CALIFORNIA STATEWIDE
UTILITY CODES AND STANDARDS PROGRAM

Notes from May 21, 2014 Stakeholder Meetings

Posted July 9, 2014

Meeting Information

Meeting Date: May 21, 2014

Topics Discussed: Nonresidential HVAC Economizer Modifications and Residential HVAC Field Verification & Diagnostics

Host: California Statewide Investor Owned Utility Codes and Standards Team

Attendees

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MEETING AGENDA

12:00 - 12:15	Introduction: Overview of 2016 Title 24 Development; Summary of stakeholder outreach purpose and procedure
12:15 - 1:30	Nonresidential HVAC Economizer Modifications
1:30 - 1:45	*BREAK*
1:45 - 3:00	Residential HVAC Field Verification & Diagnostics
3:00 - 3:15	Review and wrap-up, next steps

RECAP

- Nonresidential Economizer Modifications
  - Unit mounted economizer FDD may be difficult to access, and may not always have an indicator light. For smaller systems, the market of units that have more than one thermostat but aren't tied to an EMCS may be small.
  - There is a need to research field impacts after 2013 measures take effect to inform future code changes (2019 update).
  - Requiring return air dampers to have the same tight leakage requirement as economizers is not necessary. The energy penalty resulting from a return air damper leak is less because indoor air is more temperate.
- Residential Field Verification and Diagnostics
  - Some stakeholders noted preference for installers and HERS Raters to do the same charge verification procedure.
  - Failing to pass a charge verification test creates problems for HERS Raters and costs extra money and hassle. Using a weigh-in with delayed charge verification may increase the chance of failure.
  - Liquid line filters, that are installed by manufacturers, are installed outside of the unit to enable easy access for replacement.

MEETING NOTES

These notes summarize the discussion at the IOU-sponsored stakeholder webinar that occurred on May 21, 2014.

Overview of 2016 Title 24 Development

- Cathy Chappell (TRC, on behalf of the Statewide IOU C&S Team) presented
- Introductions

Nonresidential HVAC Economizer Modifications

- Farhad (TRC, on behalf of the Statewide IOU C&S Team) presented
- Presentation available here: http://title24stakeholders.com/wp-content/uploads/2014/05/Nonresidential-HVAC-Economizer-Modifications-Stakeholder-Webinar_May21_2014.pdf

Comments and Feedback:

Section 120.2(i) Clarify control language for economizer

No comments.

Section 120.2(i)3 Refrigerant pressure sensor

No comments.

Section 120.2(i)7 Fault reporting

Slide 26

- Adrienne Thomle (Honeywell): Does the light have to be standalone or can it be integral to the thermostat?
- Robert Long (Rheem): Regarding unit mounted indicator light – does it have to be external or is light in control box sufficient? Right now, we have a light, but have to open control box door to see it.
  - Farhad Farahmand (CASE Team): As long as it is easily viewable by technician. We left the language open, does it take sufficient effort to open control box?
    - Robert Long (Rheem): It could. We have equipment that meets B, thinking of smaller units, we have a flashing trouble light, have a flashing t-stat.
  - Cathy Chappell (CASE Team): The point of this language modification is that it will be clearly visible if there is a problem/fault. It doesn't seem that the scenario you described would meet this requirement because there may be significant effort to view the indicator light. We can circle back around with CEC about "clearly visible."
    - Mazi Shirakh (CEC): To me, implies that the indicator light has to be external. If manufacturers have a problem, we can discuss.

- Kristin Heinemeier (UC Davis): Maybe make the language more general? We don't need an indicator light if the thermostat can display the model or name of unit.
- Farhad Farahmand (CASE Team): It sounds like this would require LCD interface. Would this be more of an EMS?
- Kristin Heinemeier (UC Davis): Can we require an LCD display to show what the unit is and fault code is?
  - Cathy Chappell (CASE Team): I would think that description would fit the requirements. The light can do more than be indicator if manufacturer wants to provide more detail, but don't think it is loosening requirements. Doesn't seem that it solves problem that Robert proposed.
  - Robert Long (Rheem): We have some systems that meet the "B" req. I am thinking about the smaller sizes that are more standalone units and might not meet these reqts. Thermostat has an L-terminal that flashes a light, but no external light to indicate problem.

