**Work Paper PGECOALL106**

**Home Energy Checkup**

**Revision # 0**

**Pacific Gas & Electric Company**

**Customer Energy Solutions**

**Home Energy Checkup**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Code:** | Service Code |
| **Measure Description:** | Home Energy Checkup – Energy Advisor |
| **Energy Impact Common Units:** | Each |
| **Base Case Description:** | Any residential customer that has not performed a Home Energy Checkup. |
| **Base Case Energy Consumption:** | Consumption of entire residence, before Home Energy Checkup. |
| **Measure Energy Consumption:** | Consumption of entire residence, after Home Energy Checkup and customer’s resulting actions. |
| **Energy Savings (Base Case – Measure)** | Source: |
| **Costs Common Units:** | Each |
| **Base Case Equipment Cost ($/unit):** | Source: PG&E Calculations  The base case is no audit performed and no measures implemented by the customer. Therefore, the base case cost is $0. |
| **Measure Equipment Cost ($/unit):** | Source: PG&E Calculations  Measure costs are based on the likely types of simple actions participants would take on their own. In this case, the Gross Measure Cost and the Incremental Measure Cost are the same. The Measure Cost is $40.83. |
| **Measure Incremental Cost ($/unit):** | Source: PG&E Calculations  In this case, the Gross Measure Cost and the Incremental Measure Cost are the same: $40.83. |
| **Effective Useful Life (years):** | 3.0 years  Source: Energy Efficiency Policy Manual v.2. CPUC, Aug 2003.  (Audits not included in DEER 2008 EUL update) |
| **Program Type:** | Energy Advisor |
| **Net-to-Gross Ratios:** | 0.55  Source: 2014 DEER NTG Values - Res-Default>2 |
| **Important Comments:** |  |

# Work Paper Approvals

The following Manager(s) approved this work paper through the PG&E Electronic Data Routing System under Routing Requisition #2014-61256

|  |
| --- |
|  |
| **Grant Brohard**  Manager, Engineering Services |
| **Daniel Ohlendorf**  Manager, Information Products |

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision #** | **Revision Date** | **Section-by-Section Description of Revisions** | **Author (Company)** |
| **Revision 0** | **7/11/14** | **Original PGEDOALL106 Rev0** | **Steve Blanc (PG&E)**  **Jim Wyatt (PG&E)**  **Grant Geer (PG&E)** |

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# Section 1. General Measure & Baseline Data

## 1.1 Product Measure Description & Background

***Catalog Description – Description***

***Description***

Energy Advisor is a subprogram within the residential statewide Energy Efficiency Portfolio that provides customers with unique ways to engage with the concept of energy management through a variety of interactive and behavioral techniques that will allow them to better understand their energy use and to take integrated demand side management (IDSM) actions to save energy and money.

Home Energy Checkup (formerly known as the Home Energy Efficiency Survey – HEES program) is an online energy audit tool part of the Energy Advisor subprogram.  The Home Energy Checkup provides an interactive continuous engagement experience. Customers quickly create their own energy plan and find personalized suggestions to be energy-efficient and save money. Customers learn what areas of their home use the most energy and how their energy usage breaks down into key end-use components such as heating, cooling, appliances and lighting. Customers answer questions about their home and usage patterns to further refine tips and advice. Based on the customer’s profile and usage, tailored tips and recommendations promote and prioritize energy efficient appliances, rebates, services, products and programs including Energy UpgradeTM California.  Overall, the Home Energy Checkup aims to increase customer awareness of energy efficiency measures, induce behavioral changes and energy efficient purchases and retrofits, and prompt participation in other energy efficiency programs.

To use the Home Energy Checkup, customers must log into their online PG&E account called My Energy. Within My Energy customers can learn about their rate options (including Smart Rates), analyze their historical usage and compare usage to similar and energy efficient homes and calculate solar benefits. Customers can see a comprehensive list of ideas and advise to reduce the unnecessary use of energy. Answering questions within the Home Energy Checkup will further refine the recommendations. Customers see how many other people already took action for each suggestion, and add recommendations to create their own short-term and long-term plan of action. Behavior change techniques like feedback and social norms are incorporated throughout the Home Energy Checkup.

