



# Agenda

## California Technical Forum (Cal TF) Meeting #28: Technical Forum (TF)

February 23, 2017

9:30 am – 3:30 pm

Pacific Energy Center  
851 Howard Street  
San Francisco, California

Webinar Information:

<https://attendee.gotowebinar.com/register/2169749139139410179>

Time	Agenda Item	Discussion Leader(s)
9:30 am – 9:45 am	<b>Opening</b> <ul style="list-style-type: none"><li>• Agenda</li><li>• Purpose of Day</li></ul>	Annette Beitel, Cal TF Facilitator
9:45 – 11:15	<b>Smart Thermostats</b> <ul style="list-style-type: none"><li>• Review of Issues Raises/Responses</li><li>• Changes since last presentation</li><li>• Review final proposed WP</li></ul> <b>ACT:</b> Cal TF Affirmation of final proposed WP	Aaron Berndt, NEST
11:15 – 11:30	<b>Stretch Break</b>	
11:30 – 12:15	<b>Proposed List of Measures 2017 eTRM</b> <ul style="list-style-type: none"><li>• Review utility selections</li><li>• Solicit Cal TF input</li></ul> <b>ACT:</b> Cal TF input; finalize through subcommittee	Annette Beitel, Cal TF Facilitator
12:15 – 1:00	<b>Lunch</b>	
1:00 – 2:15	<b>HPC Pump</b> <ul style="list-style-type: none"><li>• Review of field research</li><li>• Review/respond to outstanding Cal TF issues from last meeting</li><li>• Review final proposed WP</li></ul> <b>ACT:</b> Cal TF Affirmation of final proposed WP	David Jagger, Energy Solutions



2:15 – 2:30	<b>Break</b>	
2:30 – 3:15	<b>Modeling Issues</b> <ul style="list-style-type: none"> <li>• Developing Building Prototypes</li> <li>• Res Modeling               <ul style="list-style-type: none"> <li>○ EnergyPlus Update</li> <li>○ CEC modeling tool</li> <li>○ Other approaches</li> </ul> </li> <li>• Approach to validating modeled measures for CA – developing a Cal TF TPP</li> </ul> <b>ACT:</b> Cal TF Input on issues; discuss outstanding questions that need to be addressed; subcommittee request.	Larry Brackney, NREL
3:15 – 3:30	<b>Closing</b> <ul style="list-style-type: none"> <li>• Upcoming Meetings</li> <li>• Upcoming Cal TF Deliverables</li> <li>• eTRM Status Update</li> <li>• Other Announcements</li> </ul>	Annette Beitel

### Meeting Materials

- Smart Thermostat
  - Draft Final WP
  - Presentation
  - Relevant EM&V Studies
  - Calculation of Baseline Adjustment Factor (Excel)
  - Calculation of Second Baseline Adjustment (Excel)
  - Full Measure Cost Analysis (Excel)
  - Responses to Q&A (2 documents)
- HPC
  - Draft Final WP
  - Presentation
- Presentation: eTRM Modeling Issues
- 2017 eTRM Measures – Proposed – tally of utility/POU votes



## **I. Attendees**

### **In Person Attendees**

Steven Long, TF Member  
Larry Brackney, NREL  
Chan Paek, SCG  
George Beeler, TF Member  
Pierre Landry, TF Member  
Armen Saiyen, TF Member  
Ed Reynoso, SDG&E  
Scott Mitchell, SCE  
Ryan Hoest, TF Member  
Chris Rogers, TF Member  
Gay Powell, PG&E  
Ron Ishii, TF Member  
Jim Wyatt, PG&E  
Mike Casey, TF Member  
Mary Matteson Bryant, TF Member  
Gary Fernstrom, TF Member  
Ed Elliot, PG&E  
Doug Mahone, TF Member  
Annette Beitel, Cal TF Staff  
Ayad Al-Shaikh, Cal TF Staff  
Henry Liu, PG&E  
Alina Zohrabian, TF Member  
David Jagger, Energy Solutions  
Jia Huang, PG&E  
Paul Pruski, SDG&E  
David Jagger

