



Goal 2: Commercial Quality Installation SFDS Working Group Wednesday October 21, 2015 Meeting Notes

Call to Order

The meeting was called to order at 1:04 pm PDT 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. 17 of 24 voting members, 3 non-voting members and 1 guest/staff attended this meeting. A total of 21 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	P
Aire Rite AC & Refrigeration	Larry	Smith	Contractor (Nonresidential)	
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	P
Clean Energy Horizons, LLC	Norm	Stone	Energy Efficiency Program Consultant	P
Cooper Oates AC	Gary	Storck	Contractor (Nonresidential)	P
Daiken Applied	Skip	Ernst	HVAC Manufacturer	P
DEG (Davis Energy Group)	Dave	Springer	Energy Efficiency Organization	P
DNV-GL (formerly KEMA)	Jarred	Metoyer	Energy Efficiency Program Consultant	P
Energy Analysis Technologies	Chris	Ganimian	Consultant	P
Energy Solutions	Jim	Hannah	NR	
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	P
IC Refrigeration	Richard	Imfeld	Contractor (Nonresidential)	
JCI (York Unitary)	Bryan	Rocky	HVAC Manufacturer	P
John Hill	John	Hill	(CPUC/ED Ex Ante Consultant)	
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	P
Aire Rite AC & Refrigeration	Don	Langston	Contractor (Nonresidential)	
NCI (National Comfort Institute)	Rob	Falke	Educator, Trainer	P
PG&E (Pacific Gas and Electric)	Robert	Davis	California IOU	
SCE (Southern California Edison)	Steve	Clinton	California IOU	
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
WHPA Goal 2: CQI Committee Invited Guests and Staff				Roll Call
STAFF				
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	

** 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.
CQI C. overall goals, CQI WG goal	Pete Jacobs and Rob Falke CQI C. Chair	Provide members with CQI C. background, where the WG goal fits into the overall CQI C. goals
Standardized Field Measurement Data Specification	Pete Jacobs	Agreement on "what" measurement data needs to be collected in order to allow unit/system performance to later be determined.
Standardized Field Measurement Data Specification	Pete Jacobs	Agreement on "how" measurement data needs to be collected in a standardized, repeatable and affordable manner.
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

This is the first meeting of this working group. Bob Sundberg will distribute draft meeting notes that will be reviewed and approved at the next meeting. Bob Sundberg would have finalized meeting notes posted to the working group's location within the WHPA/CQI Committee website location.



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Review Status of Action Items from Previous Meeting

Welcome New Members and Guests

Members to this new working group were all welcomed and thanked for their willingness to participate.

New Business - Pete Jacobs

Pete Jacobs asked Bob Sundberg, WHPA staff, to share online the location of the WHPA website. He shared the WHPA website from his desktop and demonstrated how to navigate through the site with samples of the primary tabs and also how to reach the CQI Committee's location within the WHPA site. There would be a new CQI site for this working group added shortly after the first meeting. Pete then asked Rob Falke, chair of the sponsoring CQI Committee, to comment.

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

Pete Jacobs, BuildingMetrics Inc., introduced himself as Chair and that he worked as a consultant to the CPUC. But, that in his role on this working group, he was acting as a volunteer and not being paid by the CPUC. Whatever he'd say would be his own thoughts and opinions and not that of the CPUC. Pete had prepared a presentation to help introduce the project and get them started.

