



Goal 3: Field Detection & Diagnostics (FDD) Committee
Monday March 20, 2017, Meeting Notes

WHPA Code of Conduct: <http://www.performancealliance.org/Home/CodeofConduct/tabid/205/Default.aspx>. Please note that all participants of all Western HVAC Performance Alliance (WHPA) meetings, standing committees, subcommittees, and ad hoc groups shall adhere to the WHPA Code of Conduct.

Call to Order

Co-Chair Sean Gouw (SCE) called the first meeting of the FDD Committee for 2017 to order at 10:03 a.m. PDT.

AGENDA	
TOPIC	DISCUSSION LEADER
Roll Call/Approval of Minutes	Bonnie Gustavson/Elsia Galawish
Presentation by Davis Energy Group on California T-24 Residential Quality HVAC CASE Activity – FDD topics	David Springer, Davis Energy Group
Presentation by TRC Solutions on California T-24 Nonresidential FDD CASE Activity	Farhad Farahmand, TRC Solutions
Discuss Draft FDD Committee 2017 Goals & Implementation Plan	Sean Gouw, SCE
Next Steps and Adjourn	Sean Gouw/Elsia Galawish

Roll Call / Approval of 2/13/2017 Meeting Minutes

A quorum of the FDD Committee voting members was present. A total of 16 members, guests, and Staff attended. *To avoid repetition, the abbreviation for the name of the member organization will be used in the body of the minutes.*

Organization	First Name	Last Name	WHPA Category	P=Present
Voting Members				
ACCA (Air Conditioning Contractors of America)	Glenn	Hourahan	Contractor Association	
Carrier Corporation	Dick	Lord	HVAC Manufacturer	P
Daikin Applied	Skip	Ernst	HVAC Manufacturer	P
Ezenics, Inc.	Benjamin	Kelderman	Other Stakeholder	
FDSI (Field Diagnostic Services, Inc.)	Dale	Rossi	Third Party Quality Assurance Providers	P
Goodman Manufacturing	Aniruddh	Roy	HVAC Manufacturer	P
JCI (Johnson Controls, Inc.) (YORK)	Wayne	Guelfo	HVAC Manufacturer	P
NBI (New Buildings Institute)	Alexi	Miller	Energy Efficiency Organization	
Proctor Engineering	Abram	Conant	Other Stakeholder	P
Purdue University	Andy (Andrew)	Hjortland	Research Organization	
SCE (Southern California Edison)	Sean	Gouw (Co-Chair)	California IOU	P
Trane-Ingersoll Rand, Inc.	Caleb	Joiner	HVAC Manufacturer	P



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Organization	First Name	Last Name	WHPA Category	P=Present
Transformative Wave	Joe	Schmutzler (Co-Chair)	Controls (Manufacturer or Distributor)	P
TRC, Inc.	Farhad	Farhamad	Other Stakeholder	P
XCSPec	Janet	Peterson	Controls (Manufacturer or Distributor)	P
Guests				
CEC (California Energy Commission)	Jeff	Miller	Government Other than CPUC	P
Davis Energy Group (speaker)	David	Springer	Energy Efficiency Organization	P
PG&E (Pacific Gas and Electric Company)	Christian	Weber	California IOU	P
Staff				
BJGustavson Consulting (WebEx)	Bonnie	Gustavson	Other Stakeholder	P
Galawish Consulting Associates (Staff Support)	Elsia	Galawish	Energy Efficiency Program Consultant	P

Elsia Galawish (Staff) requested approval of the February 13, 2017, meeting minutes. Skip Ernst (Daikin Applied) made a motion for approval and Dick Lord (Carrier) seconded the motion. No one opposed or abstained. Motion carried.

California T-24 Residential Quality HVAC CASE Activity – Presentation – Davis Energy Group

The FDD Committee continues to be updated with the ongoing FDD activities with T-24 Codes and Standards.

David Springer (Davis Energy) presented the T-24 California Residential Sector Energy Codes and Standards changes that are currently proposed to the CEC for 2019. The presentation is embedded on the next page. He described:

- Four proposed compliance options that can be modeled in CBECC-RES (Slide #4)
- The problems with current FID specifications (JA6), (Slide #5)
- Proposed temperature splits (Slide #6) – captures all faults and involves only nine steps versus the current 25 steps for sub-cooling verification, thereby reducing the measurement uncertainty. Correct measurement and supply air temperature is challenging because you have different temperatures coming off the coil, so it is difficult to know where to measure the temperature. Need some more field work to determine best measurement, whether it is a combination of supply registers or some weighted average based on airflow and temperature, etc.
- The types of validations performed to date (Slides #7-#11) – (a) Two field tests, (b) Evaluation using SCE & PG&E lab tests with multiple faults, and (c) Evaluation using expanded performance tables for 5 manufacturers.

He noted that in 2019, DOE is adopting a fan efficacy requirement for furnaces and for modular air handlers that accounts for the fact that many manufacturers are going away from permanent split capacitor motors to cross capacitor magnet motors.