### **Phone Attendees (morning)**

Roger Baker, ComEd  
Michael Blasnik, Nest  
Breesa Collyer, PG&E  
Mini Damodaran, PG&E  
Paul Deang, Sempra Utilities  
Andres Fergadiotti, SCE  
Yeshpal Gupta, TF Member  
Owen Howlett, TF Member



Lawrence Kotewa, TF Member  
Ben Lipscomb, National Comfort Institute  
PEC Presenter, PG&E  
Joe Priyanonda, Applied Energy Group  
David Pruitt, TF Member  
Stephen Putnam, Grundfos  
Travis Richards, RMS Energy Consulting  
David Rojas, RMS Energy Consulting  
Nils Strindberg, CPUC  
Bob Tingleff, SBW Consulting  
Bing Tso, TF Member  
S Vinod, Lincus, Inc.

## **II. Key Decisions and Action Items**

See specific action items under each measure and topic.

## **III. Presentations**

### **Introduction (Annette)**

Cal TF will focus on eTRM in 2017. Starting in April, we will have new members; TF Staff to finalize who will continue. Will have a few openings; can expand up to 35.

**ACT:** If you have people to recommend for Cal TF membership, please let Annette know.

eTRM RFP went out. Initial, positive response already.

Key agenda items for today will include:

1. Smart T-Stat WP for affirmation, presenter is Aaron Berndt. Topics will cover:
  - i. Addressing prior TF comments, comments from others and updated PPT
  - ii. Independent review of EM&V studies on smart t-stats performed by PG&E and SCE. The comprehensive review of studies included:
    1. Independent review of EM&V studies



2. Paper done by CEE
3. Inquires to eSource and cross-check with CEE
2. HPC WP for affirmation - residential pump - David Jagger
  - i. Key issue – review additional data requested by Cal TF.
3. Modeling issues:
  - i. Moving to Energy Plus for commercial. Open issue about what to use for residential modeling.
  - ii. Open issue, not yet resolved, about whether can use California DEER Building prototypes. Inquiry is in to CPUC staff to seek guidance on whether CPUC owns or JJH.

Upcoming:

What is the criteria for removing measures from eTRM?

Governance document needed; not in critical path now, but important.

### **NEST Workpaper (WP)**

Chan Paek: Request for sales data. How was this handled?

Aaron Berndt: NEST can provide some sales data, but can't provide direct sales data. WP takes different approach to getting to NTG data. The approach is to recommend the .55 adopted for SCG; then perform a follow-up EM&V study.

Alternative approach to showing NTG is program uptake post-incentive. How to show program influence:

- Pre-change to \$125 (demand response rebate), see graph in workpaper
- 8 customers / day (before)
- 50 customer / day (after)
- Existing vs new customers
  - Numbers show that 89% are brand new t-stats (upfront incentive)

Alina Zohrabian: Early retirement – how to you explain program influence in early retirement?

Aaron Berndt: It is very clear that having a substantial rebate increases uptake by six-fold. See the chart in the WP.

Pierre Landry: Does sales data track program data?



Aaron Berndt: For ComEd, we are looking at survey data to determine program influence. Specifically, the survey data is used to track program influence. For ComEd, 80% says yes.

Pierre Landry: So, the survey data indicate that customers are buying Smart Thermostats because of the program?

Aaron Berndt: Survey output; data around thermostats that are installed.