- Beth Braddy: I thought with 2013 that the thermostat had to display the fault.
  - Farhad Farahmand (CASE Team): Received feedback that manufacturers didn't want the thermostat to say what the fault was, want to wait for technician to remediate.
  - Beth Braddy (Trane): So all the work that manufacturers are doing to meet 2013 are being thrown away?
  - Farhad Farahmand (CASE Team): No. If you have one thermostat that meets this requirement, but all the rest do not, you can still meet this requirement.
  - Mazi Shirakh (CEC): Is it your opinion that you can develop a thermostat to meet these reqts? If no problems developing a 2013 compliant unit, then perhaps we are fixing something that doesn't need to be fixed.
    - Beth Braddy (Trane): We have work underway, the Honeywell J controller meets the current display requirements. Confused about what manufacturers are supposed to provide in July 2014 and for 2016.
  - Darrel DeAngelis: Light external to rooftop unit is unnecessary because economizer control is probably going to have fault on there already. Have to remove panel, but thermostats already identify which unit.
  - Cathy Chappell (CASE Team): My understanding of issue with 2013 Standards is that having a fault signal at every thermostat, especially in multi-tenant buildings led to unnecessary concerns and calls by tenant to building or facility manager.
  - Adrienne Thomle (Honeywell): I agree with Darryl, however Beth (TRANE), there are thermostats that give fault to building people. Doesn't say what the fault is, but tells them to call for service. If you go to more than individual rooftops, will have EMS. Should have option of EITHER light or some other type of indicator to put on thermostat. Both are redundant.
  - Mazi Shirakh (CEC): I like this idea.
- Aniruddh Roy (AHRI): While all proposals of proposed measures look promising, we need to consider that 2013 Standards have not yet taken effect. CASE Team needs to analyze the benefits of 2013 in the field before creating anything that would impact the design requirements. I second comments from Beth (TRANE) and suggest CASE Team look into benefits from 2013 Standards and examine benefits in field, not just CASE analysis.

- Kristin Heinemeier (UC Davis): I agree completely. Don't think we know yet what the best way is to send right info to right person at right time. Think these requirements are good; may find things in the next few years. 2013 Standards allowed communication to have alarm sent off-site to service provider, is this still available?
- Farhad Farahmand (CASE Team): From discussions with WHPA, contact information for communicating off-site might change over time, so it's difficult to maintain consistency.
- Kristin Heinemeier (UC Davis): I think to assume that occupants will call service providers will be a small fraction – cuts into cost-effectiveness. It should be communicated to remote as a functionality.

- Cathy Chappell (CASE Team): To be clear, the strike out language is in 2013 Standards. Our discussion with WHPA brought up issues with these portions of the new code language. The language in A came as a solution to that. We are open to revising if nobody now thinks that this is necessary. We could clarify the language so that it can be annunciated locally on zone thermostat. Part of concern was that certain people thought it shouldn't be on thermostat – maybe from technicians – that it led to undue callbacks.
  - Mark Alatorre (CEC): The proposal to clarify 2013 language should be inclusive to work done by manufacturers to meet these reqts.
  - Farhad Farahmand (CASE Team): The idea was not to change nature of language, but to result in higher rate of reporting faults.
  - Mazi Shirakh (CEC): I agree with Cathy's summary.
- Jon McHugh (CASE Team): The key question was about ambiguity. "Fault reported to day-to-day…" That could be a light up on the roof. The compliance manual doesn't provide guidance. The issue is that we want signal off roof, not what the signal looks like. Want to make sure that we don't over specify.
  - CASE Team to revise language and follow-up with manufacturers.

Sections 140.4(e) and NA7.5.4

SLIDE 27

- Kristin Heinemeier (UC Davis): I think language is good, addresses main concern.
- Mike Ray (Lennox): Can you confirm what 100% open means?
  - Cathy Chappell (CASE Team): We are attempting to get away from the connection to actual cfm. It is the mechanics of the damper to operate at 100% open and closed (entirely horizontal or vertical).
  - Kristin Heinemeier (UC Davis): We wanted to avoid contractor having to take flow measurement to verify.
- Jon McHugh (CASE Team): It seems you are fixing problem in terms of an acceptance test, but creating a new problem. Now, the economizer not required to supply 100% of outside air with this language.
  - Cathy Chappell (CASE Team): That problem already exists (we are not creating it). We can't address that problem in the 2016 update, but want to address for 2019. Make sure that it is proper design and getting adequate airflow – gets complicated fairly quickly and more than we intended to tackle for 2016. In discussions with CEC, was never intended to be a design

requirement. The language was modified back in 2005 or 2008 to initially address issue, but was not clarified very well.

