CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Notes from 2019 Title 24 Part 6 Code Development Cycle Utility-Sponsored Stakeholder Meeting for Demand Response and Residential HVAC Topics

Posted July 12, 2017

Meeting Information

Meeting Date: March 28, 2017

Meeting Time: 9:00am – 12:00pm

Meeting Host: California Statewide Utility Codes and Standards Team

Attendees

First Name	Last Name	Contact	Organization
Statewide Utility Codes and Standards Team			
Utility Staff			
Kelly	Cunningham	KACV@pge.com	Pacific Gas & Electric (PG&E)
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Other Participants			
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Eric	Adair		Adair Concepts & Solutions LLC
Laura	Petrillo-Groh		Air-Conditioning, Heating, Refrigeration Institute
Scott	Bailey		ASWB Engineering
Doug	Avery		Avery Energy Enterprises
Russ	King		Benningfield Group
Bruce	Wilcox		Bruce A. Wilcox, P. E.
Nicholas	Brown		Build Smart Group
Robert	Raymer		Ca Building Industry Association
Chris	Walker		Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
Shelby	Gatlin		CalCERTS, Inc.
Michel	Fourcroy		CalCERTS, Inc.
Bill	Martin		California Geothermal Heat Pump Association
Zoe	Zhang		California Air Resources Board
Brad	Powell		Carrier
Jeanne	Fricot		Center for Sustainable Energy
Gregory	Mahoney		City of Davis
Tony	Martinez		ConSol
Sri	Swaminathan		Daikin
Brandon	De Young		De Young Properties
Dave	Hegarty		DuctTesters
Jennifer	Butsch		Emerson
Juvenal	Martinez		EnerCal Solutions
Ty	Peck		Energy Outlet
George	Nesbitt		Environmental Design/Build
Peter	Grant		Frontier Energy
Aniruddh	Roy		Goodman Manufacturing Company, L.P.
Jeremy	Turner		Green Technics
Dan	O'Donnell		Honeywell International
Jim	Lutz		Hot Water Research
Julie	Eagle		Ingersoll Rand
Courtney	Ward		Kitchell
Lyn	Gomes		kW Engineering
Luis	Garcia		LDI Mechanical
Glenn	Savage		LG
Misti	Bruceri		MBA., LLC
Albert	Claypool		Micrometl
Mark	Lyles		New Buildings Institute
Michael	Scalzo		National Lighting Contractors Association of America - California Electrical Training, Inc. (NLCAA - CETI)
Sally	Blair		NORESCO
Kyra	Weinkle		NORESCO
Pierre	Delforge		National Resource Defense Council (NRDC)

Katrina	Keeley		Owens Corning
Shawn	Mullins		Owens Corning
Richard	Haring		Philips Lighting
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Lisa	Gartland		Proctor Engineering Group, Ltd.
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Gerry	Tortorice		SunStreet
Beth	Braddy		Trane
Caleb	Joiner		Trane
Rick	Kloeppner		Trane
Scott	Blunk		TRC Energy Services
Matt	Christie		TRC Energy Services
Enrica	Galasso		United Technologies
Marcos	Hernandez		Villara Building Systems
Rob	Penrod		Villara Building Systems

Meeting Agenda

Time*	Topic	Presenter
9:00 – 9:25	Introduction	Kelly Cunningham (PG&E) and Chris Kuch (SCE)
9:25 – 10:40	Demand Response Clean-up	Heidi Hauenstein (Energy Solutions) Bijit Kundu (Energy Solutions)
10:40 – 11:55	Residential Quality HVAC	David Springer (Davis Energy Group)
11:55 – 12:00	Review and wrap-up, next steps	Kelly Cunningham (PG&E)

Key Takeaways and Action Items

1. **Introduction**
    a. The Statewide Utility Codes and Standards Team is seeking input and feedback on proposed code changes for the 2019 Title 24, Part 6 standards.
    b. Provide feedback by contacting CASE Authors, emailing info@title24stakeholders.com, or getting in contact with Energy Commission staff.
    c. Draft CASE Reports will be released in April/May 2017 and will include draft code change proposals.
2. **Demand Response Clean-up**
    a. Communication protocols: participants expressed support for standardize OpenADR 2.0, but allowing for ample flexibility on how the control system that uses OpenADR 2.0 can be configured.

