**Work Paper SCE13CS007**

**Plug Load**

**Revision # 0**

**Primary PA Owner**

**PA subtitle**

**Set Top Boxes**

**Product sub-categories if applicable**

At-a-Glance Summary

|  |  |  |
| --- | --- | --- |
|  | Measure 1 | Measure 2 |
| **Measure description** | Satellite Non Estar STD Def STB Upgrade To Satellite Thin Client ES 3.0 | Satellite Non Estar HD STB Upgrade To Satellite HD ES 3.0 |
| **Program delivery method** | Midstream | Midstream |
| **Measure application type** | ER, ROB | ER, ROB |
| **Base case description** | Energy Star 2.0 or non-Energy Star set top boxes | Energy Star 2.0 or non-Energy Star set top boxes |
| **Energy and demand impact common units** | Per Unit | Per Unit |
| **Peak Demand Reduction**  **(kW/unit)** | 0.00379 kW/unit | 0.00322 kW/unit |
| **Energy savings**  **(Base case – Measure)**  **(kWh/unit)** | 119.47 kWh/unit | 101.53 kWh/unit |
| **Gas savings**  **(Base case – Measure)**  **(therms/unit)** | -2.363 therms/unit | -2.008 therms/unit |
| **Full measure cost**[[1]](#footnote-1)  **($/unit)** | Need Source | Need Source |
| **Incremental measure cost[[2]](#footnote-2)**  **($/unit)** | Need Source | Need Source |
| **Effective useful life**  **(years)** | 6 years per ECOVA Study | 6 years per ECOVA Study |
| **Net-to-gross ratio(s)** | 0.70 (DEER 2015) | 0.70 (DEER 2015) |
| **Important comments** |  |  |

Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision # | Revision Date | Section-by-Section Description of Revisions | Author (Name, PA) |
| **0** | **4/13/15** | **New Work Paper** | **Alfredo Gutierrez, SCE** |
|  |  |  |  |

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Commission Staff Review and Comment History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision # | Date Submitted to Commission Staff | Date Comments Received | Commission Staff Comments |
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General Measure & Baseline Data

* 1. Product Measures

**General Description**

The measures contained within this work paper are Energy Star 3.0 and Energy Star 4.1 compliant satellite set top boxes. These boxes will be replacing either Energy Star 2.0 or non-Energy Star set top boxes. The measures can be seen below in Table 1.

Table 1: Measures and Codes

|  |  |  |
| --- | --- | --- |
| Solution Code | Measure Code | Measure Name |
| CE-1XXXX | N/A | Satellite Non Estar STD Def STB Upgrade To Satellite Thin Client ES 3.0 |
| CE-2XXXX | N/A | Satellite Non Estar HD STB Upgrade To Satellite HD ES 3.0 |
| CE-3XXXX | N/A | Satellite Non Estar HD STB Upgrade To Satellite Thin Client ES 3.0 |
| CE-4XXXX | N/A | Satellite Non Estar HD DVR STB Upgrade To Satellite HD ES 3.0 |
| CE-5XXXX | N/A | Satellite Non Estar HD DVR STB Upgrade To Satellite Thin Client ES 3.0 |
| CE-6XXXX | N/A | Satellite Estar 2.0 HD STB Upgrade To Satellite Thin Client ES 3.0 |
| CE-7XXXX | N/A | Satellite Estar 2.0 HD DVR STB Upgrade To Satellite Thin Client ES 3.0 |
| CE-8XXXX | N/A | Satellite Non Estar STD Def STB Upgrade To Satellite Thin Client ES 4.1 |
| CE-9XXXX | N/A | Satellite Non Estar HD STB Upgrade To Satellite HD ES 4.1 |
| CE-10XXX | N/A | Satellite Non Estar HD STB Upgrade To Satellite Thin Client ES 4.1 |
| CE-11XXX | N/A | Satellite Non Estar HD DVR STB Upgrade To Satellite HD ES 4.1 |
| CE-12XXX | N/A | Satellite Non Estar HD DVR STB Upgrade To Satellite Thin Client ES 4.1 |
| CE-13XXX | N/A | Satellite Estar 2.0 HD STB Upgrade To Satellite Thin Client ES 4.1 |
| CE-14XXX | N/A | Satellite Estar 2.0 HD DVR STB Upgrade To Satellite Thin Client ES 4.1 |

**Technical Description**

The measure is an Energy Star 4.1 or 3.0 compliant Set Top Box replacing an Energy Star 2.0 or lower STB within the residential sector. Set top boxes are used in the television/entertainment sector and have different roles based on their functionality. Per Energy Star, STBs can be of the following types:

**Product Type (Base Type): Thee means of access to video content for a STB or DVG.**

• Cable: A STB or DVG that can receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with Conditional Access (CCA) or a STB or DVG capable of receiving cable service after installation of a CableCAARD or other type of Conditional Access system.

