**SW Smart Thermostat WP**

**Responses to Comments from Cal TF**

**And EAR Team**

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| **Comment** | **Response** | **Response Adequate/Further Comments?** |
| **Cal TF Meeting – July 28th**  |
| 1. Consider possibility of running same analysis using building temperature
* Concerned that frequency and timing of set point change would affect thermal mass in building
 | Addressed by adding new section towards the end of Section 2.5.5 that compares the output of this analysis/methodology with a Florida study that utilized sub-metered homes. The savings from both studies (a florida sub-metered study compared to Florida homes run through the same savings estimation methodology we are using in the workpaper) are very closely aligned signifying that the shift in run time is captured with the analysis and proven to not drive significant differences in savings.  |  |
| 1. EUL follow-up: What is warranty and how does it compare to estimated life?
* What is basis for EUL?
 | Basis for EUL is the 11 year EUL in supporting section.  |  |
| 1. Must come up with a definition that is manufacturer neutral and adequately distinguishes “Smart thermostats” from connected thermostats.
 | The technical measure description was updated to utilize a definition from Navigant to be vendor neutral and builds on other TRM’s they have worked on across the country. Section 1.2. |  |
| 1. Provide more information on EPA Energy Star working group method that NEST is basing its approach on:

What method has the working group developed?* If not single method, what are methods being considered?
* How does NEST’s proposed method differ and what are the basis for the differences?
* Who at EPA is leading the Working group, and is there a website?
* Can Cal TF get materials?
* Materials/website from working group/participants
 | Updates and descriptions expanded and added to Section 2.3 |  |
| 1. Need to do more analysis on base case
* How is base case determined?
* What would be base case if DEER/Title 24 used? How does it compare to proposal in WP?
* What would be savings values be if DEER/Title 24 used as base case?
 | This section was completely re-written to be based on California specific data from the RASS study as outlined in Section 2.5.5 |  |
| 1. Provide further support for 1/3 Reduction for prior efficient behavior
* Basis for/how can this number be refined quantitatively
 | See response above, a ⅓ adjustment is no longer utilized. |  |
| 1. Include all market research (studies considered/studies used/conclusions drawn.
* Important note: Need to include studies

Consied that were rejected, as well as those considered and included)* Include customer survey data
 | Multiple studies added to section 1.5 and referred to throughout several sections in the document |  |
| 1. Address choice of baseline
* what about code baseline?
* DEER?
* How do you address/account for “manual touch” i.e. manual adjustments to device
 | * Using code baseline would technically increase savings as discussed in Section 2.5.7. Baseline adjustments were updated and refined with CalTF feedback and documented in Section 2.5.5.
* The savings calculations were updated to use DEER system sizing per Section 3.1
* On “manual touch” adjustments, see responses to 19 and 29.
 |  |
| 1. How does data set/data analysis methods address outlier days (warm days in SCE in Feb, for example)
* How many degree days in season vs. shoulder season
 | There are two main components to the analysis and neither will be affected materially by outliers. The regression modeling estimates the relationship between set points and HVAC runtime and is based on data from mid-season months where the relationship can be estimated most accurately. This regression model is used to estimate the percent savings per degree change in temperature. Data from shoulder months and outlier weather days should have little impact on the estimate of this relationship except to lead to slightly higher savings per degree and noisier estimates. The second component is how actual set points differ from the comfort temperature and that is based on data from the entire year but weighting each month by the relative share of heating/cooling runtime in the month. Issues of outlier weather days and shoulder months have no material impact on the savings estimates.  |  |
| 1. Address why not calibrating to temperature, and instead calibrating to set point

. | Addressed by adding new section towards the end of Section 2.5.5 that compares the output of this analysis/methodology with a Florida study that utilized sub-metered homes. The savings from both studies (a Florida sub-metered study compared to Florida homes run through the same savings estimation methodology we are using in the workpaper) are very closely aligned signifying that the shift in run time is captured with the analysis and proven to not drive significant differences in savings.  |  |
| **September 26th Cal TF Meeting** |
| 1. Sample characterization data needs to be provided on the measure, e.g., single story vs. two story; homes with multi t-stats vs single t-stat.  According to NEST, approximately 80% of homes are provided with single t-stat and remaining with two or more t-stats.