b. Acceptance Testing: To pass the acceptance test, the control system needs to be programmed/configured. Currently, designers think that they just have to specify the DR capability, but do not need to do anything else to make it happen. Acceptance Testers (CALCTP) think the control system needs to be configured/programmed and tested. This needs to be clarified.

c. The intent of the code change is to clarify existing DR requirements, not to propose additions or revisions that would change the stringency of the standards or allow different control strategies.

3. Residential Quality HVAC

a. Meeting the 0.45 W/cfm requirement with MERV 13 filters

i. MERV 13 filters, as proposed as an IAQ measure, raised concerns about the ability to attain the proposed 0.45 W/cfm fan efficacy. As a follow-up, calculations were completed to show that if MERV 13 filters are sized not to exceed 0.15 inches w.c. pressure drop (~250 ft/min maximum velocity for a 1" Filtrete 1900) and systems are designed in accordance with Manual D, a total external static pressure (ESP) of 0.7 inches w.c. can be achieved. Two furnaces with ECM fans were tested to determine the W/cfm at 0.7" ESP, and both were close to 0.4 W/cfm. No further follow-up activities are planned.

ii. Tables 150.0-B and 150.0-C in the 2016 standards allow an exception to measurement of airflow and watt draw. These will be retained for 2019. The filter velocities assumed in the tables (using 400 cfm/ton) range from 151 to 176 ft/min. At these velocities, the Filtrete 1900 – MERV 13 filter would have a pressure drop of less than 0.1 inches w.c. Calculations show that use of the tables would result in a 4.5-fold increase in filter size compared to the size required for a MERV 8 filter.

iii. Though not included in the HVAC CASE Report proposal, the Energy Commission should consider moving the requirement for ACCA Manual D duct sizing from Section 4.507.2 of Title 24, Part 11 to Section 150.0 of Title 24, Part 6, and include a checklist item on the CF1R to improve compliance with this requirement (in response to Scott Higa – SCE – comment).

b. Fault Detection and Diagnosis (FDD/FID) cost-effectiveness and reliability

i. Cost-effectiveness was not determined because this measure is proposed as a compliance option. The scale of field tests required to identify average energy savings cannot be accomplished within the timeframe of the 2019 standards process.

ii. Diagnostic capability and reliability will depend upon what devices are submitted for Energy Commission approval. Devices must find a balance between the ability to detect faults and avoiding "false alarms". Determination of the reliability would also require a large-scale field test, but data from one prominent manufacturer on the reduction in warranty costs is compelling. The intent of this measure is to minimize the number of systems that are performing significantly below manufacturers specifications over their lifetime, and to reduce the cost of diagnosis and repairs.

c. Temperature split measurement as an alternative to refrigerant charge verification

i. In response to a question from a manufacturer of mini-split systems, it was clarified that this method is not to be used for mini-splits and non-ducted systems.

ii. The sample size of data to validate the temperature split method may be too small. Additional field tests will be completed to determine the reliability of the temperature split test to verify refrigerant charge and to detect other faults.
iii. Will this method reduce the time required of HERS Raters? This information will be gathered while completing additional field tests.

Meeting Notes

Introduction

- Kelly Cunningham (PG&E) and Chris Kuch (SCE) presented.
- Presentation available here.

Comments and Feedback

1. No comments or questions.

Demand Response Clean-up

- Bijit Kundu and Heidi Hauenstein (Energy Solutions, Utility CASE Team) presented.
- Presentation available here.