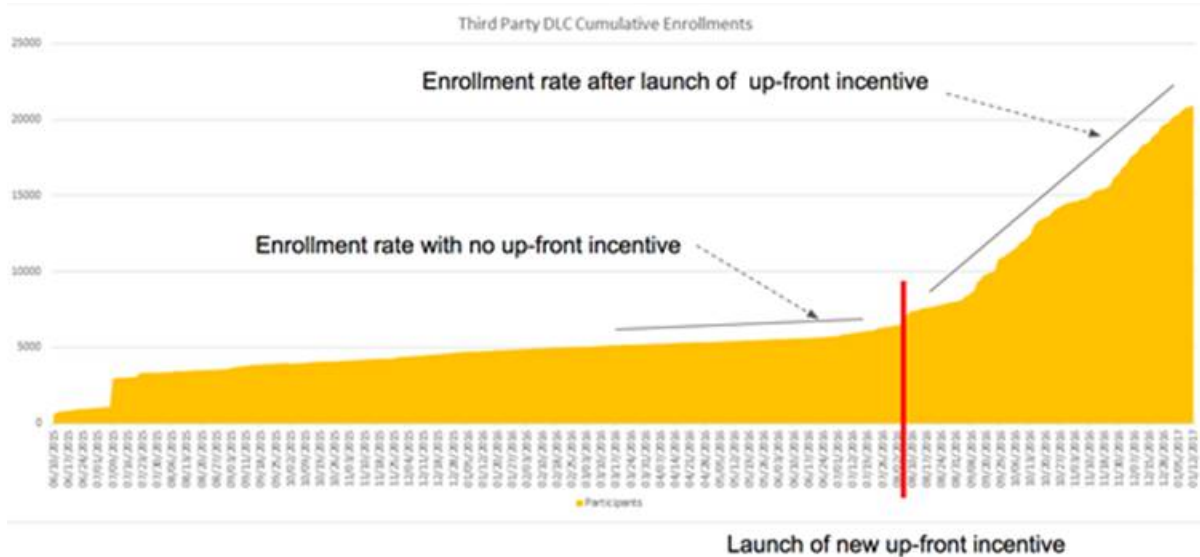
Pierre Landry: Does enrollment in program (where you get incentive) track sales? NEST needs to compare enrollment data to sales data. Maybe give slope of sales.

Pierre Landry: ComEd survey of customer. Did rebate or program influence decision? 80% of customers say 'yes'. Does program volume align with uplift in sales?

Steven Long: Can ComEd survey data be provided for WP?

Pierre Landry:

- "Interrupted time series" - description of situation
  - Attribute
    - "fast diffusion curve" - in a situation like this, if you do not capitalize on an opportunity, you could miss it.
  - If put sales into regression and see slope change still, then impact is real (NTG should be high)
  - If put sales into regression and slope changes goes away, then no impact (NTG should be low)
  - Initial bump - explained as...those who had already owned t-stat
  - Is the slope truly new sales?
    - Fence sitters



Pierre Landry: Would slope analysis be possible to provide?

- ComEd provides s/n
- Nest does query of s/n (serial number) to see if activated (turned on)

Aaron Berndt: Other Smart Thermostat EM&V studies reviewed by PG&E/SCE to validate that approach in WP is correct/reasonable

- SCG Study- abnormally mild winter
- PG&E Study- electrical savings are conservative; gas WP are much lower
  - Study designed to capture electric savings
    - Not meant to be representative of gas
  - Looking into whether control group matched for gas customer; not sure this is true
    - Look at billing data vs EMI data
    - This analysis uses monthly
  - PG&E is looking into it
  - Confirmed:
    - Electric = cooling
    - Gas = heating
- NTG
  - DI - .85; Std - .55; POU - .96
  - Could use SCG as .89 value placeholder
    - All devices enroll to SCG program
    - Aaron tells SCE the total enroll units



- Aaron tells SCG which device is a newly purchased unit
- Subtracted out devices that were activated before program began (not newly purchased)

Aaron Berndt: EUL. Measure called operational measure by EAR Team. Therefore, EUL must be 3 yrs per EAR team feedback. Not based upon any data. Nest has looked at life of t-stats online. Have data for range 9.2 to 13.8 = average 11 yrs.

Aaron Berndt: 4 other jurisdictions are using NTG ratios averaging .9.

Annette Beitel: Not clear that what the other jurisdictions are using is based on data rather than just a planning assumption.

Aaron Berndt: Every month, Nest give s/n of devices that are new. For SCG, they can claim only if new .89 represents proportion of new vs all enrolled.

Doug Mahone: BUT - some purchases may have happened anyway, so .89 should be discounted. If .8 from survey of ComEd customers, this might be the right discount. However, this values needs to be subject to check to confirm data from ComEd survey.

Annette Beitel: Seek Cal TF affirmation of Smart Thermostat WP with following modification: IOU: .55 NTG but .8 NTG for POUs based on most recent data from ComEd (best available data) (subject to data being added to WP).