 | Available data was added to first table in Section 2 (Nest does not have good data on single story vs two story. Nor was it round to be impactful as outlined in line item 30 of this doc). Number of thermostats per home was added to Section 2.2. On average, the homes within California that were utilized to support this study have 1.27 thermostats. Nest is reviewing additional data that could be added to the next draft.Nest added the additional characterization data below to the WP. CZ Area Tstats (Sqft) 1 2059 1.392 2177 1.283 2106 1.304 2090 1.235 2116 1.226 2320 1.347 2153 1.238 2138 1.219 2155 1.3010 2355 1.2411 2301 1.2712 2259 1.2413 2255 1.2914 2260 1.2015 2181 1.5116 2187 1.36Avg 2195 1.29 |  |
| 1. Related to NTG – supporting documentation needs to be provided on offering tracking number of new t-stats vs. existing t-stats
 | This comment was referring to the interim SCG wp as the SW EE rebate would only be available to new devices. Language was added to Section 1.6.2 on data that could be collected from manufactures on installation rates.  |  |
| 1. “ROB may be a more conservative approach than RET.”  Measure cost and IMC needs to be accounted when evaluating cost effectiveness of the measure – ROB (incremental cost 1st baseline), RET (full cost 1st baseline / Incremental cost 2nd baseline)
 | Section 1.4.1.3 updated to be Early Retirement based on supporting data. Choosing the more conservative approach would be the correct method if there was not strong supporting data showing that customer are replacing existing/working technology and seeing the purchase as an upgrade. |  |
| 1. Pending issues - translating percent savings to energy savings
 | Significant updates were added in Section 2.5.3, 2.5.4, and we added 2.5.8 to more clearly map out the calculation steps.  |  |
| 1. All supporting documentation shall be included along with workpaper submittal
 | Supporting data/calcs were attached to the WP.We will be working with SCE and CalTF on making anonymized data available to an independent EM&V contractor for validation.  |  |
| 1. Conservative Assumptions:  Identify clearly in WP the conservative assumptions made in WP
* Please Identify in WP that moving in assumption that prior set-back behavior is always in the efficient direction is a conservative assumption.  Also, identify whether some move in inefficient direction as future research needs
* Identify in WP conservative assumptions regarding savings calculations (slide 23), identify which will lead to future research to refine assumptions.
 | A new section was added, 2.5.7 Compilation of Conservative Assumptions,that discusses all of the conservative assumptions we have reviewed with CalTF and the ex-ante team, many voicing concerns that we were being too conservative on the estimates.  |  |
| 1. Is assumed set point flat or does it vary by day/season?
 | The output of this analysis creates one comfort temperature setpoint for the heating season (specific to each thermostat/customer) and one comfort temperature setpoint for cooling season as outlined in Section 2.5.1 |  |
| 18. Self-reporting – Hirsch analysis suggests it underestimates conservation behavior.a.       NOTE:  Michael Blasnik had study reaching opposite conclusion.  I think it would be useful to include this. | Discussed in depth in the third bullet point of newly created Section 2.5.7 Compilation of Conservative Assumptions |  |
| 19. Some individuals will trend in negative direction.  In other words, they will use MORE energy once smart thermostat is installed.  These outliers should not be removed from analysis.    a.       NOTE: Confirm outliers not removed from the analysis.  Might be helpful to put this in the WP, even in a footnote. | * Like any billing analysis, we can only estimate the mean impact and have no way to say what any one home saved due to the retrofit. The recent ACEEE paper outlining the EPA methodology reiterates that point as well - the analysis works at the aggregate level. The analysis is based on average impacts and average baselines -- these values in no way preclude having negative savers in the mix. In other words -- customers with usage increases are already accounted for in the analysis.
* Just as some customers may see increased usage, some customers will see dramatically reduced usage well beyond the estimated savings in this work paper. Likewise, we don’t need a special factor for these larger savers either.
* This approach accounts for the feedback received from some comments that some customers may increase usage once they have remote control capability - ie turning the ac/heat on before they get home. All of these setpoint changes are captured and studied in the analysis and therefore included in creating the average savings.

