



## Goal 2: Commercial Quality Installation SFDS Working Group Wednesday November 13, 2015 Meeting Notes

### Call to Order

The meeting was called to order at 1:04 pm PST by Pete Jacobs, BuildingMetrics Inc. and Chair. Meetings are normally scheduled for up to 2 hours.

### Roll Call

Quorum for voting organizations = 13 of 24. 14 of 23 voting members, 4 non-voting members and 1 guest/staff attended this meeting. A total of 19 members and guests were in attendance.

P = present at meeting

A = absent voting member; if proxy has been assigned it will be noted below.

WHPA Goal 2: CQI SFDS Working Group VOTING Members				Roll Call
ACCA (Air Conditioning Contractors of America)	Donald	Prather	Contractor Association	
Aire Rite AC & Refrigeration	Larry	Smith	Contractor (Nonresidential)	P
BMI (BuildingMetrics Inc.)	Pete	Jacobs	Energy Efficiency Program Consultant	P
Carrier Corporation	Dick	Lord	HVAC Manufacturer	
CDH (CDH Energy Corporation)	Hugh	Henderson	Energy Efficiency Organization	
Clean Energy Horizons, LLC	Norm	Stone	Energy Efficiency Program Consultant	P
Cooper Oates AC	Gary	Storck	Contractor (Nonresidential)	
Daiken Applied	Skip	Ernst	HVAC Manufacturer	
DEG (Davis Energy Group)	Dave	Springer	Energy Efficiency Organization	
DNV-GL (formerly KEMA)	Jarred	Metoyer	Energy Efficiency Program Consultant	P
Energy Analysis Technologies	Chris	Ganimian	Consultant	P
Energy Solutions	Jim	Hannah	NR	P
FDSI (Field Diagnostic Services Inc.)	Dale	Rossi	Third Party Quality Assurance Providers	P
Galawish Consulting & Associates	Elsia	Galawish	Energy Efficiency Program Consultant	P
HSGS (Honeywell Smart Grid Solutions)	Shayne	Holderby	Energy Efficiency Program Consultant	
IC Refrigeration	Richard	Imfeld	Contractor (Nonresidential)	P
JCI (York Unitary)	Bryan	Rocky	HVAC Manufacturer	P
Marina Mechanical	Denny	Mann	Contractor (Nonresidential)	
NCI (National Comfort Institute)	Ben	Lipscomb	Educator, Trainer	P
PG&E (Pacific Gas and Electric)	Adam	Scheer	California IOU	P
SCE (Southern California Edison)	Steve	Clinton	California IOU	P
University of Nebraska (Lincoln)	David	Yuill	Educator, Trainer	
XCSpec	Jan	Peterson	Controls (Manufacturer or Distributor)	P
WHPA Goal 2: CQI SFDS Working Group Non-VOTING Members				Roll Call
ACCA (Air Conditioning Contractors of America)	Wes	Davis	Contractor Association	
ACCA (Air Conditioning Contractors of America)	Glenn	Hourahan	Contractor Association	
Aire Rite AC & Refrigeration	Don	Langston	Contractor (Nonresidential)	
NCI (National Comfort Institute)	Rob	Falke	Educator, Trainer	
SCE (Southern California Edison)	Lori	Atwater	California IOU	P
PG&E (Pacific Gas and Electric)	Robert	Davis	California IOU	P
SCE (Southern California Edison)	Steve	Clinton	California IOU	P
SCE (Southern California Edison)	Andres	Fergadiotti	California IOU	



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SCE (Southern California Edison)	Sean	Gouw	California IOU	
XCSpec	Jeff	Aalfs	Controls (Manufacturer or Distributor)	P
<b>WHPA Goal 2: CQI Committee Invited Guests and Staff</b>				<b>Roll Call</b>
<b>STAFF</b>				
BBI (Better Buildings Inc.)	Dale	Gustavson	WHPA Executive Advisor	
BNB Consulting/WHPA Staff, host, admin. support & scribe	Bob	Sundberg	WHPA Staff	P
Empowered LLC	Shea	Dibble	WHPA Co-Director	
John Hill **	John	Hill +	(CPUC/ED Ex Ante Consultant)	

\*\* Organization is Not a Member of the WHPA; + Individual is NOT Registered with the WHPA;  
(P) after last name = Member/Registrant is Pending Approval from the WHPA Executive Committee