Comments and Feedback

1. There is support behind OpenADR communications versus keeping the code language vague
    a. Mark Martinez (SCE): There are a lot of communication pathways. Utilities can talk to individual devices, clouds, aggregators, and others. I would not want to isolate one type of gateway, such as a thermostat. I believe it can have broad options.
        i. Heidi Hauenstein (Energy Solutions, Utility CASE Team): Great comment. Thank you.
    b. Heidi Hauenstein (Utility CASE Team): Right now, JA5 says you have to be "compliant" with OpenADR. Do we want to say you have to be "certified" to OpenADR? Also, do we want to specify OpenADR 2.0a or 2.0b? Should we allow the protocol to be in the cloud?
    c. Mark Martinez (SCE): The OpenADR protocols are evolving. I would not be so prescriptive when saying it needs to be OpenADR 2.0a or OpenADR 2.0b. At this point, I believe saying "2.0" is probably sufficient, but I think that is a separate discussion since it is a protocol. OpenADR is adopted internationally.
    d. Dan O'Donnell (Honeywell International): Leave communications language vague or back away from prescriptive language.
    e. Bijit Kundu (Utility CASE Team): Regarding communications, it sounds like we have support for OpenADR and some feedback that we should keep it vague/allow a wide range of configurations.
2. Acceptance testing
    a. Heidi Hauenstein (Utility CASE Team): There are two acceptance tests. One is for nonresidential HVAC, and the other is for nonresidential lighting controls. The tester manually tells the control system that a DR Signal has been received. The link between the entity that sends the signal and the control system receiving the signal is not tested. For nonresidential HVAC, the acceptance test technician then confirms that temperature is setback the appropriate amounts in non-critical zones. For lighting, the technician

confirms that lighting power (or light levels) are reduced in non-exempt zones to at least 15 percent below the maximum output. I would be interested if you have comments on the value of these acceptance tests. We have heard comments that the acceptance tests only test one control strategy (e.g., dimming lighting by 15 percent or 4 °F temperature setbacks) is tested, but when people enroll in DR, there are more controls strategies. Testing one control strategy has limited value.

i. Lyn Gomes (kW Engineering): Adding a requirement that HVAC and lighting controls have DR capabilities is only half of the equation. Title 24 acceptance testing for mechanical and lighting require that these systems be tested. To test, the designers must also write sequences of operation that will tell the programmers how to configure the systems. There should be a fact sheet that provides sample DR sequences of operation for HVAC and lighting controls. As a commissioning provider, we see that the design community knows very little about effective sequences. I cannot stress enough that sequences of operation for DR must be on the drawing to make the acceptance testing even possible.

ii. Michael Scalzo (NLCAA-CETI): There are testing procedures for DR, the system must be programmed.

1. Lyn Gomes (kW Engineering): Exactly, the designers never read the acceptance tests.
2. Michael Scalzo (NLCA-CETI): Nor do they always design correctly.
3. Lyn Gomes (kW Engineering): Absolutely.

b. Lyn Gomes (kW Engineering): “Capable” must be defined. Right now, there is a rift between designers and acceptance testers. Designers think "capable" means that they just have to specify the capability, but do not need to do anything else to make it happen. Acceptance Testers (CALCTP) and Title 24 interpret "capable" as meaning that it has been programmed and can be tested.

i. Utility CASE Team: Thank you. We will try to address this, likely in the Compliance Manual, not the code language.

c. George Nesbitt (Environmental Design/Build): We need to define what we want to happen when we send a DR command, does it need to only turn on or off, or do both. We may have different requirements for residential vs. nonresidential, and even in nonresidential to have different requirements based on building type or occupancy.

3. Additional discussion on communications protocol
   a. Mark Martinez: I think OpenADR is the best machine-to-machine language for DR communications.
   b. Ty Peck (Energy Outlet): The IOUs already embrace OpenADR, I suggest the code should reflect that to keep the current OpenADR assets as resources, my vote is for the code to specify OpenADR as the required protocol.
      i. Mark Martinez (SCE): I agree with Ty.
      ii. Lyn Gomes (kW Engineering): Same here.
   c. Ty Peck (Energy Outlet): There is an OpenADR alliance workshop at EPRI April 19-20 covering OpenADR and DERs for those interested.
4. Discussion on security
   a. Lyn Gomes (kW Engineering): I see a lot of resistance from IT managers for connecting their Energy Management Control System to the internet. It presents a major cyber-

security risk. Rather than specify security in Title 24, more education is needed for the design and implementation community.