Nest added a paragraph to address this up front in the WP |  |
| 20. Table of Other Studies:  For this table, include in the report what characteristics the samples had, the diversity and size of the samples, as well as the number in the sample.  The SCG study – diversity of samples not that great.  Did not know how to extend into larger homes with multiple thermostats.  | Section 3.3.1 Comparison Report Summaries added in response. |  |
| .9 NTG:  Our understanding is that there are 240,000 NEST thermostats in CA.   Is this correct?  (Jeff G.  Correct) What makes you think  90% going forward will be due to incentives?  Is .9 NTG reasonable in light of pre-existing?a.       NOTE:  Include data on lift from incentives vs. what would have been naturally occurring from other jurisdictions to substantiate a .9?   | Updated section to use recommended 0.55 from disposition. Stakeholder group also gave the feedback that NTG values for POU programs should be included as well. |  |
| 21. Early Retirement vs. ROB:  There are various scenarios, what are percentages.  If there is a very predominant one, is may not be worth doing multiple scenarios | Measure will be filed as a blend of ROB/ER for IOU programs and ROB for POU programs based on stakeholder discussion.  |  |
| 22. Underlying Data:  NEST (SCE) must provide to staff underlying data, and not just results.  a.       SCE suggested in addition might be worth making underlying data available to independent EM&V contractor (such as Navigant) to validate conclusions supported by data.   | We will be working with SCE and CalTF on making anonymized data available to an independent EM&V contractor for validation. Nest added in a section/paragraph that notes at a high level how this can be done  |  |
| 23. Set points vs. Temperature Calibration: Calibrating to set points, not indoor air temperature – validity of this approach | Addressed by adding new section towards the end of Section 2.5.5 that compares the output of this analysis/methodology with a Florida study that utilized sub-metered homes. The savings from both studies (a Florida sub-metered study compared to Florida homes run through the same savings estimation methodology we are using in the workpaper) are very closely aligned signifying that the shift in run time is captured with the analysis and proven to not drive significant differences in savings.  |  |
| 24. Shifting Run Time: Shifting run time, will change efficiency – how does that impact savings? | Addressed by adding new section towards the end of Section 2.5.5 that compares the output of this analysis/methodology with a Florida study that utilized sub-metered homes. The savings from both studies (a florida sub-metered study compared to Florida homes run through the same savings estimation methodology we are using in the workpaper) are very closely aligned signifying that the shift in run time is captured with the analysis and proven to not drive significant differences in savings. Nest added in additional details from the results of the PG&E study. |  |
| 25. Future Research Needs:  Clearly identify future research that could help refine the values. | Added 5 sub-sections for potential future data analysis based on the CalTF meeting to Section 1.6.2 |  |
| 26. One vs. Two Thermostats: How is composition on current SCE study?  How many homes have one versus two thermostats? | Added to Section 2.2. On average, the homes within California that were utilized to support this study have 1.27 thermostats. |  |
| **EAR Further Feedback – JJH Teleconf. with Cal TF Staff (Annette/Tim) September 29** |
| 27. **Methodological Criticism 1:  Only Post Data Considered**:  NEST is only looking at post-data, and does not have “pre” data.    Does not think you can just make assumptions about pre-baseline without having actual data. a.       NOTE: Cal TF has spent considerable time discussing a reasonable approach to determining what baseline was prior to installation of NEST.  Current approach is based on data in RASS data. Clearly explain in the WP why this approach is reasonable. b.       NOTE: Cal TF Staff discussed how proposed approach was an alternate to RCT studies given that RCT studies so expensive.  Cal TF Staff also mentioned that NEST had validated results from their approach against FLA RCT results.  JJH Comment:  What does FLA have to do with CA?  Bottom line is that cross validation of NEST approach against RCT results from rigorous studies needs to be explained well.  | * Yes, in an ideal situation, we would have data from RCT pre/post billing studies from each CA climate zone including: housing type, including all smart thermostat vendors, each with a significant sample size. A study of such magnitude would be considered best-in-class if it was feasible to run. However, a study of that magnitude would take years and tens of millions of dollars to complete. Few, if any, retrofit measures have savings results with that level of rigor -- instead we attempt to produce the most accurate savings estimates based on the best available data. In this instance, the approach is a combination of a statistical analysis of empirical thermostat data from California (broken out by climate zones) and assumptions about baseline behaviors that are based on available survey data and that can be assessed by comparison of savings estimates to all available billing analysis based studies. Many accepted measures must rely on assumptions about baseline conditions that are based on imperfect data. The key is to assess the assumptions by comparing savings estimates to the best available data.