• Satellite: A STB or DVG that can receive and decode video content as delivered from a MVPPD satellite network.

• Cable Digital Transport Adapter (DTA): A minimally-configured Cable STB that can receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system.

• Internet Protocol (IP): A STBB or DVG that can receive television/video signals encapsulated in IP packets.

* Over-the-top (OTT) Internet Protocol (IP): An IP SSTB that cannot receive signals from a Multichannel Video Programing Distributor (MVPD) as defined in Title 47 U.S. Code § 522.
* Multichannel Video Programming Distributor (MVPD) Internet Protocol (IP): An IP STB or DVG that can receive signals from a MVPD.

• Terrestrial: A STB that can receive television signals over the air (OTA) or via community cable distribution system without Conditional Access (CA).

• Thin-client / Remote: A STB that can receive content over an HNI from another STB or DVG, but is unable to interface directly to the MVPD network.

**Additional Functionality:**

* CableCARD: The capability to decrypt premium audio/video content and services and provide other network control functions via a plug-in Conditional Access module that complies with the ANSI/SCTE 28 HOST-POD Interface Standard.
* Digital Video Recorder (DVR): A feature that records television signals on a hard disk drive (HDD) or other non-volatile storage device integrated into the STB or DVG for playback at an arbitrary time. A DVR includes features such as: Play, Record, Pause, Fast Forward (FF), and Fast Rewind (FR). STBs or DVGs that only support buffering or a Service Provider network-based “DVR” service are not considered DVR STBs or DVGs for purposes of this specification. The presence of DVR functionality does not mean the device is defined to be a STB or DVG.
* DOCSIS®: The capability to distribute data and audio/video content over cable television infrastructure in accordance with the CableLabs® Data Over Cable Service Interface Specification.
* Home Network Interface (HNI): An interface with external devices over a local area network (example: Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wireless-Fidelity or Wi-Fi), Multimedia over Coax Alliance (MoCA), HomePNA alliance (HPNA), IEEE 802.3, HomePlug AV) that is capable of transmitting video content.
  + Multi-Input Multi-Output (MIMO) Wireless HNI: IEEE 802.11n/ac and related MIMO enabled Wi-Fi functionality that supports more than one spatial stream in both send and receive. When using the notation MIMO AxB: A is considered the number of spatial streams while B is the number of antennas supported. A spatial stream is an independent and separately encoded data signal.
* Multi-room: The capability to provide independent live audio/video content to multiple devices (2 or more Clients) or support pause/time-shifting capability for otherwise standalone IP or Thin-client STBs within a single family living unit. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.
* Multi-stream: A STB or DVG feature that allows the device to receive multiple independent streams of video content for use with one or more Clients, one or more directly connected Display Devices, or a DVR, etc. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.
* Ultra HD (4k) Resolution: The capability to transmit or display video signals with a minimum output resolution of 3840×2160 pixels in progressive scan mode at minimum frame rate of 24 fps (abbreviated 2160p24).
* High Efficiency Video Processing: Video decoding providing compression efficiency significantly higher than H.264/AVC, for example HEVC (H.265).
* Three-dimensional (3D) Capability: The capability to transmit or display video signals with 3D depth information for stereoscopic display.
* Access Point: The capability to provide wireless network connectivity to multiple clients. For the purposes of this specification, Access Point functionality includes only IEEE 802.11 (Wi-Fi) connectivity.
* Router: The capability to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information. Router functionality includes Access Point functionality.
* Telephony: The ability to provide analog telephone service through one or more RJ11 or RJ14 jacks.
  1. Program Implementation Overview

**Implementation Methods**

The delivery method is:

• Midstream Programs / Mid-Stream Incentive

The application type is Early Retirement (ET/RET) and Replace on Burnout (ROB).

**Program Restrictions and Guidelines**

**Eligibility Requirements**

* Customer cannot install more set top boxes than were previously present.
* Existing box must be an Energy Star 2.0 or non-Energy Star set top box.

