



# Western HVAC Performance Alliance

## Onboard/In-Field Fault Detection and Diagnostics (FDD) Committee FDD Committee Recommendations, Considerations

A WHPA Work Product as of January 18, 2017

**Prepared by:**

Onboard/In-Field Fault Detection and Diagnostics (FDD) Committee

Working Group Co-Chairs:

Sean Gouw (Engineer, Technology Test Centers, Southern California Edison)

Joe Schmutzler (Director, Global Utility Relations, Transformative Wave)

## Fault Detection and Diagnostics Committee (FDD) Working Group

Goal #3: Leveraging Goal #2 where applicable, Develop a Recommendation for Criteria and Performance Verification Requirements to Qualify FDD Technologies for Inclusion in IOU Commercial HVAC Programs				
Milestone	Owner	Deliverable	Due Date	Dependencies
1. Determine Qualification Criteria for FDD Technologies	Chairs and Committee Members	Qualification Criteria	July 31, 2016	<ul style="list-style-type: none"> <li>Availability of Chairs and Committee Members</li> </ul>
2. Explore methods to demonstrate compliance with FDD Qualification Criteria	Chairs and Committee Members	Validation Requirements	August 31, 2016	<ul style="list-style-type: none"> <li>Availability of Chairs and Committee Members</li> </ul>

### 1. FDD Committee Recommendations / Considerations

- a. Continue to require that the economizer controls replacement measure leverages T-24 certified FDD technologies
- b. WHPA FDD committee should continue to maintain the FDD technology list, and other supporting documentation (research list, fault list)
- c. Consider the merits of two strategies for further incorporating FDD into CQM
  - i. **Create a stand-alone HVAC CQM statewide FDD measures, in addition to the current measures**
    - a. Begin compiling all research that quantifies FDD savings, and start work paper development
    - b. Consider in-field FDD measure
    - c. Consider onboard FDD measure
      - a. Consider additional programmable thermostat with FDD measure
  - ii. **Maintain a qualified FDD product list, let FDD enhance the realization rates of current CQM measures by acting as a “validation tool” for CQM implementers and evaluators**
    - a. The Comprehensive list of HVAC faults should also be maintained and updated as necessary by the WHPA FDD committee. As available, FDD technologies should indicate fault coverage, in a manner consistent with the terms outlined in the fault list.
- d. FDD CQM Qualification criteria
  - i. The FDD technology shall meet the following general definition
    - a. Technologies that assist in identification of performance, maintenance, or repair needs using measurements and software intelligence in an in-field and/or onboard fashion.
  - ii. The FDD technology shall be classified with Type and Subtype clearly identified
    - a. In-field FDD
      - a. FDD products shall meet definition of in-field FDD: FDD technologies that use temporary sensors that reside with HVAC equipment for a short amount of time
      - b. In-field FDD sensors shall be calibrated on a regular basis
      - c. FDD shall indicate fault coverage, in a manner consistent with the Fault List

# FDD Committee Recommendations, Considerations 2016 Implementation Plan

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- i. FDD shall be capable of determining whether or not any of the statewide CQM measures should be performed on a given HVAC system
    - b. Onboard FDD
      - a. FDD products shall meet definition of onboard FDD: FDD technologies that employ permanent sensors that continually reside with HVAC equipment
      - b. FDD shall indicate fault coverage, in a manner consistent with the Fault List
        - i. FDD shall be capable assisting in determining whether or not any of the statewide CQM measures should be performed on a given HVAC system
      - c. Economizer Controls – Replacement measures
        - i. FDD products shall be T-24 certified
      - d. Programmable Thermostat Replacement measure
        - i. Add Wi-Fi-enabled FDD thermostat replacement measure to statewide CQM offerings...
      - e. Where 3<sup>rd</sup> party / Long-term retrofit products are considered, any installation aspects that potentially void factory HVAC warranty need to be indicated (mitigated as possible)
  - e. **Demonstrating achievement of FDD CQM Qualification criteria**
    - i. Documentation/literature shall be provided that clearly indicates specified capabilities.

## 2. Reference: 2016 California Statewide QM Measures

- a. Condenser Coil Cleaning – Clean condenser coils on qualifying units.
  - i. On AC with gas heat
  - ii. On AC only
  - iii. On heat pump
  - iv. On VAV AC with gas heat
- b. Economizer Controls – Replace existing economizer control sensor or optimizing existing economizer controls by adjusting the changeover setpoint
  - i. Adjustment vs replacement
  - ii. On AC with gas heat
  - iii. On AC only
  - iv. On heat pump
  - v. On VAV AC with gas heat
- c. Economizer Repair – Restore economizer functionality through repairs
  - i. ADEC vs non-ADEC
  - ii. On AC with gas heat
  - iii. On AC only
  - iv. On heat pump
  - v. On VAV AC with gas heat
- d. Evaporator Coil Cleaning – Clean evaporator coils on qualifying units.
  - i. On AC with gas heat
  - ii. On AC only
  - iii. On heat pump
  - iv. On VAV AC with gas heat
- e. Refrigerant Charge Adjustment – Adjust refrigerant charge to meet manufacturer specifications
  - i. Single stage

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- ii. Multi-stage
  - iii. First stage only vs second/higher stage only vs both
  - iv. On AC w gas heat
  - v. On AC only
  - vi. On heat pump
  - vii. On VAV AC w gas heat
- f. Unoccupied Fan Control – Set supply fan to “Auto” or intermittent during unoccupied periods
- i. On AC w gas heat
  - ii. On AC only
  - iii. On heat pump
  - iv. On VAV AC w gas heat
- g. Airflow Adjustment
- h. Programmable Thermostat – Replace non-programmable thermostat and set supply fan to Auto in unoccupied periods for packaged rooftop HVAC

# FDD Committee Recommendations, Considerations Work Product Summary



**DATE:** January 3, 2017

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**INITIATING BODY:** Onboard/In-Field Fault Detection and Diagnostics (FDD) Committee

**WORK PRODUCT NAME:** FDD Committee Recommendations, Considerations

**TYPE OF ACTION REQUESTED:**  **VOTE**     **GUIDANCE**     **OTHER:**

The initiating body requests that the WHPA Executive Committee adopt the referenced FDD Recommendations, Considerations as a WHPA Work Product to be posted and marked in accordance with previously established policy.