* The EPA savings estimation methodology, of which this workpaper uses a similar approach, was specifically developed since that level of data is not available but multiple studies from across the country indicate significant energy savings from connected thermostats. The approach uses data that is available from smart thermostats and in this case from 100k+ thermostats across California.
* In addition, the workpaper further refines the analysis with California specific baseline data based on RASS in addition to comparing the results to previously completed RCT pre/post billing analysis studies to ensure that the savings estimates are in-line with what has been measured elsewhere.
* Using post-only data is a key drawback that we have fully acknowledged and have been discussing with CalTF and the ex-ante team for the last 6 mo. However, the EPA is on-board with this approach and at least 20 other states in the US are already offering smart thermostat rebates based on the studies referenced in this SCE work paper.
* Stakeholders have been focused on trying to develop the best estimates we can based on available data to support the rebate, AB793, low income programs, and SB 350.
* Nest is fully in favor of using pre/post data whenever it is available. Because the data set utilized to support this workpaper is so large - from over 100k thermostats - it represents a diverse set of homes, occupancy patterns, thermal characteristics etc. and thus aggregating the savings estimates over such a large sample reflects well the capabilities of the measure.
* Nest would be happy to use another baseline methodology if a reasonable and better option can be proposed.

Outlined below is a discussion on the EPA approach and why it is a reasonable approach for CA’s smart thermostat workpaper* Foundational: It uses the best available data - (since data from RCT studies / billing analysis in every climate zone is not generally available or feasible)
* EPA is trying to define relative impact on runtime of smart thermostats to determine whether or not they will drive savings. Example, SEER rating doesn’t tell you how much you save unless you have a baseline.
	+ Need to compare thermostat to a definable baseline
	+ So let’s see how customers actually behave with their thermostats and use their real data, for every thermostat, to build our metric
* How relevant are studies from other states? The citation of research from other states is not claiming that the savings are the same as in those states but instead is being used only to assess the reasonableness of the methodology in estimating savings. if the methodology is applied to data from Florida thermostats, are the savings estimates consistent with studies from Florida. Physics experiments can be run in any state.
* Many techniques of extracting building thermal performance metrics from energy data have been developed. The best known is perhaps PRISM - which found a roughly linear relationship between energy usage and temperature delta’s
* The EPA approach builds on the statistical estimates developed under the thermal modeling and regression analysis used in approaches like PRISM - but utilizes a data set that is now available today thanks to smart thermostats
* The EPA approach fits a regression model for each thermostat to estimate the relationship between HVAC runtime and temperature difference and uses these models to estimate energy savings for each and aggregates the results
* The baseline temperature is defined by EPA as the 90th percentile of the indoor temperatures on days with a minimum threshold (30 or 60 minutes) of heating (for cooling it’s defined as the 10%tile on days with a minimum threshold of cooling). An earlier iteration had used set point temperatures for the baseline but used indoor temperature in the regression models creating a potential bias The 90th percentile was selected to represent the temperature commonly found when the home is occupied and the occupants desire comfort. By using the 90th percentile, the 10 percent of the time with less efficient temperatures reduce the savings -- providing some compensation for actual baseline behaviors being more efficient than a constant set point.
* Billing data analysis studies rely on pre and post retrofit data for a treatment group and a control group. Such studies can provide the best estimates of retrofit savings when performed well. But there are limitations to how many such studies can be performed at the level of segmentation desired (by climate zone, housing type, etc). These studies also take a significant amount of time (always more than 1 year, sometimes more than 2).
	+ The question then becomes how to best estimate savings from the limited studies available -- how can we extrapolate across studies? In addition, we have a new and unique data stream from smart thermostats that can be leveraged. The EPA performance metric and Nest’s proposed savings estimation approach both leverage the extensive resource of thermostat data to estimate savings.