**Cal TF Affirmation:** Smart Thermostat WP with modification, indicating .8 NTG for POUs, above, subject to NEST providing ComEd survey data results

Follow-Up Action Items:

**ACT:** Is it possible to determine Leakage rate? How many installed in ComEd vs purchased there and installed somewhere else. Analysis can be used to refine WP when next updated.

**ACT:** NEST to provide slope of the data for sales uplift if you can't provide absolute sales data due to confidentiality issues. This can be done through small TF-only. Can be used to refine .55 NTG ratio at later date.





**ACT:** NEST to include results of ComEd survey results on program influence in WP to support higher NTG value for POUs.

### **Measure Consolidation**

Comments from TF on 2017 Measure Consolidation priorities

- Measure consolidation
  - High impact, (Eestat data, not granular)
  - Refrigerator Strip Curtains
    - Scott Mitchell: Could be considered for existing baseline
    - No other supporters
  - Commercial Pressure Fryer
    - Not a lot of volume
    - Some measures are market transformational
    - Alina Zohrabian: Not looking at high impact measures
      - Potential water savings measures
      - Could change cost effectiveness of portfolio
      - Not as controversial
  - Deck Oven
    - Measure may be dropped
    - Armen Saiyen: Not sure if LADWP used it.
    - Jim Wyatt: Sunset potential issue
    - Armen Saiyen: Not much volume
  - Glass Door Freezers
    - Scott Mitchell: Revising measure; concerns with savings values with new DOE standards in March
    - Jim Wyatt: Recent sunset issue
  - Low Pressure Sprinkler Nozzles
    - Ed Reynoso: Offering now
    - Steven Long: Had a disposition/white paper that noted this needed more studies
    - Still worth looking at:
      - Good savings potential
      - Expect that not looking at it correctly
      - Maybe ISP issue
    - Find out volume from Ed Reynoso
    - Look at white paper
      - Note that only one of 3 sprinkler to drip still available



- Steven Long: Believes that had low uptick
- Recirculating Pump Timeclock
  - Chan: Working on this measure currently
    - Timer that turns on/off pump
    - Office building, school
    - Gas and electric
- Appliance Recycling
  - SCCAPPA: Still wants this
  - Gary Fernstrom: Saturation of second refrigerators - increased in RASS
    - Premise - get rid of 2nd refrigerator
    - Expect that program is not working
  - Is the average efficiency of 2<sup>nd</sup> unit still increasing
  - Believed:
    - More refrigerators in garage
    - Maybe less in garage?
    - Maybe more efficient in garage?
  - Steven Long- What are the savings?
    - Numbers are very disputed
    - Not just controversial
    - Annette Beitel:
      - Age of unit
      - Where it is; how being transferred
      - Over time; 2nd efficiency go up, savings go down
- Residential Audit
  - Jim Wyatt: PG&E has online survey
  - Steven Long: Online EM&V report (2 approaches)
    - SCE: Onsite is vendor; Ex Post approach
    - SCE: Ex Ante approach
  - Ex Ante data - to support workpaper
  - LADWP - don't claim savings currently, but do offer res audit services
- EE Dishwashers
  - Considering for smart category
  - ENERGY STAR offering for both EE and DR category
  - SCE: Don't currently have a workpaper
  - SCG uses DEER saving; considering developing WP



**ACT:** Cal TF recommends following measures for 2017 consolidation and/or review and inclusion in the 2017 eTRM that did not get at least two votes:

- ★ Recirculating Pump Timeclock
- ★ Appliance Recycling
- ★ Residential Audit

**ACT:** Finalizing Measure Consolidation plan

- Recirculate list with updates based on TF comments.
- Add what new measures are being planned and what measures are being updated.
- Get feedback on what TF wants to move in for 2017/18

### **HPC Pump**

David Jagger:

- Start at green curve
- Adjust curve to new max
- Knows where it should be operating, to where is operating
- Expect about 50,000 pumps/year
- NTG
  - Conservative deer value .7
  - POU - .875 (from Efficiency Vermont data)
- CA market
  - Sst / bronze - DHW
  - Cast iron - closed loop, hydronic
- 90+% in DHW
  - Most are 26-100W range
  - Because hydronic heating in NE
- Adaptive proportional pressure pump
- Questions from Cal TF:
  - Field Test
    - Installed Alpha pump
      - Some are ER, not ROB
    - What is the rule of thumb for optimization
      - Longer is better
      - Avoid abnormalities
      - Then better optimize
    - Larger homes were the focus of the field tests.
      - Has higher cost for energy (tier 3,4)
    - Called a "convenient" sample



- Expect that the application is very typical, so results are still expected to be random
- Test
  - Contractors came back in
    - If took reading right away – Then take optimization routine out
  - What was steady state wattage (tub for 3 min)
  - What was instantaneous wattage (turn on faucet)
    - Presumption is that where it goes to, is where it should stay
  - Goal of ss flow
    - Match head and flow characteristics  
When no flow...little head
  - Why power increase
    - Contractors have not been able to go back
    - Did go back into one  
Took more measurements; switched into the low usage category
    - Potential explanation: Hypothetically  
Drop pressure too much, could backflow  
Could result in results like this
  - Comment: Typically, can't recirculate through demand water heater
    - Some do it
    - Some models come with it
    - Response: Some include to generate pressure only
  - Why 26 vs 12W?
    - Higher usage
    - Looks at max and min usage
    - Higher usage could be because of extra guests in the homes during the short test
    - Engineering calculations could be assuming lower flow rather than reality
  - Small sample
    - What if line is blocked?  
Max out to 45W
  - Purpose of control routine
    - To understand that pump is not oversized
    - Algorithm - focus on running of usage where it spends most of its time  
Self optimization - 18%  
Motor power - ~60%



Note that most of the savings are realized even if not optimized over time

- Cost/Incentive Strategy
  - Time starting when left shop and back
  - Labor cost down on Multi-family
    - No travel

Steven Putnam: Vast majority would be direct replacement.

Cal TF Comments: Policy in CA for incentive strategy

- Alina Zohrabian: Can't be more than 50% of IMC
- Steven Long: Correction: Deemed can be 100%, but not more than 100%
- Want to ensure up-tick in the beginning

Chan Paek: What is target? Single and multifamily? **ACT:** Recommend adding single family application as well as multifamily application.

Doug Mahone:

- Used in other application
  - Hydronic heating - cast iron
    - Other future opportunities

Steven Putnam:

- Workpaper is manufacturer neutral could apply to competitors also
- Are they open to others, distinguishing products
- How to differentiate with competitors
  - Vermont
    - Generic standards for qualifying products
      - Driven by ECM
      - Onboard speed control
      - Self-Optimizing control scheme
    - Considerable amount of products that qualify
  - ★ Workpaper does not spell these out explicitly (but included)

Armen Saiyen: **ACT:** Should include three criteria for qualifying product explicitly in the WP.

- Armen: Limitations of product and target markets
  - Dedicated hot water return



- NTG
  - Total market potential
    - Home energy - about 200,000 pumps
  - Data taken from manufacturer data (internal sales)
  - Similar model to Vermont

Annette Beitel: Call for Cal TF Affirmation.

**ACT:** However, prior to submitting WP, WP needs to be updated to explicitly state requirements for qualifying products:

1. Must have electrically-commutated motor (ECM)
2. Must have variable speed controls
3. Optimization controls that adjust to system requirements to minimize energy use

**ACT:** WP developers should also consider adding single family application, which can be done at later date.

**Cal TF Affirmation:** Cal TF Affirmed.

**Modeling:**

Larry Brackney

- Issue of Commercial building prototypes – who owns California DEER Building Prototypes
  - Most recent version of MAScontrol makes available
  - Who owns them
    - If Commission - we can use it
    - If JJH - TBD
  - Talked to Katie Wu about this issue
    - Assigned a commission lawyer
  - If IP is murky, then NREL does not want it into Energy Plus
- Probably won't be a clear answer coming back
  - May not be able to use best available data
- Residential vs Commercial Modeling
  - Bifurcated T24 compliance
    - CBECC Res vs Com (e+)
    - Deficiencies in E+ res
      - Foundation
      - Infiltration
      - Attics



- Processing overhead
  - For deemed savings; mass simulation in the cloud, not the bottle neck
- Switch from California Simulation Engine
  - Seems like it would be unnecessarily disruptive

Doug Mahone: Why does residential building model for deemed measures need to be consistent with CSE?