- Mark Alatorre (CEC): It was 1992 language.
- Mazi Shirakh (CEC): We are trying not to design through standards, but intent is to provide options. We do not want to dictate design or introduce restrictions.
- Farhad Farahmand (CASE Team): We're still in discussion with stakeholders to see if this opens up any loopholes.
  - CASE Team to revisit language and close loopholes, if possible.
- Beth Braddy (Trane): I think this is a very good modification to clarify what is required and make realistic
- Daryl DeAngelis: Providing 100 percent air quantity is in ASHRAE 90.1.

SLIDE 28

- Beth Braddy: I see where you're going. One of the concerns when 2013 code written – it called out certification to AMCA 510 which required outside test. Concern was that there were not many independent labs available to perform tests, which causes a supply and demand issue. Not sure if we aren't getting back into the same issue here. No problem with ISO except expense and lining up to get testing done.
  - Martin Grissel (Greenheck): There are currently over 40 damper manufacturer that have AMCA certified leakage, so don't think there would be a flood of manufacturers; as most have certified leakage.
  - Beth Braddy (Trane): Dampers from HVAC equip suppliers (we make our own, but sometimes buy from other manufacturers). Requires us to line-up with everyone else and get them tested.
  - Jon McHugh (CASE Team): To Martin, were those damper manufacturers getting certified to AMCA from 3rd party or self-certified?
  - Martin Grissel (Greenheck): AMCA 511, can go to website and see. None are self-certified.
  - Mike Ray (Lennox): Even if self-certified, do they have to go to 3rd party lab to meet standard?
  - Farhad Farahmand (CASE Team): Yes, that is the intention.
  - Mike Ray (Lennox): Greenheck currently certified, so they would still have to take their dampers to independent 3rd party?
  - Martin Grissel (Greenheck): AMCA would be that 3rd party, so no additional testing required.
    - Farhad Farahmand (CASE Team): If meet AMCA 511, they already have independent testing and certification done; do not need to do again.
    - Martin Grissel (Greenheck): It's a quick test, don't think there will be a problem with manufacturers that build their own dampers. Less than a 1 day test.
  - Farhad Farahmand (CASE Team): Beth's concern – how many labs available across country? It is a viable concern and we can look into that.
    - CASE Team to follow-up with third party labs.

Integrate Testing Guidance into JA

SLIDE 30

- Beth Braddy (Trane): May be separate issue, related to declaration and upfront certification that FDD is present on equipment. We have run into issue of desire to have some sort of label that all manufacturers would display that we have been approved by CEC. Would help field inspectors to see if we are certified and helps customers verify that their equipment meets T24. Label can distinguish equipment. Suggests CEC come up with a label much like AHRI certification for performance.
  - Mark Alatorre (CEC): That would require our legal offices to get involved. Not a lot of desire to go down that road. I have worked a little with manufacturers that have shown some of their proposed labels; as long as don't have CEC label, it is ok. Can have link to our database. We will not likely be producing a uniform label.
- Robert Long (Rheem): Fault annunciation of FDD. We don't have a lot of control as a manufacturers that it is installed properly. If we have a flashing light, they have to have thermostat with L-terminal.
  - Kristin Heinemeier (UC Davis): I think your comment is addressed with an acceptance test. Need to demonstrate in lab that it is capable of working. In the field, contractor must demonstrate that faults are annunciated and light goes on in response. You are just certifying that it is capable of annunciating results.
  - Robert Long (Rheem): We provide the terminal that they can hook up for that.
  - Kristin Heinemeier (UC Davis): It would be sufficient to pick a piece of equipment and show that it works with at least one thermostat.
  - Farhad Farahmand (CASE Team): Our intentions is that the reqts 1-9 for economizer FDD are not connected to the penalty of perjury document. The evidence you must provide for Testing Guidance is what you must certify from lab tests. I will double check that this is true.
    - CASE Team to verify that poor installation doesn't hold manufacturers liable.