i. Aimee Wong (SCE): I agree with Lyn.

b. Lyn Gomes (kW Engineering): For web-connected thermostats, will Title 20 mandate cyber-security requirements?

i. Utility CASE Team: There are no Title 20 requirements for thermostats. Current requirements in Title 24 JA5 say thermostats should "consider relevant security issues and potential cyber-attacks", but there are no specific security requirements in the existing standards. This code change proposal does not intend on changing the stringency of the standards, including adding/modifying security requirements.

5. Discussion on getting DR signal to building
   a. Ty Peck (Energy Outlet): In terms of getting a signal to a customer for DR, essentially you are talking about automating their DR signal. As someone who has extensive experience selling Automated DR to C&I customers, having one gateway/VEN at the site is sufficient to receive the signal. The gateway keeps the Energy Management Control System from being subject to cyber security risk.
   b. Sri Swaminathan (Daikin): Single communication gateway would cause burden to stick with one vendor.
   c. Aimee Wong (SCE): Not necessarily a single communication gateway, but rather an open protocol that allows for Energy Management Control Systems and communicating equipment to receive signals. Keep in mind that in California, the CPUC is pushing for DR resources (kW) to be integrated into the California Independent System Operator (CAISO) wholesale energy market, so a customer's system should be able to receive a signal from a utility, a DR provider/vendor, from the CAISO, etc. Therefore, it would be important to ensure that these systems can be able to connect to all types of signals, thus the importance for consistent standards and protocols.
      i. Lyn Gomes (kW Engineering): I agree.
   d. Pierre Delforge (NRDC): In response to gateways, it may be best to specify functional and performance requirements (protocols, security, etc.), but leave the implementation (single gateway or not) as open as possible to allow for innovation.
   e. Lyn Gomes (kW Engineering): The Illuminating Energy Society has not even started considering a standard communication protocol. Because of this, integration of lighting and HVAC is a long way off. Maybe California can lead the charge?
   f. Glenn Savage (LG): From an HVAC manufacturing perspective, we do not care about how the signal gets to the site, but we do need to know how the signal will be formatted and what it expects as a result from the system that receives it.
   g. David Springer (Utility CASE Team): There are many web-connected thermostats on the market. For residential systems, they would be the most expedient way to communicate day-ahead signals to initiate precooling or other DR strategies. Also, demand flexibility is more important than DR to absorb excess daytime generation from PV.
6. Discussion on compiling all DR requirements into one section of code
   a. Mark Martinez (SCE): I am curious why we need to isolate DR into its own section? Should not all end-uses related to Title 24, Part 6 be demand responsive or flexible? It seems like we are going backward into isolating DR from energy efficiency again.

i. Bijit Kundu (Energy Solutions, Utility CASE Team): Mark, the intention is not to silo energy efficiency and DR. The intent in moving DR into its own section is to provide clarity on the requirements related to DR since right now, DR measures are scattered throughout the code. But we hear you and will consider that.