	+ Nest’s proposed approach further adjusts these savings estimates for a more efficient baseline than the 90th/10th%tiles values. The adjustments involve making assumptions about the true baseline / prior behaviors. These assumptions are based on the best available data from RASS but could still introduce some bias. The potential bias is minimized by checking that savings estimates are consistent with measured savings from billing analysis studies. If the savings estimates are larger than billing analysis study results, it implies that baselines were more efficient than assumed and they can then be adjusted to better align. Similarly, if the savings estimates are lower than the billing analysis studies then assumption can be adjusted the opposite direction..
	+ Our baseline may have a bias so we do a cross-check with the billing analysis studies we have. If they are consistent, it supports the idea that we’re making a reasonable set of assumptions.
	+ Furthermore, Nest is happy to adjust the baseline with any better data that the ex-ante or CalTF teams have. However, we believe we have used the best-available data and have reviewed that with the CalTF over a 9 month review process.
	+ We have data on runtime, and we have data on how people use their setpoints, and we know how setpoints impact runtime of the equipment -- so we should use this data to estimate savings
* Nevertheless, the homes that have smart thermostats represent a very large – tens of thousands (hundreds of thousands in our case) — and diverse set of homes. Factors that affect savings estimates for specific homes can be expected to vary randomly.
* Thus, aggregating scores over a large sample of homes will better reflect the capabilities of the product representing the mean performance
 |  |
| 27. Continued | **Comparison to pre/post billing analysis studies conducted in other jurisdictions:**As mentioned previously, the Nest team agrees that pre/post billing analyses are the idea way to measure energy savings for smart thermostats. However, we must use the best-available data in California to estimate savings for this important measure to begin rollout to build the foundation for strong energy efficiency, demand response, and time of use programs. As a result, our team built the same regression model using data from thermostats installed in Oregon, Indiana, and Florida. As a result, we can now compare the exact analysis we’ve conducted for CA directly against pre/post billing studies using thermostats installed in those states to demonstrate the reasonableness and conservative nature of these proposed results. The table below shows results of running the exact same fixed effects regression model, calibrated using the same reduction factors used in CA, compared against the following pre/post studies.As the table clearly shows, this methodology nearly always under-estimates savings, and sometimes to a significant extent. Nest added PG&E study to this table to further support.  |
| 28. RCT studies not expensive | Well-done RCT studies in California are time-consuming and expensive, ranging from a few hundred thousand for a small study to north of a million for studies that include thousands of homes. The studies required to cover the state of California would certainly be measured in the millions of dollars. In addition to the expenses, they can take years to set up and run properly.  |  |
| **29. Methodological Criticism 2:  Ignores customers who see increased usage as a result of the NEST device**.  Per JJH, SoCalGas study had 20 – 30% of customers who see increased usage.  He reports that he and many of his friends use NEST in a way that would cause usage to increase – use SmartPhone to pre-cool prior to arriving home, which they would not have done absent NEST.  In addition, says he and other users have experience where NEST turns on equipment when customer does not want it turned on. a.      NOTE: NEST will need to address how many customers see increased consumption and by how much, which will vary by climate zone (per Jeff) and factor into their analysis.  If they do not, EAR team will develop factor for percent of customers that see increased usage, and by how much, and reduce savings by this amount. (ie apply an “adjustment” factor for customers who see increase in load from result of NEST thermostat installation)  | * Like any billing analysis, we can only estimate the mean impact and have no way to say what any one home saved due to the retrofit. The recent ACEEE paper outlining the EPA methodology reiterates that point as well - the analysis works at the aggregate level. The analysis is based on average impacts and average baselines -- these values in no way preclude having negative savers in the mix. In other words -- customers with usage increases are already accounted for in the analysis.
* Just as some customers may see increased usage, some customers will see dramatically reduced usage well beyond the estimated savings in this work paper. Likewise, we don’t need a special factor for these larger savers either.
* This approach accounts for the feedback received from some comments that some customers may increase usage once they have remote control capability - ie turning the ac/heat on before they get home. All of these setpoint changes are captured and studied in the analysis and therefore included in creating the average savings.

