**DISPOSITION FOR WORKPAPER WPSCGREHC160624A revision 0**

**Residential Smart Thermostat**

**California Public Utilities Commission, Energy Division**

July 19th, 2016

# Review Scope

This disposition includes a review of the following:

1. Unit energy savings calculations
2. Net-to-Gross (NTG)
3. Measure application type and technology costs
4. Eligibility requirements
5. Ex ante data submission

The workpaper is rejected based on insufficient support for unit energy savings calculations, overly optimistic net-to-gross assumptions, incorrect measure application type, and incomplete descriptions of eligibility requirements. Revise and resubmit the workpaper to address the following five sections.

## Unit Energy Savings Calculations

Unit energy savings extrapolations from the pilot study are not approved. The authorized savings is 6.2 therms per year per single family home.

### Discussion

The energy savings calculations within the workpaper start with savings derived from a pilot study of 6.2 therms per year per single family home[[1]](#footnote-1). Then adjustments are made which more than double the savings based on the assumption that the year of the pilot study was a warmer than usual. Finally, the savings value is extrapolated to all 16 California climate zones using a heating degree day calculation. In summary, the workpaper proposes a savings of 6 therms for climate zone 15 while other locations are proposed to save 11 to 57 therms, an increase in savings from 77% to more than 800%.

In accordance with meetings on May 10th, May 25th, and June 14th, the ex ante team finds that the calculation method above is not accurate enough to justify the huge increase in savings over the pilot study. The meeting notes from May 25th accurately represent the technical concerns (see Appendix A). The pilot program results of 6.2 therms per single family home are approved for all climate zones. Please see notes under eligibility requirements and ex ante data submissions regarding the need to ensure that savings are only credited once per home.

It is suggested that any adjustments to the thermostat savings could be made by collecting additional field data as this program is rolled out. Perhaps a 1 year study which includes all climate zones, multiple thermostats per home, analysis on individual site savings, etc. would include enough information to adjust the authorized savings value. Such a study should consider how sites are selected and categorized, determine whether interaction is needed with the homeowner, etc. Any such study should begin with a workplan and Energy Division requests the opportunity to collaborate on a workplan.

## Net To Gross (NTG)

The proposed Net-to-Gross (NTG) value of 0.55 does not consider impact of ordered demand response program. Since the natural gas savings for the smart thermostat is an add-on to a Commission-directed demand response program AND an add-on to SCE's smart thermostat program, it seems unlikely that the SCG $25 rebate will cause an increase of 55% in smart thermostat installations.  A net-to-gross value of 33% must be assumed.

### Discussion

The proposed, deemed measure requires that a homeowner (a) already has a SmartConnect meter installed, (b) meets other eligibility requirements including gas space heating, (c) learns about smart thermostats from the Program Administrator, and (d) decides to purchase, install, and register their Smart Thermostat in order to save additional energy.

When all of the above conditions are met, then the incentive provided by SCG realizes savings. However, this scenario means that homeowners did not make this purchase before hearing about the $25 incentive and would not have made the purchase without the additional $25. We believe that many rebates will be paid to homeowners who either already have smart thermostats or would have bought a smart thermostat without the $25 incentive. Therefore, a net-to-gross of 0.33 is required to account for free ridership.

## Measure application type and technology costs

The Measure Application Type and technology costs for the proposed measure shall reflect early retirement for the remaining useful life only. The workpaper proposal of replace-on-burnout (natural replacement) is rejected and the workpaper is required to be structured as follows:

1. Measure application type shall be early retirement, RUL period only
2. The effective useful life (EUL) proposed in the workpaper is acceptable and is set at 11 years. Therefore, the remaining useful life (RUL) shall be 3.6 years.
3. The pre-existing technology shall be assumed to be whatever technology was prevalent in the pilot study homes. This is the technology that leads to the 6.2 therms of saving per year per home.
4. The standard/code technology shall be assumed to be a smart thermostat. This means there are no savings after 3.6 years.
5. The submitted ex ante data uses the term “Setback Programmable Thermostat”; however, it’s not clear whether this description is appropriate. The workpaper shall describe the thermostat technology(es) that were replaced during the pilot study as the pre-existing technology for the early retirement project.
6. The technology cost must reflect the net present value of installing the smart thermostat for the RUL period only.

### Discussion

The pilot study replaces pre-existing thermostats with new, smart thermostats. The therms savings and incremental costs are derived from the difference between the removed functional thermostat and the new smart thermostat. However, this does not match the proposed measure applicability type of ROB (replace on burnout or natural replacement). Instead, this workpaper is documenting early retirement measure application type. Further, since the program is meant to accelerate adoption of smart thermostat technology, it must be assumed that the replacement technology at the end of the RUL is also a smart thermostat.

We accept the measure costs presented in the workpaper. We have estimated the net present value of this cost to be approximately $56. In other words, the incremental measure cost is the difference between installing the thermostat now and installing it at the end of the RUL period in 3.6 years. SCG is directed to calculate the incremental measure cost and update their workpaper.

## Additional Eligibility Requirements

The proposed eligibility requirements for the downstream incentive are unclear. Please adjust program structure, requirements, and workpaper description as follows:

1. The workpaper does not include the requirement for the home to be heated by a gas furnace. Please add this requirement.
2. It is unclear how SCG will confirm that the demand response portion of the eligibility requirement has been met. SCG shall require additional specific paperwork to be submitted with the rebate application such as a printout from the Smart Thermostat service provider's website showing successful registration for each thermostat included in the rebate application. Update Section 1.3 to reflect this.
3. The workpaper proposes an incentive for each installed thermostat but this disposition limits that incentive to 6.2 therms per year per single family home. SCG’s program shall track data such as the home’s address and ensure that no more than 6.2 therms of savings are claimed for each single family home.
4. The workpaper is developed as a statewide workpaper with data presented for all 16 climate zones; however, the eligibility requirements and program restrictions limit participation to residents which are both SCE and SCG customers. While this is not a requirement for SCG’s workpaper approval, other PAs are advised that, in order to adopt this workpaper, Section 1.1 of this workpaper should be extracted, updated, and submitted to the WPA along with the ex ante implementation table. The submissions should **not** be a full copy of the workpaper.