7. Discussion on control strategy other than peak shaving
    a. George Nesbitt (Environmental Design/Build): In the past, DR has always meant reducing energy use when supplies are tight. The future of DR is to also be able to consume energy at times of excess supply. We have to either change our understanding (definition) of DR, or we have to change the word to DF (Demand Flexibility).
        i. Matt Christie (TRC Energy Services): I support George Nesbitt's comment. Systems/constructs need to start seeing the value of both shaving at the peaks, and filling in the valleys.
    b. Marshall Hunt (PG&E): How does the concept of Demand Flexibility fit into DR. Demand Flexibility supports the customer in minimizing costs by reducing high cost, peak hour energy use.
        i. Mark Martinez (SCE): Demand flexibility is integral to DR.
    c. Lyn Gomes (kW Engineering): Given the push for DR plus the coming changes to how utilities will define on-peak, how is code adjusting for that? For example, if the new on-peak period becomes 5pm to 10pm, will code anticipate this and require exterior lighting to be disaggregated (similar to the current requirements for interior lighting).
        i. Heidi Hauenstein (Utility CASE Team): The code change proposals for 2019 are using TDV that takes the later peak into account. This proposal is limited to cleaning up existing code language, so it does not address new or revised control strategies. We will put the idea of disaggregating indoor and outdoor loads and considering DR control strategy for outdoor lighting on the list of potential code changes for a future rulemaking.
    d. David Springer (Utility CASE Team): Demand flexibility is more important than DR to absorb excess daytime generation from photovoltaics.
    e. Lyn Gomes (kW Engineering): Currently code does not make it easy to do dimming or turn off loads for exterior lighting.
        i. Jeff Miller (CEC): Our lighting expert is not on this call, but it is something we can consider.
        ii. Lyn Gomes (kW Engineering): Exterior lighting does not usually dim or usually is not configured to accept a dimming signal. For now, turning off lighting (i.e., decorative exterior lighting) is one of the few strategies that can work with current technology, but only if the designer is smart enough to disaggregate exterior loads and write a sequence to make this possible.
    f. Jim Lutz (Hot Water Research): What about technologies not already covered? This seems focused on lighting and HVAC controls. What about the technologies such as battery storage, high-performance water heaters, white goods, etc.?
        i. Mark Martinez (SCE): SCE is working with battery platforms, high-performance water heaters, electric vehicle chargers, and other systems for OpenADR compliance.
    g. George Nesbitt (Environmental Design/Build): Is OpenADR for residential also? Or are there different communication protocols? I could turn my refrigerator and freezer on or off depending on the time of day or need.

i. Mark Martinez (SCE): OpenADR is for all customer sectors. For more info about OpenADR and how it works, definitions, etc., please go to www.openadr.org or Wikipedia.

8. Brandon De Young (De Young Properties): I cannot stress enough that a home achieving EDR 0 should not be referred to as "Zero Net Energy" since EDR is based on TDV. TDV alters the offset equation from true unit of energy generated for unit of energy consumed to "value" of unit of energy generated for "value" of unit of energy consumed. Ultimately, EDR 0 will get you close to true ZNE, but not quite there, because you get these big artificial gains for load shifting.
    a. Utility CASE Team will follow up with stakeholder after the meeting.
9. Michael Scalzo (NLCAA-CETI): The trigger of ten thousand square foot buildings should be changed to "projects".
    a. Lyn Gomes (kW Engineering): We see core + shell projects exempt themselves from DR because the shell space either has too low of a power density or are considered "unoccupiable" spaces. As a result, large buildings that should have base-building controls, do not. The tenant build-out may not meet the ten thousand square feet threshold, so DR is doubly eliminated.
    b. Michael Scalzo (NLCAA-CETI): Lyn, great point. This happens a lot.
10. Anniuda Roy (Goodman Manufacturing Company, L.P.): Question on sub-bullet one (slide 24). Would the list be made publicly available so it is easy for manufactures to track them?
    a. Heidi Hauenstein (Utility CASE Team): Are you asking if there will be a list of DR programs? That is something we can consider.
11. Samantha Piell (PG&E): Will there be opportunities for access to this list of attendees in the future?
    a. Bijit Kundu (Energy Solutions, Utility CASE Team): Yes, meeting notes with attendees will be posted on http://title24stakeholders.com/.

Residential Quality HVAC

- David Springer (Davis Energy Group, Utility CASE Team) presented.
- Presentation available here.