**AGENDA**

Topic	Discussion Leader	Desired Outcome
Welcome, roll call, approve past meeting minutes, review ACTION items and agenda	Pete Jacobs and Bob Sundberg	Record meeting attendees, finalize past meeting minutes, review status of meeting action items.
Welcome new members & guests	Pete Jacobs	New members and invited guests welcomed.
Identify performance indicators for diagnostic testing	Pete Jacobs	Provide members with CQI C. background, where the WG goal fits into the overall CQI C. goals
Unit (machine) performance	Pete Jacobs	Agreement on "what" measurement data needs to be collected in order to allow unit/system performance to later be determined.
System delivered performance	Pete Jacobs	Agreement on "how" measurement data needs to be collected in a standardized, repeatable and affordable manner.
Discuss revisions to Standardized Field Measurement Data Specification	Pete Jacobs	Decide what tools and instruments are necessary and highly recommended for accurate field measurements.
Summarize meeting, assignments/ACTION items, set next meeting date/time, adjourn	Pete Jacobs and Bob Sundberg	Set next meeting date, confirm time, review any new ACTION items and next meeting agenda items.

**Approve Minutes of Previous Meeting**

The October 21 meeting draft notes were distributed October 31. No suggested revisions were received. Meeting notes were approved as distributed. Final minutes would be posted to the working group's location within the WHPA/CQI Committee website.



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### Review Status of Action Items from Previous Meeting

October 21 ACTION: Pete Jacobs asked members to send him their ideas about rational goals and the data they thought was critical to collect. As Rob Falke had suggested, they should also reference key readings or documents from their areas of expertise which they'd recommend be reviewed by members. He would compile whatever was submitted and be prepared to share those submissions at the next meeting. Completed.

### Welcome New Members and Guests

None.

### New Business - Pete Jacobs

None

### CQI Standardized Field Measurement Data Specification WG (CQM SFMDS WG) - Pete Jacobs

Pete Jacobs, Chair, reviewed the takeaways from the Oct. 21 meeting, emails he'd received from members and notes from the previous meeting. He'd identified several major takeaways from that discussion. He'd prepared a group of slides to guide his remarks.

#### Slide 2 - Major takeaways from the 1st meeting

- Need to sharpen focus and identify performance metrics and specific measurements needed for each
- Existing standards have data specs already – this can “bolt on” to supplement existing standards
- Include system reliability and longevity
- Track history of unit performance starting with design intent and commissioning
- Requirements for time series v. one-time measurements
- Address “quasi steady state” nature of one-time measurements
- Data ownership issues

#### COMMENTS -

- Pete - reference data measurements from existing standards and define any additional ones needed for performance metrics calculations. Efficiency and capacity were identified as important performance metrics. They'd need to seek ways to measure or address other additional metrics like system reliability and longevity.
- Rob Falke and group - issue of availability of original installation commissioning data vs. field commissioning/performance benchmarking options. Field measuring conditions would likely be quite different than manufacturer's lab test conditions used when rating equipment. Test instruments would also be an issue, different level of accuracy, resolution and repeatability from those used in rating equipment. Improvement in quality of tools available for field measurement. Service/installation technicians were probably not trained to record and how to interpret some measurements which effected accuracy like barometric pressure. Length of line sets, head pressure for multiple story condenser to air handler.
- Dick Lord, Carrier, recommended review of a new ASHRAE Standard 30 for chiller field measurement. Lots of information regarding field measurement accuracy.
- Chris Ganimian, Energy Solutions Technology, recommended the practice of technicians who would address performance evaluation, take two sets of measurement instruments. Practice to take two measurements. If close, no issue. If far apart, the tech knows he has a problem with one of those instruments to resolve. This could be written as a recommendation in the specification.