***Program Restrictions and Guidelines***

Customers using Home Energy Checkup must have either PG&E gas or electric accounts under residential rates. Customers can access the Home Energy Checkup and related tools through their PGE.com website account.

**Terms and Conditions:**

Customers must be Gas and / or Electric customers of PG&E

***Market Applicability:***

This program can be utilized by all residential home and multifamily dwelling customers of PG&E. Customers using Home Energy Checkup must have either PG&E gas or electric accounts under residential rates. Customers can access the Home Energy Checkup and related tools through their PGE.com website account.

## 1.2 Product Technical Description

The PG&E Home Energy Checkup is an online web application provided by Opower under contract to PG&E and available through the PGE website at www.pge.com. The tool accesses available information about the customer’s residence such as geographic location, size and billing for electric and or gas services provided to the site. The application runs through a series of choices and questions to determine:

* Whether or not it is a detached house or condominium/apartment (i.e. single family or multi-family dwelling)
* owner or renter
* The number of residents in the dwelling.
* The size of the dwelling,
* type and age of air conditioning and heating systems,
* Thermostat settings for winter / summer and for day / night / away from home.
* The tool also queries for types of appliances and electronics as well as types of lighting used inside and outside the residence
* The tool provides a series of –personalized no-cost, low cost and comprehensive recommendations and advice based on user inputs.

.

## 1.3 Measure Application Type

The measure application type for this measure is Replace on Burnout (ROB)

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

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

|  |  |  |
| --- | --- | --- |
| **Code** | **Description** | **Comment** |
| ROB | Replace on Burnout | *Single baseline (above code), incremental or full costs* |
|  |  |  |

The Home Energy Checkup is performed on existing dwellings and provides information about operational practices and investment measures that can save energy and cut the resident’s energy bill.

## 1.4 Product Base Case and Measure Case Data

## 1.4.1 DEER Base Case and Measure Case Information

* The DEER2014 database accessed through READi v.2.0.1[[2]](#endnote-2) data do not contain the appropriate savings information for this measure.
* The effective useful life (EUL) is 3 years based on the Energy Efficiency Policy Manual, Version 2, August 2003 [A]. Versions 3, 4 and 5 of the CPUC EE Policy Manual no longer list EUL values, and instead defer to DEER 2008. However, DEER does not list a measure for residential audits, or Home Energy Checkup. Hence, the EUL was obtained from Version 2 of the Policy Manual.
* In Service Rate (ISR) is assumed to be 1.0 for this measure.

**Net-to-Gross Assumption:**

Table 2 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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| NTG ID | Program Approach | NTG | File name |
| Res-Default>2 | All other EEM with no evaluated NTGR; existing EEM with same delivery mechanism for more than 2 years | 0.55 | DEER 2014 |

**Effective Useful Life: DEER Version and Impact IDs**

* The Effective Useful Life estimate was downloaded from DEER, however it differs from the measure by;
  + - There is no direct reference to Home Energy Checkups or Residential Audits in DEER.
    - The Energy Policy Manual Version 2 Residential Audit value was used because it is the most recent source for a Residential Audit EUL.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **EUL (yrs)** | **RUL (yrs)** | **DEER Version** | **EUL ID** |
| **Any** | **Any** | **Any** | **3** | **1** | **N/A** | EnergyPolicyManualV2-Audits |

**In-service rate/first year installation rate**: *Given the fact that the customers self-select for the audit by accessing it on the website the in service rate is 1.0*

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

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

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

***Federal Standards:*** This measure(s) does fall under Federal DOE or EPA Energy Regulations.

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

***1.4.3.1 Study #1[[3]](#endnote-3)* Itron, Inc. --2010-2012 CPUC HEES Impact Evaluation Final Report**

This report presents a summary of the results from the 2010-2012 CPUC impact evaluation of the Home Energy Efficiency Survey (HEES) program. The main goal of the HEES program is to identify energy efficient measures and practices, educate the customer, and promote cost effective energy efficiency projects. The HEES Program aims to provide valuable analysis of customer end-use systems, identification of energy efficiency opportunities, and economic information for customers to make investment decisions.[[4]](#endnote-4)

The overarching goals of this impact evaluation of the statewide HEES Programs are to measure the gross and net impacts resulting from the residential energy surveys; provide feedback on the appropriateness of the recommendations customers receive as a result of the survey; evaluate the effectiveness of the program in driving customers to participate in other utility energy efficiency incentive programs; and provide recommendations on how the HEES Programs can be further improved to support the IOUs’ overall efficiency goals and objectives. Estimates of gross savings, free-ridership, and net savings (kWh, kW and Therms) will be provided by utility[[5]](#endnote-5)….