Nest added in a specific section, up front in the paper, that documents that the analysis approach incorporates customers that saved energy and those who increased.  |  |
| **30. Methodological Criticism #3:  Inadequate Segmentation** **a.** JJH criticized both the NEST and SCG approach for inadequate segmentation.  He stated that the SCG study that uses one thermostat homes, so likely were single story homes, then applies savings to all homes, including those that have two thermostats, is flawed.  He also said he asked for more specific details on the homes but never got it although he said they must have had it based on the study.**b.** Per JJH,Blasnik comment that 2nd story thermostats use same energy as 1st story thermostats incorrect, and segmentation by more than climate zone should be done.  | To clarify, we didn't see any difference in percent savings between one thermostat homes and multi thermostat homes. Also, as stated in our response to question 1 - because the data set utilized to support this workpaper is so large - from over 100k thermostats - it represents a diverse set of homes, occupancy patterns, thermal characteristics etc. and thus aggregating the savings estimates over such a large sample reflects well the capabilities of the measure.  |  |
| **31. NTG:** a.       Per Jeff, would only consider NTG values from other jurisdictions if they knew the other jurisdiction was “comparable,” they could review survey instruments and underlying data.  In other words, EAR would not directly use results from other jurisdictions, but they would be willing to consider “evaluation data from other jurisdiction to see if it applies.” b.       Jeff acknowledged the SCG WP NTG does NOT apply because the EE was add-on to DR program. c.       For EE program, should use Commission- adopted policy for the residential default value (.55?), collect data on “lift” for one year and propose alternative value based on program data if appropriate.  | Additional sections and supporting data added to Section 1.4.1.1 outlining the incremental program lift of incentives for smart thermostats.  |  |
| 32. Identify additional research reviewed per Cal TF direction | NEST has reviewed:1. Prior EM&V on Programmable Thermostats
2. Recent papers from ACEEE on results of Smart Thermostat use
 |  |
| **Items Included in SCG Smart Thermostat WP Disposition Dated November 8, 2016** |
| **33. General eligibility requirements**: confirm (a) measure is installed and controlling HVAC equipment and (b) new purchased thermostat (sales receipt). Data (including (a) and (b)) shall be made available if requested.  | This will be handled through IOU rebate applications (the way SCG currently is).  |  |
| **34. EUL**: The energy savings associated with smart thermostats is less tangible than the Effective Useful Life (EUL) of 11 years for a “programmable thermostat”. The savings which are considered in this disposition are based entirely on software that must be activated and accepted by the residents. **Therefore, we consider the smart thermostat technology to be an Operational Measure**. The EAR team finds that there is not enough evidence to accept the notion that the smart thermostat’s software algorithms and user settings will both persist in “energy efficiency mode” for 11 years. The 2016 commission decision directed that the EUL of non-residential operational measures to be established as 3 years[[1]](#footnote-1). While that decision excludes the residential sector, the EAR team finds that 3 years is a more reasonable assumption than 11. | Nest added a new section that provides supporting data on a reasonable EUL for smart thermostats.  |  |
| **35. NTG**: CPUC staff approves the use of the DEER default NTG value of 0.55 for this program. However, the actual NTG must be determined based on the “lift” in total sales, and subsequent installation and registration that can be attributed to the incentives of the program. Program administrators are required to submit manufacturer sales data (for 2014, 2015 and 2016), collaborate with Energy Division’s EAR team, and revise residential smart thermostat workpapers to reflect a program specific net-to-gross value informed by the total sales trend data. There are also detailed sales and customer data requirements outlined in the disposition. | Nest updated to outline the type of metrics that thermostat vendors would be able to provide to support the NTG EM&V evaluation in the future.  |  |
| 36. For the most part, the technical concerns regarding research methods, energy savings calculation strategies, and market adoption / standard practice are not address in SoCalGas’s workpaper and, to date, the concerns have not been addressed by other PAs. Further work to determine energy savings and calculate cost effectiveness for a deemed Residential Smart Thermostat program shall consider and follow the guidance and direction indicated in Appendices A and B.In particular, the EAR team is concerned that analysts are ignoring smart thermostat installations which show increases in energy use compared with preexisting conditions. **Therefore, any studies, calculation methodologies, etc. which fail to consider the large spread in energy savings (both increases and decreases) associated with smart thermostat installations may not be used to determine deemed energy savings**. Studies and calculations methodologies must include the entire range of thermostat installations. | Handled via comments to line 29.  |  |
| 37. To be considered a complete submission, future workpapers shall directly respond to each of the concerns listed within the Appendices**.**  | Either addressed in this document or within WP.  |  |
| 38. (From first disposition dated 7/19/16) 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.