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- Dale Rossi, FDSI, asked about the common situation where there weren't known goal values for a particular piece of equipment under specific, non-laboratory rated conditions specific to refrigeration cycle evaluation. To his knowledge, field adjusted goal values like evaporating or condensing temperatures were not available to technicians without some sort of mathematic model and some complex calculations. He wondered why there was so much concern about precision of specific measurements when techs didn't know what targets they should be comparing measurements to? Without good known target values, very precise field measurements would not seem very useful.
- Dick Lord agreed that field conditions would be very different from laboratory testing fixed conditions.
- Rob Falke added that the air side measurements from manufacturers were available for later comparison. On the air side, there were good goals to shoot for. His firm had developed a pdf document that captured measurement values from 26 manufacturers and their primary equipment. It included the URL to reach product data sheets for many pieces of equipment which was included in the training his firm provided contractors.
- Pete Jacobs summarized the conversation and about the degree of measurement precision needed needing to fit the need and the performance metric it was being collected for.
- Norm Stone, Clean Energy Horizons, commented on the tension between the precision the CPUC seemed to require and the ballpark estimates from field tech submitted measurements. All of the unique installations for each piece of equipment. He was most interested to reach a minimum set of measurements that could be taken before a measure is done and then again afterward to determine the delta of performance. Assume that all the other issues like the duct system, installation elements would be constant. Base the savings on that delta in measured performance even if the measurements were not perfect. Here again, perfect is the enemy of the good.
- Dale Rossi wanted to make a quick comment as he had to drop off the call. Utility programs were relied on superheat and subcooling which were non-fault charge metrics in refrigeration evaluation. The real energy savings in the refrigeration cycle came from coil temperatures, the evaporator temperature and condenser over ambient temperature. Those measurements had never been considered in the programs.
- Chris Ganimian agreed with Norm's comments and that path for identifying a smaller set of airside measurements. Technicians had limited time to spend on each job. That was just business. He thought they needed to develop a smaller set of those measurements from which they could determine whether a unit would benefit from more extensive maintenance. It needed to be approached like triage. Technicians just couldn't spend that full amount of time taking the full gamut of possible measurements. They could screw it up just as well as make it any better. Hooking up gauges on every single unit would increase the likelihood that many would contaminate the system when there was often nothing wrong to begin with. He thought they should look at how to triage the unit to determine where the biggest bang for the buck was.
- Jeff Aalfs, XCSpec, advocated taking a smaller number of measurements but collecting the data over time, monitoring the changes. Even lower precision measurements taken over time and compared with baseline readings, like power draw, would be valuable data to capture.
- Rob Falke, NCI, observed that in the past most utility program savings was based on a list of energy efficiency measures, individual tasks, for which averaged and assumed "deemed savings" had been determined. It seemed that this conversation was moving beyond those averaged savings to determine just what performance improvement was being delivered on each piece of equipment. That amounted to a huge shift for the industry. It sounded like they were asking contractors and technicians to take responsibility for how well a unit ran, not just completing a task on a checklist.
- Bob Sundberg, WHPA staff, mentioned a perspective that needed to be clarified. Several people had commented about measurements at every inspection or maintenance call. He thought they had already determined that the measurements and data collection they were considering would only be conducted when 1) a unit was entering a utility maintenance program or maintenance agreement prior to servicing, at

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specified intervals or when the program was being evaluated or 2) when an old unit was being replaced to take measurements needed to determine performance for the removed unit and then taken on the new replacement unit. These measurements were intended to be taken only when performance was expected to be determined. When performance evaluation was the need, the same data set would be collected for program participants (contractor and owner), implementers and program evaluators to perform the same performance calculations.

- Chris Ganimian added that he'd been on the phone attending the CPUC workshop on AB 802 November 6 for five hours. It sounded to him like the CPUC was also working toward developing protocols for determining unit performance deltas/improvements, possibly as early as March of 2016. It was still going to be some form of deemed savings and not case by case. Certainly better than what was currently being used.
- Adam Scheer, PG&E, said he wanted to follow up on Bob's comments and couldn't agree more. He knew that in the research plan for quality maintenance impact evaluation released 4-6 months ago, he noted one of the comments made. In CQM programs where the contractor was involved in longer term contracts with their customer, once the unit is brought up to reasonably high performance you probably would not see any further major improvements when evaluated over time. The major difference was when you compared these later performance evaluations to the any pre-program unit assessment. The CQM program was maintaining a higher level of performance, not setting new, higher levels each time evaluated. Especially with measures like coil cleaning, it was important for evaluators to ride along with the maintenance staff, especially to capture the initial performance prior to that initial coil cleaning.
- Pete Jacobs, Chair, referred back to some of what Norm Stone had mentioned earlier. There was no need to take evaluation grade measurements on every job or maintenance/service call. But, routine measurements that could be captured over many calls would definitely be valuable to evaluators. He had a slide later on that asked the question - what action would trigger a performance evaluation level of measurements. There should be certain events or specific intervals where it made sense to document performance.
- Chris Ganimian agreed and indicated that that point was what he had tried to get at.
- Jeff Aalfs, XCSpec, asked what small group of measurements would be valuable to capture if monitored over time, 24/7, which would allow determining unit performance?
- Rob Falke, NCI, indicated that in service his firm advocated taking approximately 7 measurements. Taken initially they served as benchmark measurements which could be compared at any time to those same measurements taken at a later date. Measurements taken the same way at the same locations each time.
- Ben Lipscomb, NCI, thought that very minor changes in performance resulted from commonly delivered maintenance tasks, probably less than the uncertainty ranges for the measurement instruments. He thought that significant changes to the actual system were required to make significant improvements to performance. Changing out a fan motor, large adjustments in outside air or major charge adjustments. He thought that performance measurement was probably in the +/- 10% range. So, you'd better be looking for what could change performance > 10% and maintenance activities was more in the range of 5% improvement.
- Pete Jacobs. What the group had just been discussing was the benefits, options and requirements for time series vs. one-time (not necessarily instantaneous) measurements. When was each appropriate. Neither would be true steady-state measurements like those attempted in a laboratory setting. The ambient and space conditions were always changing for field measurements. He wanted to keep the data ownership issue on their list but defer it for now.