**Implementation Requirements**

* If upgrading to a whole home STB (thin clients), the savings are per box. Each existing box will be replaced by a thin client.

These measures are approved the building types shown in Table 9 for all SCE climate zones.

**Measure Application Type**

See Implementation Methods above.

* 1. Product Parameter Data
     1. DEER Data

Currently, DEER does not address this type of measure. Also, the savings for the measures in this work paper are based off of Energy Star specifications (V2.0, V3.0, and V4.1) and a field study performed by SDG&E where monitored data was collected.

Table 2. DEER Difference Summary

|  |  |
| --- | --- |
| DEER | Used in Workpaper Approach? |
| Modified DEER methodology | No |
| Scaled DEER measure | No |
| DEER base case used | No |
| DEER measure case used | No |
| DEER building types Used | No |
| DEER operating hours used | No |
| Reason for Deviation from DEER | DEER does not contain this type of measure. |
| DEER Version | N/A |
| DEER ID and Measure Name (Sample) | N/A |

**Net-to-Gross**

**Table 3.** DEER Net-to-Gross Ratios

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| From DEER Tables | | | | | |
| NTGR\_ID | Description | Sector | Building Type | NTG | Program Delivery |
| All-Default<=2yrs | All other EEM with no evaluated NTGR; new technology in program for 2 or fewer years | Any | Any | Any | 0.70 |

**Effective Useful Life / Remaining Useful Life**

**Table 4.** DEER EUL Values/Methodology

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| READi EUL ID | Market | End Use | Measure | EUL (Years) | RUL (Years) |
| To Be Requested | Set Top Box | RES | Plug Load | 6 | 2 |

**In-Service Rate / First Year Installation Rate:**

**Table 5.** Installation Rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| From DEER Tables | | | | | |
| GSIA\_ID | Description | Sector | Building Type | GSIA Value | Program Delivery |
| Def-GSIA | Default GSIA values | Any | Any | 1.0 | Any |

**READi Technology Fields**

Table 6. READi Tech IDs

|  |  |
| --- | --- |
| READi Field Name | Values included in this workpaper |
| Measue Case UseCategory | Appliance or Plug Load |
| Measure Case UseSubCats | Consumer Electronics |
| Measure Case TechGroups | Business and Consumer Electronics |
| Measure Case TechTypes | All Equipment |
| Base Case TechGroups | Business and Consumer Electronics |
| Base Case TechTypes | All Equipment |

* + 1. Codes & Standards Requirements Base Case and Measure Information

**Title 20:** The measures in this work paper are not covered by the 2014 Title 20 code [422].

**Title 24:** The measures in this work paper are not covered by the 2013 Title 24 code [355].

**Federal Standards:** Energy Star does, however, set Total Energy Consumption limits on different types of set top boxes along with the features listed above. These TEC values are found in their specifications (V4.1, V3.0, and V2.0). As an example, the TEC values from Energy Star V4.1 can be seen below:

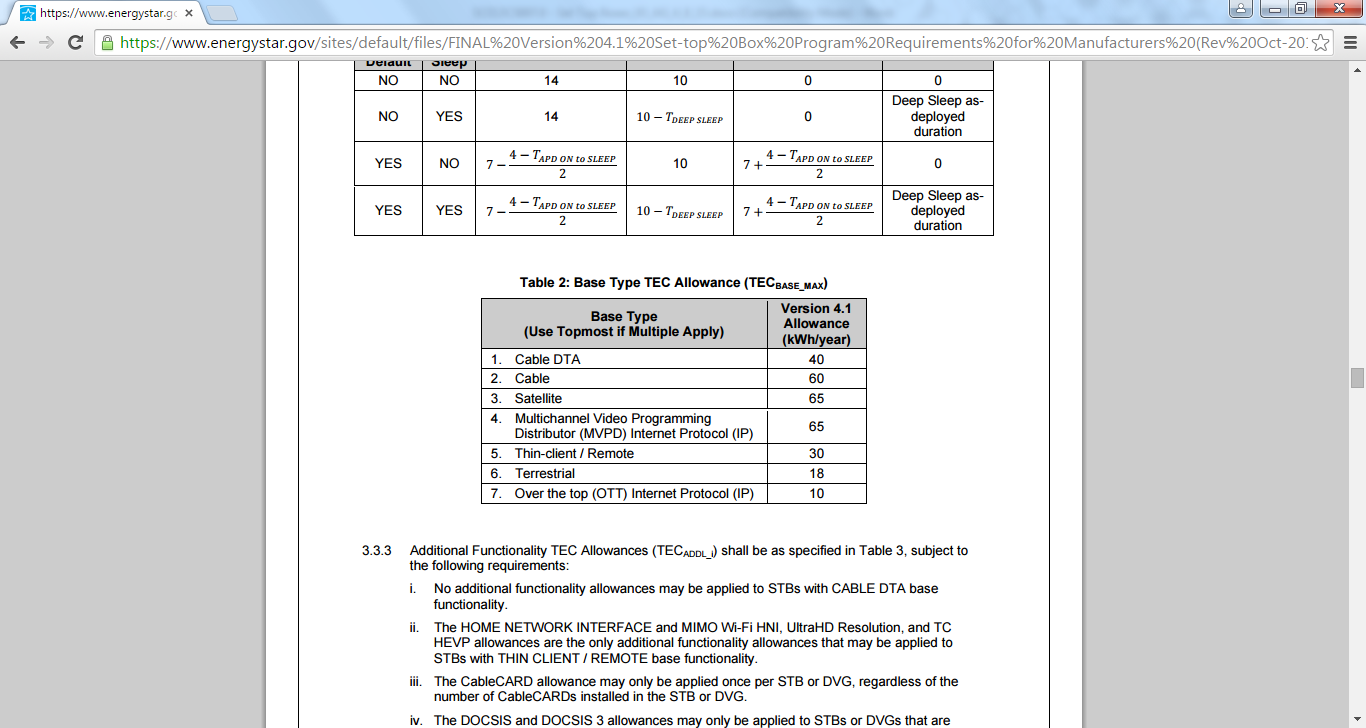


Figure 1 Energy Star 4.0 Base Type TEC Allowance

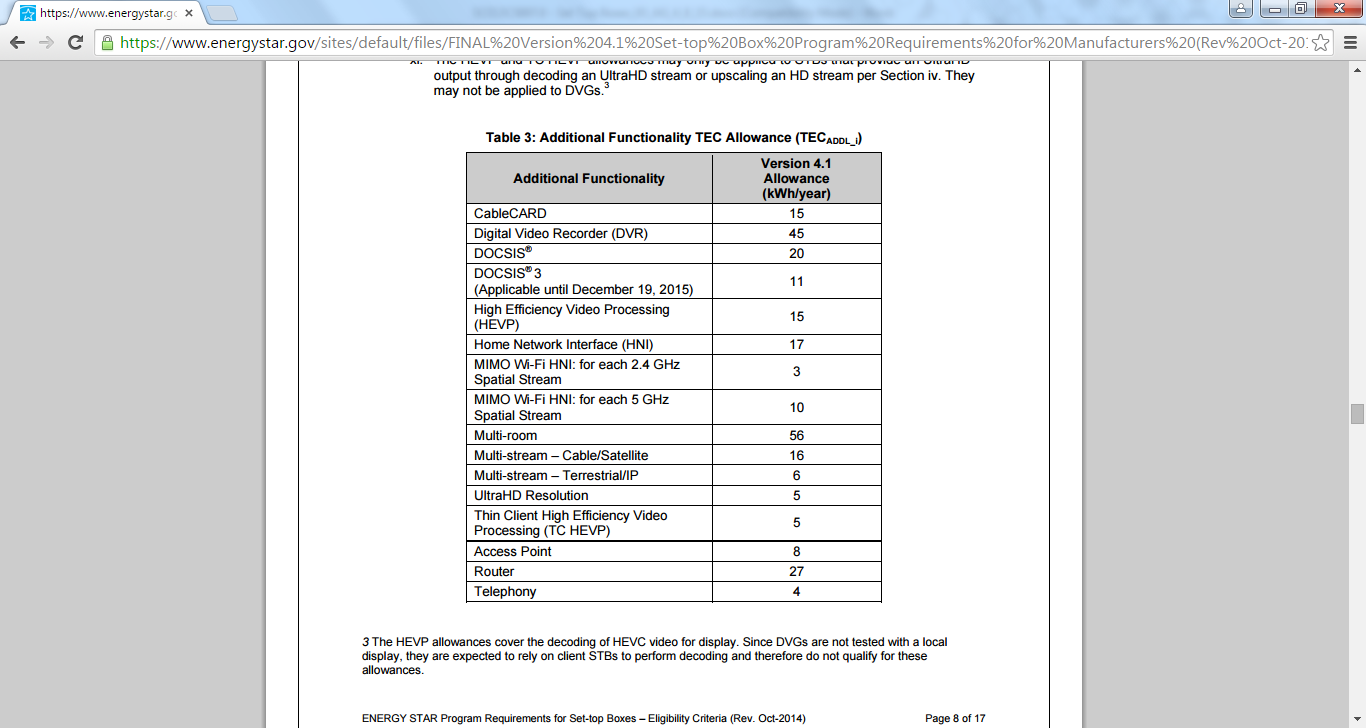


Figure 2 Energy Star 4.0 Additional Functionality TEC Allowance

* + 1. Relevant EM&V Studies

Another study was performed by SCE’s M&E team [B], wherein Research into Action investigated the market to gauge the potential of offering incentives in order to increase the adoption of Energy Star 3.0 and Energy Star 4.0 boxes. The study had three research objectives:

• Evaluating the performance of the experimental pilot;

• Examining literature and available data on the STB market in California and SCE territory; and

• Estimate the technical and achievable energy savings potential of replacing less efficient STBs with energy-efficient models in installed base of STBs in SCE territory.

One of the key findings of the study was that SCE’s Set Top Box pilot upgrade offer was effective in stimulating update of efficient boxes. It was found that the experimental group (those which received the set top box upgrade offer) upgraded their STBs at an eleven times higher rate than the control group. This finding shows that SCE’s program did motivate customers to upgrade their equipment to more energy efficient models.

* + 1. Relevant Workpaper Dispositions

There have been no dispositions on this work paper or any similar work paper.

* + 1. Other Sources for non-DEER Methods

The energy usage for non-Energy Star 4.1 or 3.0 satellite set top boxes are based upon an SDG&E field study for advanced power strips. The study involved the pre and post monitoring of 22 different homes in SDG&E territory where the focus was the energy consumption and active/inactive hours of the existing set top boxes. The energy consumption in active and inactive, as well as the hours in each mode are used to determine the yearly energy usage for non-Energy Star 4.1 or 3.0 boxes. This information can be found in the attachment section.

The basis for the EUL is taken from a consumer electronics study performed by ECOVA [A], and submitted to the California Energy Commission, wherein the effective useful life is found to be between 5-7 years. An average gives the life as 6 years.

1. Calculation Methods
   1. Program Implementation Analysis

Table 7. Baseline by Measure Application Type

|  |  |  |  |
| --- | --- | --- | --- |
| Measure Application Type | Baseline | Baseline Technology | Duration |
| **ET/RET** | First | Existing | 2 |