- S3 - The group was intended to include a broad representation of producers and consumers of HVAC data including program developers/implementers, IOUs, contractors, OEMs, trade associations and researchers
- S4 - Meeting protocol, meeting management to allow all opinions to be heard
- S5 - Field Data Specification Working Group Objective
 - Define and standardize data to be collected for performance measurement and evaluation
 - Cross-committee applicability - commercial/residential installation, commercial maintenance, energy savings and DEER committees
 - Purposes included collecting data necessary for program tracking and evaluation purposes, for effective impact evaluation of programs and also data helpful for calculating customer savings estimates
- S6 - Focus on subset of data collected required for system performance and evaluation, not on methods or protocols for processing data, not intended to supersede existing standards. Pete's interest working on ex post program evaluation was to building into the programs the data being collected which would be required of evaluators as well. Comments:
 - Rob Falke added that this working group was formed as a first step focused on data collection. The next goal of the full CQI Committee was take data collection a step further and work towards developing a consensus approach for the calculations needed and protocols required to determine unit and system performance and ultimately to allow more accurate methods for determining energy savings. This WG will help develop the "what" while the next two efforts will focus on "how to" determine performance.
 - Dale Rossi suggested they consider data collected to determine system capacity and efficiency as part of the larger picture that had an impact on system reliability and longevity in addition to energy savings.

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- Bryan Rocky asked whether the focus was on initial installation start-up & commissioning, retrofit equipment for existing buildings or repair/replacement of components. Initial commissioning would provide a baseline for later comparison. Pete Jacobs replied the intent was more in line with equipment retrofit and maintenance than initial commissioning. To take snapshots of unit performance for pre/post comparison for any activities which were intended to impact performance.
- Jeff Aalfs asked Pete what he meant by snapshot. He thought that monitoring over time had value. Pete replied that he thought of snapshots would be readings taken during a single site visit. Not monitoring over days or weeks. This group would need to balance the amount of data, its analysis and resources required vs. the value. Monitoring over a period of time would probably be out of scope for most programs. He thought they should first tackle the data required for even a snapshot for performance evaluation purposes first. But, an interesting question that could be discussed further.
- Shayne Holderby had reservations about any "over time" data collection. If the context was to be field gathered data, the expectation he had would be for instant or close proximity data gathering, not a data logger approach at least from a maintenance perspective. He pictured maintenance technicians on the roof for a limited time of their scheduled service.
- Jan Peterson said that for commercial economizers, they didn't lend themselves to instantaneous or snapshot data. Realizing their value, from her perspective, seemed to require some sort of monitoring over time. And, economizers were an area that offered a lot of energy savings opportunity.
- Dale Rossi suggested that this economizer and monitoring discussion might be better to hold in the FDD Committee meetings. Time series data was in their court.
- Rob Falke thought that the principles of monitoring and single point of time measurement were parallel. He encouraged those interested in that area continue to participate on the working group and to learn about testing principles. He thought the starting point was a field visit on the roof for a single visit.
- Chris Ganimian asked Pete why they wouldn't consider the commissioning piece. Weren't they after the same goals when replacing an existing piece of equipment? Pete replied that he thought they were trying to first focus on a subset of data that would help establish system efficiency and capacity. This information could easily plug into a commissioning protocol as a subset of measurements and data collection.
- Shayne Holderby agreed with Chris Ganimian's comment. He thought that often the steps which should of occurred during a proper commissioning and didn't occur then got shifted over to maintenance. He saw that shift as a disconnect. Commissioning a new installation should have established a high level of system performance for maintenance to retain. When commissioning steps in installation were skipped, it fell on maintenance to have to recommend service or repair to correct them.
- Bob Sundberg, WHPA staff, offered that it could be very valuable to obtain the same snapshot of outgoing system performance as would be taken for the replacement system once installed and "commissioned" and verified to be operating properly. Those replaced system snapshots could accumulate to form a database of replaced system performance, a marketplace performance baseline to replace the existing CPUC & CEC assumptions of 100% compliance with Title 24 rated performance. It might not provide the accuracy that monitoring over time could provide but it should be able to establish some real field measurements of actual unit/system performance rather than the current approach based on questionable assumptions and model partial factors. To have the critical elements for even snapshots for performance assessment would be leap forward.