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### Slide 3 - SFDS Working Group Objective

- Pete Jacobs. He approached this from the perspective of program impact evaluation. They needed to also include those responsible for program implementation and participants who were interested in documenting customer benefits including savings calculations. This specification would need to address a fairly broad range of data consumers.

### Slide 4 - FOCUS

- Pete Jacobs. He thought they needed to focus on a subset of data required for system performance measurement and evaluation. Two subsets. 1) performance indicators that supported fault detection and diagnostics. Indicators which came straight out of the CQM Maintenance Task Working Group January 2015 Report titled "System Performance Analysis." 2) Performance measurement.
- Chris Ganimian asked Pete how useful that list of measurements really would be for a technician in the field trying to decide what to do without some sort of expert system software that does diagnostics? Shouldn't standardizing the protocol for those diagnostics be some of the work of this WG?
- Pete responded that he wanted the group to focus more on the data with an eye on the metrics the data would be used for. Not so much on any particular methods at this point. The next committee goal would focus on use of the data, working towards a standardized approach or protocol for determining performance.
- Bob Sundberg, WHPA staff, suggested that the FDD Committee might be challenged to also focus on protocols for performances evaluation. Their 2015 goals had been focused on behavioral research of key HVAC stakeholder groups understanding and valuing of fault detection and diagnostics (FDD). Maybe this issue could be suggested to Joe Schmutzler and Sean Gouw, co-chairs.
- Jeff Aalfs, XCSpec, indicated that he was a member of the FDD Committee and offered to raise the issue and topic with them and get Chris connected since he was not a member.

**ACTION:** Jeff Aalfs, XCSpec, would introduce Chris Ganimian to the FDD Committee and Chris's interest to have that committee focus on standardized FDD protocols and use of FDD technologies in utility programs.

- Rob Falke, NCI and CQI Committee Chair, reminded the group that one of the next committee goals was to develop the protocol which would make use of the measurements they were addressing. One reason why there was not much reason to devote a lot of effort working on it at this time. And then to determine the calculations needed to determine operating efficiency.

### Slide 5 - Performance Measurement Metrics

- Performance Indicators
  - From "CQM Committee ANSI/ASHRAE/ACCA Standard 180 Maintenance Task Working Group Report – Refrigeration Cycle Performance - System Performance Analysis" (Jan 2015).
- Machine Performance (HVAC equipment)
  - Total capacity at machine
  - Sensible capacity at machine
  - EER at machine
- System Performance (equipment + distribution system)
  - Distribution efficiency (output delivered to space/ machine output = efficiency ratio)
  - Delivered capacity
  - Delivered EER

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- Dick Lord, Carrier, asked for an explanation of the distribution efficiency under System Performance. Rob Falke commented that for distribution efficiency you measured the capacity delivered by the equipment in BTUs divided by the capacity delivered to the space in BTUs. That ratio gave a very interesting efficiency rating. This would help take the focus off of just the equipment efficiency and move to focus on installed delivered efficiency. Dick Lord agreed and said there certainly were a lot of other factors contributing to lost efficiency beyond the equipment selected. Rob commented that some of the data collected from SCE program participants might be made available during the next month or two once approved for sharing.
- Dick Lord, Carrier, mentioned that there was work on a new ASHRAE Standard 205 which would attempt to provide extended performance maps the entire system. It would come out for public review early in 2016 and would include rooftop unit equipment.