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## APPROVAL HISTORY

**COMMITTEE:** Onboard/In-Field Fault Detection and Diagnostics (FDD) Committee

**BY CONSENSUS**     **BY VOTE**

**TALLY:** Of 21 voting members, 11 voted AYE, 2 voted NAY, 4 abstained, and 4 did not submit a vote. The motion to approve the Implementation Plan Summary passed.

**AYE votes:** ClimaCheck (Klas Berglof); Emerson Climate Technologies (Hung Pham); Ezenics (Benjamin Kelderman); FDSI (Dale Rossi); JCI (Wayne Guelfo); Purdue University (Andrew Hjortland); SCE (Sean Gouw); Transformative Wave (Joe Schmutzler); TRC (Farhad Farhamad); Verified (Robert Mowris); Weiland Consulting-Training (Bart Weiland).

**NAY votes:** Daikin Applied (Skip Ernst); Rheem (Karen Meyers).

**Abstain votes:** ACCA (Glenn Hourahan); BELIMO Aircontrols (Darryl DeAngelis); Goodman Manufacturing (Aniruddh Roy); Proctor Engineering (Abram Conant).

**Votes not cast by:** Carrier Corporation (Dick Lord); NBI (Alexi Miller); Trane-Ingersoll Rand (Caleb Joiner); XCSpec (Janet Peterson/Jeff Aalfs).

**DATE:** January 3, 2017

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**WORK PRODUCT OBJECTIVES:** FDD technologies have much potential to improve HVAC Commercial Quality Maintenance (CQM). It is important for the California statewide CQM programs to have an improved understanding of the roles FDD can play. This deliverable seeks to capture key elements from the 2016 discussions on how FDD can better fit in with the CA statewide CQM programs. It touches on different strategies for implementation and qualification criteria to consider. This will be a living document to allow for updates and refinement as needed as the FDD Committee continues to review technologies and program methodologies.

# FDD Committee Recommendations, Considerations Work Product Summary



## CA ENERGY EFFICIENCY PLAN STRATEGIC GOAL ALIGNMENT:

GOAL 1    GOAL 2    GOAL 3    GOAL 4

### **CEESP HVAC GOAL STRATEGIES: Develop a Recommendation for Criteria and Performance Verification Requirements to Qualify FDD Technologies for Inclusion in IOU Commercial HVAC Programs.**

**BENEFITS:** Establishing a standardized set of criteria for FDD technologies for inclusion in the QM programs will allow for greater consistency and ease of use by the maintenance contractors. Many contractors have territories that cross over utility service lines, and limiting the inconsistencies would help encourage them to join more than one program. This should also encourage interest from manufacturers as they will more easily be able to introduce their products into the QM program market. Having a central technology database would also allow for more easily removing products that no longer meet Title 24 and QM program requirements. Having a more globalized perspective on FDD technologies improves the awareness of their different functions and allows for better integration and implementation of innovative products that help CQM activities.

**OUTSTANDING ISSUES / DEBATES / MINORITY VIEWS:** Daikin wanted removal of the language “in a manner consistent with the Fault List.” Daikin also wanted removal of the section “Reference: 2016 California Statewide QM Measures.” The next steps are: to share the recommendations document with CA CQM IOU program staff and solicit feedback; discuss feedback with WHPA FDD Committee and revisit the recommendations/considerations summary document as per 2017 discussions; revise accordingly; and more coordination with the WHPA CQM Committee should be established.

**POTENTIAL AUDIENCE:** Utility Quality Maintenance program implementers and managers, FDD technology manufacturers, and QM program maintenance contractors.

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**EXECUTIVE COMMITTEE:** On January 18, 2017, at the Executive Committee Meeting, motion was made to approve this as a WHPA Work Product.

**VOTE TALLY:** Motion was made by ASHRAE (Ron Jarnagin) and seconded by IHACI (Bob Wiseman). Additional AYE votes were cast by ACCA (Don Langston), AHRI (Garrett McGuire), ASHRAE (Ron Jarnagin), HARDI (Talbot Gee), NCI (Dominick Guarino), PG&E (Jeanne Duvall), SCE (Scott Higa), SDG&E (Jeremy Reefe), SoCalGas (Harvey Bringas), and UA (Don Tanaka).

There were no NAY votes.

There were two ABSTENTIONS by CEC (Lea Haro) and CPUC (Carmen Best).

**FURTHER ACTIONS REQUIRED:** WHPA Staff will ensure this “FDD Recommendations, Considerations” of its 2016 Implementation Plan Work Product Summary is properly posted and distributed in accordance with established marketing protocol for approved WHPA Work Products.

**NEXT STEPS:** This Work Product will be posted on Performance Alliance website and made available to IOU Quality Maintenance program implementers and managers, FDD technology manufacturers, and QM program maintenance contractors.