The table below summarizes the net HEES per participant savings estimates from the regression-based impact analysis assessment. These results are based on the model specification that incorporated dummy variables (as opposed to ex ante savings estimates) to control for the impacts resulting from other utility energy efficiency programs. As this table shows, HEES online program participants in PG&E and SDG&E service territory decreased their usage in the first year post-HEES survey by an average of 316 kWh and 294 kWh (both 3.1%), respectively.

**Regression-based Estimates of First Year Net per Participant HEES Impacts[[6]](#endnote-6)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Utility** | **Delivery**  **Method** | **Average Monthly Usage** | | **1st-Year Net HEES Per Participant Impacts** | |
| **Pre-HEES** | **Post-HEES** | **kWh** | **% Savings** |
| PG&E | Online | 841 | 811 | 316 | 3.1% |

**Regression-based Estimates of Overall First-Year Net HEES Impacts[[7]](#endnote-7)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **Utility** | | **Delivery Method** | **2010-2012 Participants** | |  | | --- | | **First-Year Net EES Impact** | | | |
| **Per/Participant (kWh)** | **Total (MWh)** | **% of Statewide Total** |
| PG&E | Online | 86,255 | 316 | 27,257 | 42% |

***1.4.3.1 Study #2 Billing Records for OPower Online Audits***

The customer listing included with this work paper documents the 12 month prior billings of 24,301 PG&E residential customers who used the online audit tool during 2013. Billings averaged 9461 kWh per year with a median of 8573 kWh/yr. Billings include a significant number of **net metered** (negative energy readings) residences along with a smaller number of very large users (> 20,000 kWh per year). No gas usage was provided.

**Energy Savings Assumption (ΔW, ΔTherms):**

* The electric savings were taken from ITRON Study directly, they match the intended measures.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Building type** | **Bldg Vintage** | **Climate Zone** | **Electric Savings or Usage** | **Study units** | **Specific study reference** |
| **RES** | **Ex** | **ANY** | **3.1** | **%** | **Itron** |
| **RES** | **EX** | **ANY** | **9461** | **kWh /yr** | **Opower lIst.** |

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

There are no other sources for Base & Measure cases. All cost data sources are listed on the Cost calculation spreadsheet (Ref 9).

***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 identifiable A/C measure, the TOU adjustment factor is 0.

***1.5 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** | Any | 0 | *-* | *293 kWh/yr* | *Section 1.4.3* |
| **Gas Savings** | - | - | - | 0 | - |
| **Hours of operation** |  |  |  |  |  |
| **Full Cost** | ROB | 0 | - | $24.65 |  |
| **Incremental Cost** | ROB | 0 | - | $24.65 |  |
| **EUL** | ROB |  |  | 3 | Section 1.4.1 |
| **NTG** | Std |  |  | .55 | Section 1.4.1 |
| **ISR** | Applies -- No |  |  | 1.0 | Section 1.4.1 |
| **TOU Factor** |  |  |  | *0* | *Section 1.4.5* |

# Section 2. Calculation Methods

## 2.1 Electric Energy Savings Estimation Methodologies

The average savings for was determined by the Itron 2010-2012 CPUC HEES Impact Evaluation. The average savings per survey is 3.1% of annual billed electrical usage. The average annual billed usage comes from an Opower study of PG&E billing data. The average annual billed usage for residential customers is 9461 KWh/yr.

### Unit Energy Savings Calculations

## 2.2. Demand Reduction Estimation Methodologies

* There is no anticipated demand reduction associated with this measure.

## 2.3. Gas Energy Savings Estimation Methodologies

* There are no gas energy savings associated with this measure.