### Slide 6 - Data Spec Contents - revised into two categories

- General Data - static information
  - Contractor and technician data
  - Customer information
  - Job information
  - Equipment data
  - Design data (e.g. from a commissioning report)
- Direct field measurements
  - Test parameters
  - Thermostat and economizer operation observations
  - Air side
  - Refrigerant side
  - Combustion
  - Electrical

### Slide 7 - Pete Jacobs shared the most recent Data Spec Spreadsheet online

Data Spec. Tab 2 - Proposed data points. Spec. spreadsheet ver. 2 11-11-15.

Pete Jacobs thought that some final form of this spreadsheet which would represent the data spec accompanied by an explanatory report would probably be the output of this working group. He'd established columns for Descriptions, Data point name, test instrument used, performance indicators, machine performance, system performance and data point description. The spreadsheet rows were separated into the following categories.

- Contractor and Tech Information
- Customer Information
- Job Information
- Equipment Data
- Design Data
- Test Parameters
- Thermostat
- Airside Pressures
- Airflow
- Economizer
- Distribution System (running along roof, in plenum, insulation level on duct system etc.)
- airside Temperatures (dry bulb only in heating mode)
- Electrical Data
- Refrigerant System
- Combustion System



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Right now everything was included in one big table. But, Pete had received the recommendation to break out the table into different tabs for each party responsible for supplying or filling in certain information. Also, what got populated once and other portions which got populated more frequently. To make it more do-able for those responsible for data entry. He would reorganize it for the next meeting.

### COMMENTS:

Jarred Metoyer, DNV-GL: opportunity to capture information about when the unit participated in past programs; level of previous maintenance, neglected, repair on failure, minimal inspection only, longer term scheduled maintenance, utility Standard 180 based program maintenance. Because of AB 802, we'd really like to know if buildings have never participated in programs to get a better picture of baseline performance. Programs typically had stickers applied to units. There would be information on them at the unit as well as site level. That would be a link to program tracking. He thought that the customer account number and site number should be part of the customer information.

Chris Ganimian noticed that pressures and temperature values were being collected but not the refrigeration cycle calculated values like super heat, subcooling and saturation temperatures.

Pete Jacobs clarified that they were first trying to capture just the data that they could take from the equipment.

### Equipment Data Elements (static)

Most data points had come from the CQM Maintenance Task Working Group January 2015 report. He'd added a couple of points for economizer systems and thermostats to capture information about the capability of the thermostat to control economizer functions properly. Stickers could include current and past unit sticker information.

Bob Sundberg, WHPA staff, raised the issue of the importance of capturing the number of cooling stages the installed thermostat was capable of controlling. That needed to be in sync with the number of mechanical cooling stages + one for economizer only free cooling operation when outdoor air was suitable. Pete Jacobs agreed.

### Design Data Elements

Chris Ganimian commented, as Rob Falke had earlier, that very often there was no initial design data or commissioning data available. Pete Jacobs suggested that when that was the case, they needed to somehow drive a stake in the sand and determine where they were at some later point in time, as Rob had suggested before. He thought it might be more appropriate to call this section "baseline data" instead. Either from design intent or some baseline activity after systems were installed.

### Test Parameter Date Elements

What activity was driving or occurred when the data was collected. Commissioning, initial performance evaluation, maintenance, service, renovation.

Dick Lord, Carrier, offered to share a white paper he'd authored on the subject of testing. How factory testing procedures varied from trying to do similar testing in the field.

**ACTION:** Dick Lord, Carrier, offered to provide the group with a copy of the white paper he'd authored related to test parameters and procedures.





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Pete Jacobs commented that some of the data elements were shared across several of the categories - performance indicators, machine performance, system performance. He'd indicated "X" marks where he believed a data element was present.

### Thermostat Data Elements

Whether the current thermostat settings were the same as baseline settings. Set up the way it should be set up.

### Airside Pressure Data Elements

Looking at static pressure measurements throughout the system.

### Airflow Data Elements

What method of airflow testing was used. Whether there was a VFD controlling the fan speed. Those control parameters. Pete Jacobs knew that several of these measures were problematic. He intended to reserve time at a future meeting to get into more detail on them.