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- Rob Falke shared some data from a presentation made recently to the full CQI Committee on performance data collected as part of the SCE Commercial Quality Renovation (CQR) program over several years. Capacity was increased 42% on one 10 ton unit. A 4 ton increase in capacity with an energy kW increase of only 2%. Assessing field performance was a new opportunity to support programs and communicate value to customers.
- S7 - This Working Group being formed was the result of formulating the full CQI Committee Goals and Implementation Plan - Relevant CQI Committee Goals reviewed
 - Support a cross-committee working group to develop a field data collection specification for reporting unit specific data collected by contractors. This data specification will be used to standardize field data for tracking program accomplishments and conducting program evaluation
 - Form an additional working group to produce a standardized, repeatable performance based method for system evaluation including calculations and needed formulas. (See Commercial Installation Committee Goal 4)
 - Then establish a third workgroup to publish HVAC system performance verification procedures (or how-to test procedures) determined in steps one and two. (See Commercial Installation Committee Goal 5)
- S8 - Working Group Goals
 - Identify critical data elements needed to accomplish objective
 - Provide clear definitions of those data
 - Establish reliability of the data
 - Understand the context of the data collection
 - Tools used and their accuracy
 - Sensor placement
 - Experience of person making the measurements
 - Establish basic quality control protocols
 - Range checks - flag "out of the ball park" readings, data entry/transcription errors
 - Internal consistency - e.g. in cooling mode you'd expect leaving RH to be same or lower than entering RH - cooling would NOT increase RH
 - Establish data capture and documentation guidelines
 - Comments.
 - Skip Ernst/Daiken. There's a degree of uncertainty even in laboratory conditions but even more so in field measurements. Pete replied that the information he thought they'd specify would be helpful to consumers of the data to understand the instrumentation used, accuracy of those tools and sensor placement so they could make an independent judgment of the uncertainty of measurements.
 - Dale Rossi/FDSI often wondered whether data was measured at all, measured from the unit it was purported to be from or just made up. Fraud detection should be considered. Pete replied - good point. Hopefully, some of the QC procedures could flag some of that.
 - Rob Falke, CQI C. Chair, added that a lot of the questions about sensor placement and protocols for data/measurement collection would be addressed when the committee tackled their Goal #5. That's where they'd dig deep into the instrumentation use, accuracy issues and recording information valuable to consumers of the data. That group will address confirmation of data. Rarely was one single reading alone considered credible. Single time readings seemed to form a pattern. Once reading inconsistent with all others would

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stick out like a sore thumb. Multiple complementary readings would help verify any single reading or discredit one that appears out of place.

- Chris Ganimian agreed with Rob's comments. By taking a suite of readings, the outliers stand out in almost all cases.
 - Pete Jacobs took from the above comments that it was important to capture what was used to take the measurements as well as how they were taken within the data spec. Quantifying uncertainties might be pushed off to a later activity. Maybe plan on tackling that when the committee addresses Goal #5.
- S9 - Data Specification Considerations - balance the needs and realities for collectors/producers (tech on the roof) and consumers (evaluators, researchers)
 - What's practical and not onerous for those collecting
 - What's critical to know for those attempting to use the data, assurances that the data was reliable. This data would be important for DEER updates on the ex ante side of the CPUC. Also, it would be of extreme value for the CPUC/ED ex post group which Pete works with regarding program evaluation.

Comments

- Jarred Metoyer, DNV-GL thought that program evaluators would also have a dual role of being producers of data as they verified samples of completed jobs.
 - Bryan Rocky, JCI, asked how this would work for equipment tied into building automation systems? How would the data collected by those systems be considered when there was no technician manually recording data? And, who owned that data? Pete confirmed that their assumption had been that data would come from handheld instruments. Good point. Something they hadn't considered.
 - Shayne Holderby thought that the basic data points which building automation systems collected would be a good place to start with identifying what data was critical for performance evaluation.
 - The group discussed ownership of data collected within a utility program. Dale Rossi - he who pays for gathering that data, usually the building owner, owns the data according to some court cases. Rob Falke - in the TAB air balance world the air balancer typically owns the data under a copyrighted published document distributed to owners and architects. Ben Lipscomb - if the data is collected as part of a utility program which the customer has consented to participate in, the data belongs to the utility.
- S10 - More Data Specification Considerations
 - Not all data was necessary for all activities - service data lists would differ from commercial installation
 - Multiple methodologies exist depending upon specific purpose. They'll need to identify a particular methodology or protocol and the data specific to that approach. Try not to be judgmental about one being better than others
 - S11 - Steps In The Process
 - Identify an initial table
 - Discuss, review, compare, add/delete
 - Standards review and selection
 - Finalize Field Data Collection Specification
 - Submit to appropriate committee for review/comment/approval
 - Submit to WHPA Executive Committee for approval/adoption