Questions

- 1. Is there a difference between stand-alone and integrated economizer FDD devices that T24 should distinguish?
  - Cathy Chappell (CASE Team): Does silence mean current distinction is sufficient?
  - Farhad Farahmand (CASE Team): I think so.
- 2. Are EMCS regularly monitored?
  - Kristin Heinemeier (UC Davis): Depends on building. I think for most they are. Can't say definitively.
  - Christopher Goff (SCG): Depends on sophistication of system. Some are so basic, they're paper based and are not closely monitored and faults may be realized long after indication. Electronic DDC that have electronic alarms are monitored very closely.
    - Farhad Farahmand (CASE Team): Paper based systems?
    - Christopher Goff (SCG): It is like a data logger that is on a paper graph that would indicate a problem. Someone would have to look at the graph to interpret information to determine fault. Not sure how many of these are still out there, but less likely to be monitored.
    - Christopher Goff (SCG): Depends on the sophistication of the EMCS, DDC systems are monitored, closely.

- 3. Do damper manufacturers perform third-party leakage testing?
  - Farhad Farahmand (CASE Team): Seems that at least 40 that do. Packaged unit manufacturers that also develop dampers do not. Is this consistent?
  - Martin Grissel (Greenheck): Yes, I think this is correct. Damper manufacturers do, packaged unit manufacturers do not.
- 4. Can current economizer FDD accurately detect excess or inadequate outdoor air? How accurate are these?
  - Adrienne Thomle (Honeywell): So many variables and ways to do this test. Dependent on system and how economizer is installed and monitored.
  - Robert Long (Rheem): Needs to be in several questions. If you're in economizer mode, you're 100% open or trying to maintain a mix. If at minimum position – are you at inadequate outside air? I think that is what you need to ask.
  - Adrienne Thomle (Honeywell): Also if adding CO2 monitor, adding another component. Can determine if inadequate outside air. But too much outside air depends on the fan used for system by OEM.
  - Farhad Farahmand (CASE Team): Is damper modulation used as proxy for outside air coming in? Or airflow sensors on damper?
  - Robert Long (Rheem): I don't see a lot of units with built-in outdoor air sensors. We don't sell those. That question needs to be broken out.
  - Adrienne Thomle (Honeywell): Very open ended question.
  - Cathy Chappell (CASE Team): If we breakout to 5-6 specific questions, can we send them to you and get response? We are looking at this for 2019, but still interested in input.
  - Jon McHugh (CASE Team): What should the 6 questions be?
    - Adrienne Thomle (Honeywell): Would be happy to. If damper is stalled closed, you know not getting adequate air. Stalled open, know there is excess air. Kristin's team on fault detection that was originally provided did have the table that showed how all of these can be pointed out.
    - Kristin Heinemeier (UC Davis): In test center of guidance doc there is a section for stuck dampers. Closest we could get to identify these. Think inadequate outside air relates to inadequate airflow (supply air?) CEC doesn't regulate because not energy issue. Idea of excess outdoor air is important and is difficult to detect.
    - CASE Team to follow up with Adrienne and Robert on appropriate questions.
- 5. Should damper leakage be reduced to 4 cubic feet per minute/square foot?
  - Beth Braddy (Trane): Dampers are commercially available. The ASHRAE 90.1 reqts 4 cfm/sf at extreme south and north of country. CA falls into middle region of 10 cfm/s.f. If CA chooses to implement 4 cfm/s.f., it is a question of whether it is worth the cost impact. Is it commercially viable for the customer base?
  - Farhad Farahmand (CASE Team): So is it more money? My understanding is that they only make one kind of damper, so not that big of a jump.
  - Martin Grissel (Greenheck): There is no difference for stand-alone damper manufacturers. All certified dampers comply with 4 cfm/s.f. because it wouldn't be competitive if doing 10 cfm/s.f.

Can't speak for those manufacturer who are making their own dampers. 95% or more meet 4 cfm/s.f. for our dampers. Don't need to change much in the design.