**ACT:** Put together a comparison (CEC compliance model vs E+); discuss through charrette and include participants who both use and support CSE as well as those who use and support EnergyPlus.

- Come up with criteria for CSE change
- Include CSE advocates
  - Code and Standards people input
    - If similar results, then it may be fine
    - It may not be similar

Doug Mahone: Cal TF should use model that best represents measure energy savings. The CPUC and CEC have different goals for residential model usage:

- PUC wants to know actual usage,
- CEC, CSE shows that meeting compliance standards
- Not the same goal/intent
  - If mission is the best technical solution, we should go to Energy Plus.
- Expect that professionals in field would come out on E+'s side

Larry Brackney: EnergyPlus residential modeling tool has undergone significant enhancements.

- Results
  - Foundations - checked
  - Airflow enhancements - checked
  - Attic model -
  - Other enhancements....
  - Open Studios enhancements
    - B-opt program - integrated into Open Studios measures
  - Other partners improving E+
    - Natural Resources Canada
    - BPA
      - Pinchpoint analysis
      - Opportunity



- Open Studio geometry tool upgrade
- Res modeling
  - Statistical approach (varies parameters)
  - Look at potential within the State
  - Top measures
  - Savings vs net cost
- Res E+/OS is valid TPP3

NOTE: Several Cal TF members agreed with D. Mahone comment that goal for Cal TF should be to use model that is open, transparent, and produces best technically-defensible outcomes.

Larry Brackney: Options to move forward with residential modeling tool decision.

- Bifurcate eTRM vs compliance
  - Recommended approach
- Develop OS/CSE translator
  - Not reasonable to do
- Who impacted
  - Residential model compliance
    - (model group)
    - Should be planned
    - Change management plan needed
  - Biggest problem - if different values for savings, it could change code
    - Impact what is being installed
    - Timing for ZNE for Res; wait for after code cycle
- Talk about Prototypes
  - OS concept - Supports various level of inputs
    - Family of prototypes
    - Zero touch audit
    - Asset score
    - Simuwatt
    - Hand built
  - Some being built now (fewer inputs)
  - Prototype
    - Standards = Gem
    - Build prototypes on-the-fly
      - All defined in spreadsheet - definitions
      - Extensible - add rows
      - Have DEER vintage
    - There is DOE funding to start now





- Can't expose E+ to lawsuit
- Eventually
  - OS Gem will be in eTRM
    - Time and date stamped
    - Assumptions and version controlled
- Short term test
  - Can build and test with 90.1 prototypes
- Prototypes are fictional buildings
  - If used for savings potential
  - Are they accurate?
    - Think about statistic samples of models
    - Generating all models based upon real estate records
  - CEUS - had models
    - Inputs to models used
    - Not recalibrated to building usage
  - DEER models
    - Not proper calibration - from info in DEER
    - Some weighted, tweak within models
    - Inputs are changed; no building you could calibrate to (meant to be a compost building)
  - Want to be able to funnel evaluation data back in
- Back-up
  - Could take CEC data
    - Post-process bunch of CEC data (CEUS data)
    - Benefit from processing; we would have to redo some it
  - DEER vs CEC vs ASHRAE prototypes
- Need some change management around results
- Working in parallel paths (LADWP with NREL)
  - Using vintage data and CEUS together

Armen Saiyen: Has a quick need for California Building Prototypes. Cal TF could potentially be building off work LADWP is funding if cannot get clear feedback on whether CPUC has clear title to California Building Prototypes in DEER/MASControl

**ACT:** Larry Brackney to get more information on “translator” option.

**ACT:** Cal TF Staff will organize “charrette” that includes proponents of CSE to determine what approach to take on residential modeling, and pros and cons of CSE, vs. “translator” approach vs. using EnergyPlus for residential modeling.



## **Closing**

Annette Beitel

- No March meeting
  - Next is April
- April - talk about subcommittees
  - Modeling
  - Governance subcommittee
  - Technology-Specific Subcommittees