Dick Lord commented that most motors are rated in brake HP. You needed to take motor efficiency into account as well. You also had to be careful to note any accessories (economizers, filters etc.) or weather conditions which would impact field motor performance.

Dale Rossi added that if you were going to be measuring pressure drops across the coil, that would certainly be safer with new equipment. With older systems you might really be measuring how dirty those coils were. A lot of these measurements wouldn't apply easily for equipment that's been in service for a while. If you had a measurement from when the coil was new, you could use it for an indication of how dirty the coil was but not for a measure of cfm when it was dirty. The CQM working group report that was referenced also included the suggestion that an information sticker be applied to each unit to document those benchmark measurements.

### Economizer Data Elements

An indication would needed to be documented about what kind of performance test was done and whether the system passed or not.

Dale Rossi offered that it made a considerable difference whether the system was an older analog one or a newer digital one which had greater complexity for assessment. The CQM Maintenance Task Working Group he led had just completed their report in which a test out procedure was provided for digital economizer systems, the first attempted to his knowledge. Dale approved having the draft report sent out to this working group.

**ACTION:** Dale Rossi directed Bob Sundberg to send a draft of the CQM Standard 180 Maintenance Task Working Group's (WG) Economizer System Table 5-12 report to all members of the CQI SFDS Working Group.

Pete Jacob thought that they could pull some of the WG's report content into their work product in the functional test method section.

### Distribution System Elements

They would have to recognize a number of accepted test methods used in the industry.

Dale Rossi commented that the blower door methods would probably only apply to residential applications. You couldn't use it on commercial systems. And, that most commercial buildings had concentric drop ventilation so there wasn't a lot of installed ductwork.



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### Airside Temperature Elements

Pete wondered whether they should change the measurements from wet bulb (WG) to relative humidity (RH) since most of the instruments used in the field now only provided RH readings. Then, leave the WB calculations out of this information gathering first step.

Rob Falke believed there were readily available, very accurate and affordable instruments for direct readings of WB. Dick Lord added that you also then needed to make sure you included the right air properties like barometric pressure at the site and measurements taken considering required minimum velocities. He shared that some of the toughest times they had in laboratory measurement was getting accurate WB readings. Dick thought that with the accuracy concerns, they ought to make some instrument recommendations.

Pete Jacobs mentioned the "tool" tab on the specification spreadsheet. Establishing some of the uncertainties and sensor placement protocols were part of what he intended for the group to tackle.

Dick Lord suggested they review ASHRAE Standard 37 which dealt with those test protocols like temperature stability.

Chris Ganimian thought that it was also very important to address sensor placement which had a huge impact on accuracy and repeatability.

Pete Jacobs thought they'd probably need to convene another working group to hash through the issues around sensor accuracy and placement.

The group discussed some of the difficulties with commercial packaged equipment mixed air readings. Stratified outdoor and return air, impact of supply air measurement being only accurate if heating/cooling were not operating. Also, the uncertainties of solar impact heating the rooftop unit at times.

### Electrical Data Elements

### Refrigerant System Elements

### Combustion (heating) System Elements

## **Closing Comments/Adjournment**

Pete Jacobs suggested he re-work the spreadsheet to split up readings by the activity. Who collects what at what time. He'd intended to get into some questions around 1) defining a quasi-steady state method and 2) how stable did units really need to be. Also, what trigger points were associated with when certain types of measurements should be taken and when not.

Pete said he'd revise the data spec spreadsheet from the written and discussed comments. Reorganize tasks into activities and send it out for further comment. He requested that everyone provide him with general comments via email and also take the spreadsheet and enter their specific comments into the far right column and send them into him. He'd respond to the comments and send out a revision ahead of the next meeting.



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The next meeting was not scheduled. Bob Sundberg would email a link to all members for access to an online poll to help decide when the greatest number of members could attend November 20 or December 4.

The meeting was adjourned at 3:00 pm PST.

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### Summary of Pending and New Action Items and Key Decisions

November 13 ACTION: Jeff Aalfs, XCSpec, would introduce Chris Ganimian to the FDD Committee and Chris's interest to have that committee focus on standardized FDD protocols and use of FDD technologies in utility programs.

November 13 ACTION: Dick Lord, Carrier, offered to provide the group with a copy of the white paper he'd authored related to test parameters and procedures.

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