00497 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z12 | yes | -0.00129 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z13 | yes | 0.01028 | Design Cooling Tons | 2008 | d03-211 |
| Grocery | 03 | Z16 | yes | -0.00567 | Design Cooling Tons | 2008 | d03-211 |

# References:

1. The DEER Measure Cost Data Users Guide found on [www.deeresources.com](http://www.deeresources.com) under *DEER2011 Database Format* hyperlink, DEER2011 for 13-14, spreadsheet *SPTdata\_format-V0.97.xls.* [↑](#endnote-ref-2)