| Second | Existing | 4 |
| ROB | First | Existing | 6 |
| Second | N/A | N/A |

* 1. Electric Energy Savings Estimation Methodologies

The energy savings for the measures contained within this work paper are found from a combination of field monitored data and Energy Star spec total energy consumption allowances. The monitored data was used to establish the baseline while the Energy Star specs were used to establish the allowed measure usage.

The filed monitored data included 22 different sites where 6 sites had existing satellite boxes. It was these sites that were relied upon to gather the following metrics:

* Average Active STB Power
* Average Inactive STB Power
* Hours Watched Per Day

With the above information, the baseline was determined for the following types of boxes:

* Satellite Standard Definition (SD) with Digital Video Recording (DVR)
* Satellite High Definition (HD) with Digital Video Recording (DVR)

In order to establish the baseline for non-Energy Star boxes (which include SD and HD), yearly energy usages were provided to SCE by television providers. These values are confidential, but are used to establish the baseline for non-Energy Star boxes. These average values can be found below:

Table 8 Non Energy Star Box Energy Usage

|  |  |
| --- | --- |
| Satellite Box Type | Equipment Total Energy Usage (kWh/year) |
| Basic (SD) | 153.38 |
| HD | 195.61 |
| HD-DVR | 242.58 |

The following information was used from the field data obtained through SDG&E’s study:

Table 9 Field Data for Existing STBs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Satellite Box Type | Average Active Power | Average Inactive Power | Hours Watched Per Day | Inactive Hours Per Day |
| SD-DVR | 24.7 | 23.5 | 5 | 19 |
| HD-DVR | 32.8 | 31.9 | 6 | 18 |

Using the following equation, the yearly energy consumption was found for the STBs using the field data:

Equation 1 Yearly Consumption Energy

Yearly Consumption (kWh/year) = [(Average Active Power\*Active Hours Watched per Day) + (Average Inactive Power\*Inactive Hours per Day)]\*(365 days/year)\*(1 Watt/kW)

Based on the previous equation, the energy usage for the STBs in the field study are as follows:

Table 10 Yearly Energy Consumption

|  |  |
| --- | --- |
| Satellite Box Type | Yearly Energy Consumption (kWh/year) |
| SD-DVR | 208.05 |
| HD-DVR | 281.42 |

The measure case usage can be found from the Energy Star Specs, V2.0 (as a baseline proxy), V3.0, and V4.1.