 | In addition, in PG&E’s recent smart thermostat ET Study(35), survey’s found that only 1% of customers had an existing smart thermostat that they were replacing. 15% of customers had manual thermostats, which are very likely to be operated past their EUL, indicating ROB. The remaining 85% of customers stated having a programmable thermostat. WP written in a way that 15% would be submitted in as ROB and 85% ER.  |  |
|  | **Additional Feedback/Questions From SCE** |  |
| 39. Section 1.4.1.3 of WP, 89% indicated that their reason for buying the smart thermostat was to upgrade from their current thermostat. Was any information gathered on the age of the units replaced? ROB would be relevant if age is > than 11 years.  | Section updated with output of PG&E studies. No, age of the units was not collected.  |  |
| 40. Section 1.5 Add in and/or reference additional data in table SCE is working on. | This section will be updated with the analysis the IOU’s completed - include all studies reviewed.  |  |
| 41. Section 2.5.3 Pooled Fixed Regression Model, additional explanation requested where the code for the model is described as: xtreg heat\_hrs hdd60 tset \_ht, fe | Nest added additional explanation into WP. |  |
| 42. Section 2.5.5 RASS Base Case Calibration, for Table 2.1 RASS Baseline Correction Factors, in the next update consider doing by climate zones. | Direction from CalTF was to maintain 1 heating and 1 cooling factor as the calibration factor in general is a blunt tool and having a factor for each CZ added a false sense of precision.  |  |
| 43. Section 2.5.6 Second Baseline Savings Adjustment, approach needs to be clarified. Also, should market adjustment value be taken as a weighted average from years 3-11, not the start of year 3. | Nest added further explanation of approach taken to reduce savings. Regarding if the weighted average from year 3-11 should be used for the adjustment, the clarification of the approach should help answer, but the answer is no. The analysis takes into account the change in market conditions out into the future – roughly gauging what portion of the market would be buying a smart thermostat regardless of incentives – vs the baseline condition of replacing with a programmable thermostat. This would have the effect of lowering the savings during 2nd baseline period – based on feedback received from the Exante team during a CalTF meeting. The timing and adjustment is to roughly take into account those changing market conditions (a higher portion of customers buying smart thermostats versus programmable) – at the point in time of the switch to 2nd baseline.  |  |
| 44. Section 3.2 First and Second Baseline Heating and Cooling Savings by CA Climate Zone. Concern is that the units are assumed to run at their peak load all year. Suggest using DEER data and/or other sources to come up with some type of factor that could be applied here. Otherwise savings will be overstated, particularly in the shoulder seasons. | See answer to line item 24 as this is the same question rephrased.  |  |
| 45. Recommended that NEST savings are calibrated to PGEs studies on a per CZ basis opposed to the average of PGE savings.  Methodology for calibrating needs to be clear and well documented – I would suggest evaluating adjustments based on cooling degree hours or similar.  Consider only evaluating thermostats 1 and 2 since thermostat 3 was discontinued during the pilot due to low uptake | Stakeholder team determined it was best to add the PG&E study data in for comparison versus calibration into the workpaper.  |  |
| 46. Uncertainty with PG&E gas savings results  | Workpaper updated to make clear that results from PG&E’s study are preliminary and will be updated at a future date.  |  |
| 47. Access to Data to 3-P* Operational data
* Sales data
 | Nest added information on data that could be provided.  |  |
| 48. Second baseline: What should it be? | Nest added additional language clarifying the approach for reducing savings for 2nd baseline to account for a potion of the market adopting smart thermostats.  |  |
| 49. Please add direct install as a delivery channel per PG&E’s request | Added |  |
| 50. Update SCE PTR program data with chart from SCE, not just Nest program enrollment and include % new devices that are enrolling into that program. | Added |  |

1. [↑](#footnote-ref-1)