Changes relating to HVAC measures include:

- Add compliance option for FDD devices, including FIDs
- Improve FID specs to invite participation
- Reduce maximum fan efficacy from 0.58 W/cfm to ~0.40 W/cf
- Add temperature split to A/C verification options

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FDD and FID Code Change objectives

- FDD: (a) to provide low-cost means of ensuring long-term, sustained performance, (b) to facilitate fault identification and diagnosis (possibly), and (c) to notify service technician of significant fault.
- FID, a more sophisticated communication device: (a) to provide a more sophisticated communication device capable of notifying the homeowner and/or the technician, (b) to provide notification of fault and/or loss of performance, and (c) to ensure sustained performance and serve as an alternative to refrigerant charge verification.

For more information and to stay engaged with these ongoing T-24 activities, see Title24Stakeholders.com, EnergyCodeAce.com, or email dspringer@davisenergy.com. The next HVAC Stakeholder Meeting is on March 28, 2017, at 9 AM PDT.



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Presentation-Res Que

Discussion:

- Dick Lord (Carrier) requested a copy of the presentation – Bonnie Gustavson (Staff) will distribute to the Committee.
 - Carrier tests 50 to 100 units/systems per month in development, and we can validate some of the proposed changes very quickly in our laboratory to provide some additional checks, especially the delta temperature measurement approach. David Springer (Davis Energy) will send Dick Lord (Carrier) the temperature split tables.
- Christian Weber (PG&E): (a) With respect to FDD and FID, is the intention to provide that at the unit or at the thermostat? (b) Is there any thought to ensuring those faults are accessible remotely? (c) Are there similar efforts on the commercial side?
- David Springer (Davis Energy): (a) For FDD, it could be accessible at the unit and use flashing LEDs to diagnose various problems. (b) For FID, it is up to the CEC to determine what is acceptable; but in general, they are looking to provide some form of enunciation to the homeowner, and optionally to the technician, of what can broadcast that there is a problem. (c) Regarding efforts on the commercial side, I will have to research and get back to Christian Weber (PG&E).
- Farhad Farahmand (TRC) confirmed that nonresidential FDD stakeholder occurred on 3/15, and he will answer questions after Agenda item #3 FDD nonresidential presentation.
- Skip Ernst (Daikin Applied): Why did you go away from sub-cooling indication on refrigerant charge?
- David Springer (Davis Energy): We are not going away from it. We are proposing temperature split as an alternative to sub-cooling. The reason: temperature split is capable of capturing multiple faults. This way the HERS rater does not have to tap into the refrigerant charge system risking potential contamination or loss of refrigerant. Sub-cooling can still be used as a means of providing a pass-fail indication. There are those who feel that the temperature split should be used in addition to the sub-cooling.
- Dick Lord (Carrier): One of the issues with sub-cooling is the use of fixed sub-cooling for all units. This can result in a high efficiency unit being over charged. When we go to new refrigerants, you have a whole world of refrigerants that will change sub-cooling.

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- Dale Rossi (FDSI): (a) Given the information presented so far regarding temperature split measurement detecting multiple faults, we should be careful that we are talking about detecting faults and not diagnostics. One cannot get good diagnostics from temperature split. (b) Charge checking with pressures and temperatures for sub-cooling. By taking all those temperatures and pressures, you can use that same information with other calculations to detect and diagnose the wide of faults that might occur. That cannot be diagnosed using the temperature split method.
- David Springer (Davis Energy): I agree with Dale Rossi (FDSI). All we expect from the HERS rater is to verify sub-cooling.
- Sean Gouw (SCE): Beyond the 3/28 meeting, are there other opportunities for FDD members to weigh in on the residential changes?
- Jeff Miller (CEC): We are beginning the update cycle for the 2019 standards.
 - June-August 2017 – pre-rulemaking workshops, then a period of responding to public comments
 - Fall 2017 – formal rulemaking sometime in November 2017
 - Spring 2018 – possible adoption
- Sean Gouw (SCE) informed David Springer (Davis Energy) of another potential validation data set to look at. The Purdue FDD calculator is where they took certain FDD protocols and accumulated test data under various fault conditions. Sean Gouw (SCE) will provide David Yule (University of Nebraska, FDD calculator guru) contact information to David Springer (Davis Energy).
- Dick Lord (Carrier): Has a sensitivity analysis been conducted on this work? It was noted and is required that one has to get the average temperature and not just a point temperature in the duct.
- David Springer (Davis Energy): A full sensitivity analysis has not been conducted.

Sean Gouw (SCE) wants an update at another Committee meeting. Members are welcomed to provide input to David Springer (Davis Energy) at dspringer@davisenergy.com.