- Adrienne Thomle (Honeywell): Does this mean 4 cfm/s.f. when installed in unit or 1 year after or what? Does it have to be checked periodically by technician?
  - Cathy Chappell (CASE Team): If in T24, just at time of installation.
  - Mark Grissel (Greenheck): Not verified in field, it is certified by manufacturers when tested for AMCA 500. 10 cfm/s.f. is Class 2 AMCA. Class I is 4 cfm/s.f. You won't find any Class 2 dampers at 1" water column.

- 6. Should inlet and return air dampers have the same leakage criteria? That is how they currently are.
  - Mike Ray (Lennox): Why do we care if return air damper leaks?
  - Farhad Farahmand (CASE Team): If leaking into plenum, you are getting more return air than want and wouldn't get as much of the desired air from economizer. In cooling condition, thermostat at 75 degrees, return air might be at 78 at top of ceiling. If outside air is 60 degrees, you don't want to mix with hotter air.
  - Robert Long: That's a small percentage of time.
  - Christopher Goff (SCG): Need to look at actual buildings in operation. Can talk theory all you want. When maintenance isn't done one of the things that gets neglected are dampers on economizers.
  - Cathy Chappell (CASE Team): We're looking at requirements for new equipment. The FDD needs to look at both inlet dampers and return air dampers. Question is – do they have the same leakage criteria? Sounds like Mike and Robert say no because return damper control is different than inlet.
  - Mike Ray (Lennox): I don't necessarily disagree with proposal to have the same, but want to understand what the status is.
  - Cathy Chappell (CASE Team): We are not saying that yes it does, but want to know if the leakage from inlet and return have the same impact. The percent of time that it has a significant impact is relevant to that question.
  - Adrienne Thomle (Honeywell): I don't think you want same requirement. Want outdoor sealed more than return. When outdoor damper open, no need.
  - Mike Ray (Lennox): I agree with that. If it is 120 or 140 degrees on roof. Outdoor air shouldn't leak; don't want to leak in hot air, want return air to come back and take advantage of that temperature. More critical to have inlet damper have leakage criteria.

Follow Up Items

- **Fault reporting:** CASE Team will revise language to be inclusive of 2013 requirement
- **100% economizer open:** CASE Team to try to update language to close loopholes that allow <100% design airflow.
- **Leakage third party testing:** CASE Team to follow up on number of labs in the country to ensure no 'long lines'.

- **Integrate testing guidance:** CASE Team to ensure that manufacturers are not held liable for meeting the requirements 1-9 in the field.
- **Other:** Follow-up with Adrienne and Robert on questions to assess how accurately economizer FDD works

Residential HVAC Field Verification & Diagnostics

- Farhad (TRC, on behalf of the Statewide IOU C&S Team) presented
- Presentation available here: http://title24stakeholders.com/wp-content/uploads/2014/05/Residential-HVAC-Field-Verification-Stakeholder-Webinar_May21_2014.pdf

Comments and Feedback:

Rename Charge Indicator Display (CID) to Fault Indicator Display (FID)

- Laura Petrillo-Grohl: Is there a comprehensive list of faults that CEC is interested in detecting?
  - Jeff Miller (CEC): Not aware of any specifically prepared list of faults
  - Farhad Farahmand (CASE Team): JA6.1 is more focused on the calculations required to verify proper charge in the unit
  - Mazi Shirakh (CEC): What is the point of the change, if we aren't specifying what the faults are?
  - Marshall Hunt (PG&E): It was originally 'charge', which is extremely narrow. Want to allow alternatives.

Align charge verification instructions for installer and HERS Rater

- No comments.

Require liquid line filter

- No comments.

RA2.4.4 – Clarify protocol for delaying charge verification until warm weather

- Jeff Miller (CEC): A charging procedure cannot be verified, just redone. So HERS raters are not supposed to charge the equipment.
  - Mazi Shirakh (CEC): HERS raters are very reluctant to touch or change any system that contains refrigerant, that's why we had the requirement for the installer use the weigh-in and allow rater to do the classic method.
  - Farhad Farahmand (CASE Team): suggesting for rater to observe the charge.
  - Mazi Shirakh (CEC): That is one option, or rater can use weigh-in method.
  - Farhad Farahmand (CASE Team): Issue is more discordant responses when rater and installer use different methods.
  - Marshall Hunt (PG&E): We need to clarify this, because we did not intend to imply that HERS raters are breaking into the system.
  - George Nesbitt (Environmental Design / Build): My understanding is if an installer does weigh-in, and rater came back to check charge, the installer doesn't need to check charge. I'm not sure observing weigh-in is sufficient. Can you quantify the exact length of a lineset, and who knows if they added or removed anything? If no one ever checks charge, it could end up being undercharged. I think ideally installers and raters should use the same procedure, tables for superheat, etc.