Comments and Feedback

1. Glen Savage (LG): Are you taking into consideration MERV 13?
    a. David Springer (Utility CASE Team): We brought up that issue in Residential Indoor Air Quality. The graph in the lower right shows MERV 11 (slide 11). The resulting face velocity is quite a bit lower than what is currently in Tables 150.0-B & C. Filter selection is important. The analysis completed for the Indoor Air Quality CASE Report showed that if a MERV 13 filter was used instead of a MERV 8 filter, the total filter area and filter grille size would have to be increased about three-fold to maintain a pressure drop of 0.15 inches w.c. (based on pressure drops for 1" Filtrete brand filters). A Title 20 Emergency Rulemaking delayed the requirement for filter labeling to 2019.
    b. David Springer (Utility CASE Team): Further analysis was completed to estimate the impact of filter MERV on filter and filter grille sizing, and it was concluded that the face area must be increased by a factor of about 3 to limit pressure drop to 0.15 inches w.c. when increasing from MERV 8 to MERV 13. Regardless of the filter MERV rating, filters should be sized to limit filter static pressure losses to 0.15 inches or less, which

will help keep total external static pressure below 0.7 inches w.c. and ensure 0.45 W/cfm can be achieved.

i. George Nesbitt (Environmental Design/Build): I opposed the Title 20 delay in filter labeling.

2. Luis Garcia (Southern California Edison): Do the exceptions to Fan Watt Draw and CFM/ton that appear in the 2016 standards remain in the 2019 proposal? This includes larger RA duct, filter and grille sizes.
    a. David Springer (Utility CASE Team): We are not proposing to change Tables 150.0-B & C in the 2016 standards, though the filter sizes are conservative and result in very low velocities (173 to 202 fpm) and filter pressure drops of less than 0.1 inches w.c. (for a MERV 13 Filtrete 1900).
    b. David Springer (Utility CASE Team): The CASE team also laboratory tested two typical furnaces with ECM fans to measure the W/cfm at 0.7 inches total external static pressure and found that they were close to 0.4 W/cfm at worst case airflow settings.
3. George Nesbitt (Environmental Design/Build): I think aligning with the federal standards will be harder and makes duct design even more important.
    a. David Springer (Utility CASE Team): We looked at that carefully when we did testing on filters. We found that furnace manufacturers typically limit the external static pressure to around 0.7 inches w.c. We tested a constant CFM, ECM motor as well as permanent split capacitor (PSC) motors. The way ECMs react to increasing static pressure is they maintain a relatively constant CFM, but increase power. With permanent split capacitor motors, the air flow falls as static pressure increases and power increases slightly.
    b. David Springer (Utility CASE Team): There has been some discussion of moving the ACCA Manual D requirement from Part 11 to Part 6 to improve compliance, though it is not a current measure.
4. Eli Howard (SMACNA): For servicing HVAC systems one must always have a skilled field tech, so minimizing this role is incorrect and could lead to additional problems.
    a. David Springer (Utility CASE Team): I do not disagree that there should always be a skilled field tech. However, the skill level can vary greatly. FDD systems can help field techs more quickly detect and diagnose problems, regardless of their skill level.
5. Aniruddh Roy (Goodman Manufacturing Company, L.P.): Has the combined impact of the proposed 0.45 W/cfm fan efficacy and the MERV 13 air filter requirements been analyzed?
    a. Eli Howard (SMACNA): Good question.
    b. David Springer (Utility CASE Team): We are only working with filters that are labeled. There are not many that list pressure drops, and they are not always proportional to MERV rating. For example, we found that a 3M Filtrete MERV 13 filter has lower pressure drop than MERV 11.
    c. David Springer (Utility CASE Team): The CASE Team also laboratory tested two typical furnaces with ECM fans to measure the W/cfm at 0.7 inches total external static pressure and found that they were close to 0.4 W/cfm at worst case airflow settings.
6. Russ King (Benningfield Group): Could/should furnace manufacturers show W/cfm values in their fan flow tables? That would make it possible to design to a target.
    a. David Springer (Utility CASE Team): That would be helpful, in addition to label information.
7. Aniruddh Roy (Goodman Manufacturing Company, L.P.): Is the $100 going into the cost-effectiveness analysis?

   a. David Springer (Utility CASE Team): It is a compliance option, so we did not complete a cost-effective analysis.