Solutions on California T-24 Nonresidential FDD CASE Activity – Presentation - Farhad Farahmand, TRC

Farhad Farahmand (TRC) provided a summary of the proposed changes to T-24 Nonresidential HVAC Economizer FDD CASE for Build-Up Air Handlers that was presented at the 2nd CEC Stakeholder Meeting. See embedded document on next page. He updated the Committee on the more contentious items that came up during the 3/15 Stakeholder Meeting so Committee members can provide feedback.

- (1) The packaged economizer system needs to pick up 5 faults per Section 120.2(i)
 - (2) FDD system is required to undergo two compliance paths (outlined in JA 6.3)
 - a. CEC certification (FDD manufacturers need to submit their FDD products to the CEC to show they can meet all fault detection requirements).
 - b. The Acceptance Test – performed during construction of building. The technician visits every air-handler unit and conducts a series of tests on the economizers.
 - (3) Compliance and enforcement barriers – this generated the most questions at the Stakeholder Meeting on 3/15.
 - (4) Cost data details (collected from mechanical designers and controls contractors) for adding RAT and MAT sensors to the air handler.
- Current FDD Requirement only in T-24 for nonresidential controlled packaged air-handling units: Units > 4.5 tons must have an air economizer.

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- Code proposal changes would expand the economizer fault detection requirements from packaged unitary systems to all air handlers which could be built-ups receiving chilled water or heating hot water from a central plant. Again, this would be for units 4.5 tons or greater with an economizer.
- Farhad Farahmand (TRC) shared Stakeholders' query: it will be a little difficult if a mechanical designer writes his own sequence of operations, customized for a specific project for economizer controller diagnostics, and the designer was then going to elect to incorporate that for the air-handling unit. What is the process for CEC certification? We have not considered that scenario and are currently in discussions with the CEC on how to handle that.



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Discussion:

- Sean Gouw (SCE): Is there a commercial split system that would have an indoor unit with an economizer that could be considered an air handler? In addition, are you including or excluding those?
- Farhad Farahmand (TRC): If indoor unit has an economizer and it is over 4.5 tons, then it would be included.
- Dick Lord (Carrier): There are actually two types of air handlers (fan coils): (1) DX connected to a commercial split and it can have an air-side economizer, and (2) chilled-water air handlers that can have an air-side economizer or a hydronic economizer. Hydronic economizers are covered in Standards ASHRAE 90.1 and IECC as an alternate to an air economizer.
- Sean Gouw (SCE) recommends consistency in terminology definitions.

Draft FDD Committee 2017 Goals & Implementation Plan - Discussion

Action Items from Previous Meeting:

- Prioritize and establish 2017 Goals
- Develop 2017 Implementation Plan

FDD Committee Goals for 2017

- **Revisit and update the 2013 FDD Roadmap:** The first round of discussions will take place at the next FDD meeting on 4/24 with the expectation that updates to the roadmap will be incorporated by 6/12.
 - Need to update the status of various tasks and capture additional policy drivers, where appropriate.
 - Need a vision for the role of advanced metering infrastructure (AMI) data and then investigate other onboard FDD monitoring.
- **Continue CQM support activities**
 - Update CA CQM considerations and recommendations document/provide advice on structure of CQM measures and role of FDD. Discussions on 4/24 and 5/15 and updates to be incorporated by 6/12.
 - Establish a formal link with the WHPA CQM Committee.
- **2019 California T-24 Codes & Standards FDD Activities** – Discussions for CASE FDD topics as needed by 6/12.
 - Nonresidential – economizer FDD for built-up HVAC

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- Residential Quality HVAC FDD topics

Discussion:

Janet Peterson (XCSpec): CQM Committee Chair Don Langston (Aire Rite) wants to try to work closer with the FDD community. She will send Sean Gouw (SCE) the meeting notes from the last CQM Committee.

Next Steps, Schedule Meeting, and Adjourn

Next Steps:

- Vote on 2017 Goals & Implementation Plan via email
- Committee email comments on FDD Roadmap – due Monday, 4/10.

Next Meeting: Monday, May 15, 2017, 10:00 AM – 11:00 AM PDT.

Upcoming 2017 meetings scheduled to date:

Monday, June 12, 2017, 10:00 AM – 11:00 AM PDT

The meeting adjourned at 11:05 a.m. PDT.

Action Items

- ▶ Bonnie Gustavson (Staff) to send presentations and meeting recording link to members.
- ▶ Review and provide comments on the 2013 FDD Roadmap (see attached PDF below) by 4/10. Here are some example questions to keep in mind for your review.
 - Is the 2013 Roadmap still applicable to the challenges we face today in the FDD industry? If not, what is missing/outdated?
 - Is the structure of the document easy to work with? How can we improve it?
 - What is the status of the tasks outlined?
 - Are there additional drivers/policies beyond CLTEESP that we should be considering?
- ▶ For those who are voting members, please vote yes/no/abstain for the 2017 Goals & Implementation Plan (see embedded word doc below) by 4/10.



FDD Roadmap
7-10-13.pdf



2017 FDD
Implementation Plan :

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