- Farhad Farahmand (CASE Team): George, what is your stance? Installers using different procedures ok? Or should they use the same procedure?
- George Nesbitt (Environmental Design / Build): Certainly use the same charts.

- Mazi Shirakh (CEC): Only thing an installer can do is weigh in. Then a rater comes a month later, they can't do weigh in, only evacuate (not practical) or standard.
  - Farhad Farahmand (CASE Team): There is 2nd method now available for 2013 Standards (Winter Setup for Standard).
  - Mazi Shirakh (CEC): But those methods have not been sanctioned by any manufacturers.
  - Hung Pham (Emerson): I agree with point about weigh-in. Three parameters can still throw off results from different time of weigh-ins:
    - Line length;
    - Weight scale at different ambient air temperature;
    - Nameplate charge doesn't reflect variations of indoor evaporators; and
  - Hung Pham (Emerson): I would prefer the installer write down their test, so HERS rater can check the sheet.
  - Mazi Shirakh (CEC): If installer does weigh in method and goes home; then rater does standard charge verification and it passes, we're done. If it doesn't, installer has to go back and redo it. What's wrong with this?
  - George Nesbitt (Environmental Design / Build): No one wants to fail, it creates problems for HERS raters and costs extra money and hassle. Chances of failure increase with installers using weigh-in method.
  - Farhad Farahmand (CASE Team): To be fair to Mazi's point, if the installer does a weigh-in method, then the installer would have to come back and do it again, and the HERS rater would observe.
  - Hung Pham (Emerson): Need to allow installer to declare I'm not done yet, don't inspect. I agree, we need a way to make it better, and more streamlined. Could be that we don't have the same target.
  - George Nesbitt (Environmental Design / Build): With weigh-in, there is no winter approach, it' just saying add or remove and let HERS rater test it when it's warm enough. Why not just say test it when it's warm enough?
  - Hung Pham (Emerson): Say anything <55 degrees is temporary.
  - Marshall Hunt (PG&E): We want to allow people to get occupancy and move in even if house is ready in January. Struck the weigh in.
  - Hung Pham (Emerson): Yes, I like letting them moving in and saying "we're not done yet."
  - Mazi Shirakh (CEC): if we stick with this approach, then we don't have a Winter Weigh-in Method.
  - Jeff Miller (CEC): It's not universal that a professional does not consider weigh in a final procedure. Do any manufacturers not allow weigh in?
  - Marshall Hunt (PG&E): Carrier, I can send you that info.

- CASE Team to make sure language changes don't imply HERS adjusts charge, clarify when to use weigh-in and installer/HERS rater use same procedure.