A sample calculation is shown below for a Non Energy Star HD-DVR STB being replaced by Energy Star 4.1 Thin Client:

* Baseline Usage: 242.58 kWh/year (see Table 8)
* Measure Usage: 30 kWh/year + 45 kWh/year + 5 kWh/year = 80 kWh/year (See Figure 1 and Figure 2)
* Annual Energy Savings: 242.58 kWh/year - 80 kWh/year = **162.58 kWh/year**

**First Baseline**

Sample energy savings for the first baseline can be found in the section above.

**Second Baseline**

As there is no code, the savings for the first and second baseline are identical.

* 1. Demand Reduction Estimation Methodologies

The Demand reduction for each measure can be found by taking the energy savings and dividing by the total operating hours for each measure. As STBs are always plugged in, the assumed operating hours are year round (8,760 hours/year), where the distinction between active and inactive are already taken into account when calculating the energy savings. A sample calculation has been shown below:

Non Energy Star HD-DVR STB being replaced by Energy Star 4.1 Thin Client:

• Annual Savings: 242.58 kWh/year - 80 kWh/year = 162.58 kWh/year

• Annual kW Savings: 162.58 kWh/year / (8,760 hours/year) = **0.01856 kW**

The monitored data from the SDG&E Plug Load study was also used to find an appropriate coincident diversity factor as the factors found from DEER are not specific to the measures within the work paper. Looking at the monitored data obtained, the percent of time that the set top boxes were found to be in active mode between 2pm and 5pm on weekdays (peak period definition) were found and can be seen in the table below.

Table 11 Coincident Diversity Factors from Field Monitoring

|  |  |
| --- | --- |
| Set Top Box Type | Average Coincident Diversity Factor |
| Cable | 28.33% |
| Cable HD | 35.56% |
| Cable HD DVR | 24.60% |
| Satellite | 21.09% |
| Satellite SD DVR | 28.69% |
| Satellite HD DVR | 19.58% |
| **Average Satellite** | **23.12%** |

These factors were applied to determine the peak kW savings through the implementation of the measures contained within this work paper. In instances where the measure does not line up with the set box type specified in the table above, the average value was used as a proxy.

The savings contained within the calculation attachment incorporate DEER interactive effects as well as the CDFs seen above.

**First Baseline**

Sample demand savings for the first baseline can be found in the section above.

**Second Baseline**

As there is no code, the savings for the first and second baseline are identical.

* 1. Gas Energy Savings Estimation Methodologies

The gas savings for this measure are found by applying DEER interactive effect values to the kWh savings found in section 2.2 above. A sample calculation is shown below:

Non Energy Star HD-DVR STB being replaced by Energy Star 4.1 Thin Client:

* Annual Savings: 242.58 kWh/year - 80 kWh/year = 162.58 kWh/year
* Therm Savings: 162.58 kWh/year \* -0.019963 Therms/kWh = **-3.2455 Therms/year**

**First Baseline**

See above for a sample calculation.

**Second Baseline**

As there is no code, the savings for the first and second baseline are identical.

1. Load Shapes

The difference between the base case load shape and the measure load shape would be the most appropriate load shape; however, only end-use profiles are available. Therefore, the closest load shape chosen for this measure is the DEER:Indoor\_ CFL\_Ltg load shape. See table below 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 7. Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| Building Type | E3 Alternate Building Type | Load Shape |
| Residential Single Family | RES | DEER:Indoor\_CFL\_Ltg |

1. Base Case, Measure, and Installation Costs

Provide summary of base, measure, and installation costs for appropriate application type (see Appendix 2). If DEER costs are not used, include detailed, all-inclusive, and defensible explanation of cost estimation methodologies and reasons for not using DEER.