## Ex ante data submission

The following corrections are required to update the ex ante data submission to match this disposition and the ex ante data format.

1. Implementation Table:
2. MeasAppType = ER
3. Set the STdCostID = MeasCostID = HVAC-ResSmartTstat
4. Net-to-Gross ID = SmartTstat = 0.33. This value does not yet exist in the ex ante database but EAR team will create it when the data is uploaded to the database.
5. Revise the Start Date to match the date of this disposition
6. Measure Table:
   * 1. The description should be updated to reflect the action that is taking place. For example, “Residential smart thermostat replacing pre-existing XXX” where XXX is the pre-existing technology identified in the pilot study.
     2. This disposition requires the measure to be defined at ER, RUL only. Therefore the PreDesc shall be “XXX” and the StdDesc shall be “Residential Smart Thermostat”
     3. PA = Any. Allows other PAs to use this statewide workpaper data
7. Energy Impacts Table:
   * 1. Set BldgLoc = Any. This disposition does not approve climate-specific values
     2. AStdWBTherm = 6.2
     3. PA = Any. Allows other PAs to use this statewide workpaper data
     4. NormUnit = Household
8. MeasureCost Table
9. PA = Any. Allows other PAs to use this statewide workpaper data
10. NormUnit = Household

# Appendix A. Notes from Smart Thermostat

The notes below were submitted with the workpaper and illustrate the reasons why the ex ante review (EAR) team does not accept the proposed unit energy savings values. These notes outline the types of data requested by the ex ante review team prior to the submission of the workpaper. Although some of these items were provided and explained within the submission, not enough data was presented to give confidence that the calculations methodology is accurate. All text below is taken directly from a file embedded within the workpaper.

## EAR TEAM / SCG Meeting Notes from May 25th, 2016

Ex-Ante Review Team requests the submission of following information/data in tables:

Account level data (additions to existing site list tab or new tab)

* Add all accounts to data tab – control and treatment group. Supply addresses for each account (# street and unit # if applicable, city, zip). Add column that indicates control or treatment group member for each site;
* An indication of “matching” between control and treatment group site (perhaps a unique number assigned to the control and treatment members determined to be “matched” or some other kind of indication;
* Add gas use (monthly data) of each site/account for pre & post periods – for treatment site indicate date of installation (best if there are fixed columns for the full range of months of entire data sample, say 24 or 36 columns);
* Any analysis done on individual site savings (perhaps none was done, so this is not available);
* Add columns for any demographic data for each site (home size sqft, # stories, # occupants, # children, # working adults, # elderly, pool/spa, etc) including the information referenced below in the survey section (no need to duplication, us complete set in one or the other data set)

Pilot Study Surveys

* Participants survey- complete
* Non-Participants survey - to be conducted
* Provide results of completed participants survey (for each site, identify the site so it can be interconnected with the site information listed above)
* Provide questions for non-participants survey
* Provide all available demographic info on survey participants
* Provide EE program participation data for participants (if they participated in any other EE programs, if so what measures and dates)

Weather adjustment (include examples)

* Calculation (show how HDD calculation was performed - example calculation showing DD base and formulae via spreadsheet or other clear method)
* For each location in the control and treatment groups, include the calculated HDD for the associated weather station (we believe this has already been provided, but please confirm) along with reference HDD value used to perform the adjustment. Include the final adjusted gas energy use for each sit in control and treatment groups.
* Weather stations used for each site for pre/post period analysis before HDD adjustment – . Identify if it is a NOAA or CIMIS station. Provide the explicit weather station ID. For NOAA stations the explicit ID will be either: a World Meteorological Organization (WMO) index number, a four letter International Civil Aviation Organization (ICAO) indicator, or a three letter U.S Federal Aviation Administration (FAA) indicator. For NOAA stations, specify if it is a WMO, ICAO or FAA station and include the appropriate indicator. For CIMIS stations, include the station ID number.provide the entire surface observation data set collected for each weather station. It is important to provide the entire data set with all data points, even if some data points were not used in the weather adjustment analysis.
* TMY data used in analysis (DEER weather data – this is the CEC 2013 weather data correct?)

Ex-Ante Review Team requests the inclusion of following information in the pilot study report:

Explain how well the sample represents the population

Add in distribution of sample by climate zone

Summarize opt-in/opt-out/non-eligibility for the pilot study and include sample rejected sites count by reason during the recruiting process

Household info, post-treatment info - describe in report

* What other major changes took place during the post period in the control or treatment groups – remodels, new or replaced appliances (kitchen, laundry, entertainment, computers, lighting – CFLs or LEDs or other changes, pool/spa, etc.)

Sample details

* Describe the analysis done to develop requirements sample size (there was some modeling done – show the models and the results)
* Show the range of variability in the sample
* Describe the details of the matching - parameters (monthly gas consumption) and the results (show the matched sites)

Discuss the issue of non-space-heating component of gas use and how it impacts the results

* Why was the analysis done on full gas use rather than an estimate of thermostatically controlled use? What are the likely effects of including non-thermostat controlled use and support this with data and analysis

1. The workpaper actually proposes savings for each thermostat; however, the pilot study only included single-thermostat homes. Due to the lack of information to justify or describe how savings may affected by additional heating systems and thermostats, this disposition only allows savings to be claimed once for each home. [↑](#footnote-ref-1)