# *Section 3. Load Shapes*

Load Shapes are a 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\_CFL\_Ltg. Lighting load shape. See 5 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 3 Base Case Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **E3 Alt. Building Type** | **Load Shape** |
| Residential | RES | DEER:Indoor\_CFL\_Ltg. |

## 3.2 Measure Load Shapes

There are no measure case load shapes applicable to this measure. The base case shapes are to be used in the cost avoidance calculation.

# Section 4. Base Case & Measure Costs

Costs are incurred when the participant chooses to install a measure. A weighted average of measures likely to be installed was developed. These weights were applied to the Incremental Measure Cost of each individual measure. The sum of these individual weighted costs equals $24.65.

## 4.1 Base Case(s) Costs

The base case assumes the existing dwelling and there is no base case costs.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Base Case Cost** |
|  | ROB | *Existing* | *0* | *0* | *0* | *0* |

*All costs are noted as $ per measure unit*

## 4.2 Measure Case Costs

Measure costs are based on the likely types of simple actions participants would take on their own. In this case, the Gross Measure Cost and the Incremental Measure Cost are the same.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Measure Code*** | **Measure Application Type** | **Baseline** | **Equipment Cost** | **Labor / Installation Cost** | **Maintenance / Other Cost** | **Total Measure Case Cost** |
|  | ROB | *Existing* | *24.65* | *0* | *0* | *24.65* |

*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** |
| 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. In this case Full Measure Cost is equal to Incremental Measure Cost of $24.65.

# *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. The Incremental Costs for survey participant’s actions were estimated at $24.65. The DEER approach was used to adjust this for the various climate zones. Detailed calculations may be found in the embedded excel spreadsheet [F]. The incremental cost per recommendations taken is calculated by the equation below.

Weighted Ave. IMC= ∑[Rfactor(IMCrecommendation)]

Where,

Weighted Ave IMC= Adjusted IMC dependent on recommendations taken due to HEES

Rfactor, %= (factor of recommendation taken) / (total recommendations taken)

IMCrecommendation=Incremental cost per recommendation

The weighted Incremental Cost is the calculated cost per recommendation. The audit consists of behavioral recommendations that are cost-free and measure recommendations that have an equipment cost.

**Summary Table for Section 4**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Measure ID** | **Measure Application Types** | **Base Case Total Cost** | **Measure Case Total Cost[[8]](#endnote-8)** | **Full Measure Case Cost** | **Incremental Measure Cost[[9]](#endnote-9)** |
|  | ROB | **0** | **$24.65** | **$24.65** | **$24.65** |

# 

# References

*DEER2011\_NTGR\_2012-05-16.xls* from DEER Database for Energy-Efficient Resources; Version 2011 4.01 found at :<http://www.deeresources.com/index.php?option=com_content&view=article&id=68&Itemid=60>

Under: DEER2011 Update Documentation linked at: [DEER2011 Update Net-To-Gross table](http://www.deeresources.com/DEER2011/download/DEER2011_NTGR_2012-05-16.xls)

DEER Database for Energy-Efficient Resources; Version 2011 4.01 found at :<http://www.deeresources.com/index.php?option=com_content&view=article&id=68&Itemid=60>

READI Tool Version 2.0.2

1. The DEER Measure Cost Data Users Guide found on under *DEER2011 Database Format* hyperlink, DEER2011 for 13-14, spreadsheet *SPTdata\_format-V0.97.xls.* [↑](#endnote-ref-1)
2. CPUC Energy Division DEER14 (Database for Energy-Efficient Resources) database found using READi v2.0.2 at [www.deeresources.com](http://www.deeresources.com) [↑](#endnote-ref-2)
3. Itron, Inc. --2010-2012 CPUC HEES Impact Evaluation Final Report [↑](#endnote-ref-3)
4. Ibid, pg.ES-1 [↑](#endnote-ref-4)
5. Ibid, pg ES-1 [↑](#endnote-ref-5)
6. Ibid, pg ES-13 [↑](#endnote-ref-6)
7. Ibid, pg ES-17 [↑](#endnote-ref-7)
8. SCE, Measure Cost Revision 5 revised for PG&E by S.L. Blanc 2012 [↑](#endnote-ref-8)
9. SCE, Cost calculation spreadsheet revised for PG&E by G.F. Geer 2014 [↑](#endnote-ref-9)