Table 8. Measure cost summary by application type

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Measure Application Type | Base Case  Equipment Cost  ($/unit) | Measure  Equipment Cost  ($/unit) | Installation Cost  ($/Unit) | Incremental Measure Cost  ($/unit) | Full Measure Cost  (1st Baseline period)[[3]](#footnote-3)  ($/unit) | Full Base Cost  (2nd baseline period)[[4]](#footnote-4)  ($/unit) |
| **ROB** |  |  | N/A |  | N/A | N/A |
| **NC** |  |  | N/A |  | N/A | N/A |
| ER |  |  |  | N/A\* |  |  |
| REA |  |  |  | N/A\* |  |  |

\* IMC may be useful for determining program incentive.

* 1. Base Case(s) Costs

See Appendix 2 table title “Baseline Technologies for UES and Cost calculations” for guidance on determining baseline costs for different application types. Include detailed description of base case cost estimation methodology or sources, including all assumptions and calculations. If DEER costs are not used, include detailed, all-inclusive, and defensible explanation of cost estimation methodologies and reasons for not using DEER. Methods must be easily understood by a CPUC technical reviewer or third party. Reference relevant DEER, EM&V reports, past workpaper dispositions, or other sources used to inform cost.

* 1. Measure Case Costs

Include detailed description of measure case cost estimation methodology or sources, including all assumptions and calculations. If DEER costs are not used, include detailed, all-inclusive, and defensible explanation of cost estimation methodologies and reasons for not using DEER. Methods must be easily understood by a CPUC technical reviewer or third party. Reference relevant DEER, EM&V reports, past workpaper dispositions, or other sources used to inform cost.

* 1. Installation/Labor Costs

Include detailed description of installation/labor cost estimation methodology or sources, including all assumptions and calculations. If DEER costs are not used, include detailed, all-inclusive, and defensible explanation of cost estimation methodologies and reasons for not using DEER. Methods must be easily understood by a CPUC technical reviewer. Reference relevant DEER, EM&V reports, past workpaper dispositions, or other sources used to inform cost.

In most ROB cases, the installation/labor cost for the base and measure cases will be the same.

* 1. Incremental & Full Measure Costs

Choose the appropriate measure application type from the table below to indicate how either incremental or full costs were calculated (see Appendix 2) using the costs from sections 4.1, 4.2, and 4.3. In most ROB cases, the installation/labor cost for the base and measure cases will be the same. In the event that the installation/labor costs are different, the incremental measure cost will also include the difference in labor costs for the base and measure cases.

Note that the E3 calculator input field “Gross Measure Cost” requires the input of either IMC (for ROB or NC measures) or the full measure cost (for ER measures).

**Table 9.** Incremental and full measure cost calculations

|  |  |  |  |
| --- | --- | --- | --- |
| Measure Application Type | Incremental Measure Cost  ($/unit) | Full Measure Cost  (1st Baseline period)  ($/unit) | Full Base Cost  (2nd baseline period)  ($/unit) |
| ROB/NEW | **Incremental Measure Cost** =  (Measure Equipment Cost + Measure Labor Cost) –  (Base Case Equipment Cost + Base Case Labor Cost) | N/A | N/A |
| ER | N/A | **Full Measure Cost** =  Measure Equipment Cost + Labor Cost | **Full Base Cost** =  (-1)\*(Second Base Case Equipment Cost + Labor Cost)[[5]](#footnote-5) |
| REA | N/A | **Full Measure Cost =**  Measure Equipment Cost + Labor Cost | N/A |

Table 5. Incremental and full measure cost values

|  |  |  |  |
| --- | --- | --- | --- |
| Measure Application Type | Incremental Measure Cost  ($/unit) | Full Measure Cost  ($/unit) | Full Base Cost  (2nd Baseline)  ($/unit) |
| ROB/NEW |  | N/A | N/A |
| ER | N/A |  |  |
| REA | N/A |  | N/A |

# Appendix 1 - Supplemental Files



# Appendix 2 – Commission Staff Comments / Review

Include embedded file(s) with Commission staff feedback.