Questions

- 1. What residential devices can continuously monitor AC systems and report faults?
  - George Nesbitt (Environmental Design / Build): I've installed a couple mini-splits. They are reputed to have FDD and not operate if charge isn't right; but personal experience is that there are leaks and the equipment runs anyway. Most equipment doesn't have any type of fault detection.
  - Marshall Hunt (PG&E): a major compressor manufacturer has a trademark monitoring product that provides info about heat exchanger, etc.
  - Farhad Farahmand (CASE Team): Hung, does Emerson have a product with res FDD technology?
  - Hung Pham (Emerson): Yes, family of products in Res and Light commercial minimal sensors. Doing it for 10 years now.
  - Shane Easter (EcoFactor): Yes we offer similar products to Carrier.
  - Paul Layton (Emerson): Comfortguard product is available, would like to get tested. It is an agnostic product, goes on any res unit.
  - Jeff Miller (CEC): Ultimately, we need to be able to understand how to evaluate these devices, using the Purdue FDD evaluator. We need to judge whether these products accurately detect these faults.
  - CASE Team to develop Special Case for FIDs. Contact Emerson and EcoFactor for feedback.
- 2. Are manufacturer charging instructions typically available and/or used?
  - Hung Pham (Emerson): That is the most critical, there are a lot of instructions and targets, because of variety of designs. Sub cooling is published in product data manual. TXV also makes the values vary, generally a tolerance +/- 1 degree.
  - George Nesbitt (Environmental Design / Build): One difficulty is something that like super cooling values are not on the equipment or easily available. Having that readily available to installers and HERS raters makes life that much easier.
  - Farhad Farahmand (CASE Team): Are you saying manufacturer tables provided with equipment lack sub cooling info?
  - George Nesbitt (Environmental Design / Build): Mostly yes. Hard to check a charge if you don't know the target. Plus or minus something.
  - Marshall Hunt (PG&E): That is exactly the kind of thing we want to build into 2016 manuals, to make it easier and better for everyone.
  - Hung Pham (Emerson): Should be job of the installer to get that info and leave it at site, also allow for rater to have consistent info.
- 3. How often are liquid line filters installed?
  - Hung Pham (Emerson): I am very surprised to hear this concern, all the units have the dryers built in. Also provide it in the replacement kit.

- George Nesbitt (Environmental Design / Build): Some installers put them in, not clear if manufacturer includes them. Usually installed right next to condenser. Part of manufacturers' factory-installation
  - CASE Team to identify HERS language to be added.
- Cathy Chappell (CASE Team): Any feedback from manufacturers? Our research indicates they are shipped, and designed and built for each unit. Replacement compressor kits come with the dryer surprised to hear of situations with no dryer.
- Tim Hawkins: We do ship the filter dryers either installed or with the units. We were asked by customers not to install the filter because they want to place it outside the unit to enable replacement without charging. If installer isn't putting the filters in, it's just laziness because it doesn't cost any more.
- Mike Ray (Lennox): I agree with Tim Hawkins comments, sell products with filters both factory and field installed. I think all manufacturers ship equipment with dryer filters these days.

- 4. How often is HERS charge verification rescheduled when outdoor air temperatures are below 55ºF?
  - George Nesbitt (Environmental Design / Build): I'd say it's not even just the 55ºF issue. Need enough heat to get superheat, supposed to have indoor conditions at least 70ºF
  - Mazi Shirakh (CEC): There is a procedure you can use when it's cold using supplemental resistance heating.
    - Jeff Miller (CEC): Blow dryer method. Any resistance heater can provide supplemental heat at return grilled. We can provide reference to that.
  - George Nesbitt (Environmental Design / Build): But there are also conditions when wet bulb is too low.
- Jeff Miller (CEC): follow up on JA6 topic – changing CID to FID, JA6 as a whole, is describing HVAC fault detection. I think we have already accommodated your concern.
  - Farhad Farahmand (CASE Team): We need to add it to JA6.
  - Jeff Miller (CEC): Any device you propose to be included, need to show that it works. Reqts will vary based on the product capabilities. How do we determine if they are accurate?
  - Farhad Farahmand (CASE Team): Agree, that is where we rely on the ASHRAE 207.
  - Jeff Miller (CEC): Compliance option procedure may be available for creating an approved procedure. There is an avenue for approval between the code cycles. We will have it available.
  - Cathy Chappell (CASE Team): ASHRAE 207 committee plans to have something ready by January 2015. Anyway to incorporate this between adoption and implementation date?
    - Jeff Miller (CEC): Compliance option procedure might be available for creating an approved procedure; don't think that is specifically written into JA6. Could accommodate additions in between code cycles.

Follow Up Items

- **Rename to FID**: Need to develop Special Case for FIDs. Contact Hung Pham (Emerson), Shane (Easter) EcoFactor, and maybe Dale for feedback.

- **Charging instructions**: No apparent objections to removing references to RA1
- **Liquid line filter**: Need to identify HERS language to be added. How is this done? Ask for opinions from Proctor, Bruce Goetz, Tommy Young, and George Nesbitt?
- **Delayed verification**: Make sure language changes don't imply HERS adjusts charge, clarify when to use weigh-in and installer/HERS rater use same procedure. Need discussions with CEC, possibly installers.