8. George Nesbitt (Environmental Design/Build): In the code, we used to allow temperature sensors to be installed in the condensers so HERS Raters do not have to access the refrigerant line. The two that I tested with those would have failed based on that versus doing a refrigerant charge. I am somewhat skeptical that fault indicator systems are reliable yet. Systems regularly maintained can often be undercharged.
   a. David Springer (Utility CASE Team): The low cost FDD devices we're familiar with, monitor extended run times, low and high pressure switches, and compressor current. These measurements are used together to identify faults.
   b. George Nesbitt (Environmental Design/Build): The question is if they are good enough for the actual refrigerant charge.
   c. David Springer (Utility CASE Team): The proposal is for FDDs to be a compliance option, not prescriptive, though FIDs can also be used in lieu of charge verification. FIDs are more elaborate devices. FDDs and FIDs would have to be submitted to the Commission for approval.
9. Glen Savage (LG): There are a lot of things that do not apply to inverter driven equipment.
   a. David Springer (Utility CASE Team): There is not much inverter driver equipment used with residential split systems.
   b. Glen Savage (LG): Almost all mini-split from LG, Samsung, Carrier are inverter driven to meet California equipment.
   c. David Springer (Utility CASE Team): This proposal does not apply to mini-splits.
10. Rob Penrod (Villara Corp): Any consideration to changing cmf/ton to cfm/Btu? As we know, not all five ton units produce 60,000 Btu's, in fact none really do.
   a. David Springer (Utility CASE Team): We will have to look into that. What we have seen from a survey of equipment that the EERs are fairly consistent as the SEER changes, so there probably is not much variation in Btu output at standard conditions.
11. Glen Savage (LG): I think not having the technician or HERS Rater having to put gauges on is a good thing (referring to temperature split). It looks like the sample size is small however. We want to ensure repeatability.
   a. David Springer (Utility CASE Team): Having data from the nine houses gave us a great opportunity to compare temperatures at supplies with temperatures coming off the plenum. That process is a bit complicated, so we have to rely on a more simplified approach, and we plan to collect more data using measurements of the three largest supplies.
12. George Nesbitt (Environmental Design/Build): You are proposing to measure most of the airflows to find the three with the highest airflow on the supply side. I do not know if it completely removes the need for refrigerant charge and saves time.
   a. David Springer (Utility CASE Team): You will not have to measure small airflows, which should reduce time. The time requirements will be compared in future testing. Register size may be allowed as a proxy for measuring airflow to determine the highest flows, so only temperature measurement would be required.
   b. George Nesbitt (Environmental Design/Build): I have been working on 80 units. If I only had to do temperature split for those that parts, there is a certain amount of effort for setting up equipment.

c. Lisa Gartland (Proctor Engineering Group): George, would you be willing to share the data you are talking about?
d. George Nesbitt (Environmental Design/Build): Yes, I can. I have at least 80 tests and some retests.

13. Mazi Shirakh (CEC): What was the pass rate? Were you able to get accurate results for refrigerant charge (in reference to the data provided by Proctor Engineering)?
    a. David Springer (Utility CASE Team): We were missing wet bulb temperatures for that data set, so we could not look up the target temperature split.
    b. Mazi Shirakh (CEC): What are you going to do in these next months to add to the data?
    c. David Springer (Utility CASE Team): We plan to do more testing, and welcome more data.
14. Scott Higa (SCE): For the resolution to Barrier #1, is Manual D currently being implemented widely in the market? For existing buildings with poorly designed ducts, the need for improved ducts to meets the requirements is increased, however the cost to renovate ducts is a potential barrier.
    a. David Springer (Utility CASE Team): I know there are contractors that may be doing on the spot designs. Using Manual D would certainly improve things. Regarding the second part of your statement, that is true. The current standards that apply to existing homes are pretty lenient with respect to airflow and leakage requirements.
    b. There has been discussion about moving the Manual D requirement from Part 11 (CalGreen) to Part 6. Though not proposed in the CASE report, it would help ensure that calculations are completed (e.g., include a Manual D check box on the CF1R).