# Appendix 3 - Measure Application Type Definitions

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 measure application type terms as follows:

Measure Application Type

|  |  |  |
| --- | --- | --- |
| Code | Description | Comment |
| ER | Early retirement | Measure applied while existing equipment still viable, or retrofit of existing equipment |
| EAR | Retrofit Add-on | Retrofit to existing equipment without replacement |
| 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 |

Baseline Technologies for UES and Cost calculations[[6]](#footnote-6)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure Application Type | Baseline | Baseline Technology | Measure Cost Calculation | Duration |
| ER | First | Existing technology | Measure equipment cost + labor cost | RUL = 1/3\*EUL[[7]](#footnote-7) |
| Second | Code or standard | (-1)\*(Code/standard equipment cost + labor cost) | EUL - RUL |
| REA | First | Existing technology | Measure equipment cost + labor cost | EUL |
| Second | N/A | N/A | N/A |
| ROB | First | Code or standard | (Measure equipment cost + labor cost) – (Code/standard cost + labor cost) | Full EUL |
| Second | N/A | N/A | N/A |
| NC | First | Code or standard | (Measure equipment cost + labor cost) – (Code/standard cost + labor cost) | Full EUL |
| Second | N/A | N/A | N/A |

Measure cost overview developed by SCE:

**

# Appendix 4 – CPUC Quality Metrics

CPUC workpaper development actions to ensure quality are listed below, adapted from ex ante implementation scoring metrics described in Attachment 7 of Decision (D).13-09-023. The corresponding scoring metrics are shown below.

|  |  |
| --- | --- |
| **Metric** | **Workpaper Development Action to Ensure Quality** |
| 2 | Address all aspects of the Uniform Workpaper Template[[8]](#footnote-8) |
| 3a[[9]](#footnote-9) | Include appropriate program implementation background |
| 3b | Include analysis of how implementation approach influences development of ex ante values |
| 3c | Include all applicable supporting materials |
| 3d | Include an adequate[[10]](#footnote-10) description of assumptions or calculation methods |
| 4 | Pursue up-front collaboration on high impact measures with Commission staff prior to formal submission for review |
| 7 | Include analysis of recent and relevant existing data and projects that are applicable to workpaper technologies for parameter development that reflects professional care, expertise, and experience |
| 9 | Appropriately incorporate DEER assumptions, methods, and values for new or modified existing measures using professional care and expertise |
| 10 | Incorporate cumulative experience into workpaper through inclusion of an analysis of previous activities, reviews, and direction. (ED expects IOUs to immediately incorporate disposition guidance into workpapers to be submitted for formal review) |

# Appendix 5 – DEER Resources Flow Chart



# References



[355]

[422]

[A] ECOVA. (2013). Set-top Boxes and Small Network Equipment.

[B] Research Into Action. (2015). Final Report, Set-Top-Box Pilot and Market Assessment.

1. Full measure cost = measure equipment cost + measure labor cost [↑](#footnote-ref-1)
2. Incremental measure cost = Measure equipment cost – Baseline equipment cost [↑](#footnote-ref-2)
3. Full measure cost = measure equipment cost + installation cost, for first baseline period [↑](#footnote-ref-3)
4. Full base cost = 2nd baseline equipment cost + installation cost, for the second baseline period [↑](#footnote-ref-4)
5. The E3 calculator determines the net present value of the second baseline cost and subtracts it from the first baseline cost to determine the measure cost for the early retirement measure. According to the Energy Efficiency Policy Manual v.5 at page 32, the measure cost for an early-retirement case is “the full cost incurred to install the new high-efficiency measure or project, reduced by the net present value of the full cost that would have been incurred to install the standard efficiency second baseline equipment at the end of the [RUL] period”. [↑](#footnote-ref-5)
6. According to the Energy Efficiency Policy Manual v.5 at page 32, the measure cost for an early-retirement case is “the full cost incurred to install the new high-efficiency measure or project, reduced by the net present value of the full cost that would have been incurred to install the standard efficiency second baseline equipment at the end of the [RUL] period”. Page 33 elaborates that “the period between the RUL and EUL defines the second baseline calculation period…the measure cost for this period is the full cost of equipment, including installation, for the second baseline equipment measure”. [↑](#footnote-ref-6)
7. The Energy Efficiency Policy Manual v.5 at page 33 states “the remaining useful life (RUL)…[is established by DEER] as one-third of the expected useful life (EUL) for the equipment type”. [↑](#footnote-ref-7)
8. The Uniform Workpaper Template is not posted on the DEER website as of 4/21/14, and is currently in Microsoft Access Database format. [↑](#footnote-ref-8)
9. Metric 3 is not split among a – d in Attachment 7, however metric 3 was separated into four subcategories in this document for the purposes of identifying individual workpaper development actions to address quality. [↑](#footnote-ref-9)
10. “Adequate” is defined in Attachment 7 such that derivations of underlying assumptions of workpaper are easy to understand by the CPUC reviewer. [↑](#footnote-ref-10)