Comments

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- Jeff Aalfs - how would monitoring collection of data fit into this work since it seemed like most of the focus was on technician manual collection of measurements? Pete thought that was still an open question. Bob Sundberg, WHPA staff, afterward noticed the parallel activity between the monitoring of the economizer systems which Jeff and Janet had described and the question Bryan Rocky had raised about how would building automation system monitored data fit in. Both involved automated data collection with a subset of the data that would probably be needed. The group would have to get into what points were being monitored and data collected before it could go further on this source of information.

- S12/13 - Data Spec Overview - what could be measured and recorded
 - General data
 - Contractor and technician data
 - Customer information
 - Job information
 - Equipment data
 - Site conditions during test
 - Direct field measurements
 - Airside
 - Temperature, humidity, pressure, flow rate, etc.
 - Refrigerant side
 - Temperature, pressure, charge adjustments, etc.
 - Electrical
 - Phase, V, amps, PF, watts
 - Combustion
 - Temperature, O2, CO
 - Controls
 - Thermostat/controller, economizer
 - Settings and signals

Comments

- Ben Lipscomb offered an alternative view. That if might be valuable to have the "end product" metric in mind as they tried to determine which measurements were critical to capture and record. For example on the airside you might want to get at sensible capacity and total capacity. Then, identify what measurements were necessary to get those values. That approach could reduce efforts spent going after extraneous data points. Pete Jacobs agreed.

- Shayne Holderby offered that a lot of the equipment data was already included in equipment make, model and serial number a technician already collected. They should try to avoid duplicate requests for information already known through the make, model and serial number unit information. Voltage and phase and other basic information could be easily extracted from that model number later and save time in the field.

- Dale Rossi commented that the total nominal capacity information was typically included in the model number. Determining capacity in the field required a complex set of algorithms or a time-consuming manual process. Asking the technician to fill in the nominal capacity for a unit might seem like repetitive data gathering but incredibly useful later during analysis especially when doing the same for large numbers of units. The EER of a unit would be a look-up from that model number. If not captured the missing information becomes a huge problem later on but also at the



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time the unit is being evaluated in the field. He cautioned about going too far in efforts to streamline data collection. Extracting that critical information from the model number becomes very difficult later on.

- Ben Lipscomb added that the operating values in the field could vary greatly from the rated values for the equipment, especially when considering volts, amps, watts and power factor. That difference represented a lot of the opportunity to deliver savings.
- Rob Falke offered that this difference being discussed seemed to him to represent the old way of looking at equipment, to assume rated values and that the system worked perfectly. Those values compared to how the unit actually was operating on the building. His work had found that much of the equipment they'd addressed was only operating at 50% to 60% of a rated capacity even when adjusted for ambient conditions. Both sets of values are critical to capture and compare. What the unit manufacturer specified or rated compared to what values would be measured in the field. Part of the failing today is the inability to ensure that units are installed properly and delivering those values specified by the equipment manufacturer. The really poor performance out there seems to be a result of initial installations not being held to those standards. That field verification step that the group is developing this field measurement data spec for will help provide the data needed to make the comparison between those two sets of values. Getting those two sets of data leads you to comparison which leads to diagnosis and corrections or repairs which leads to improving the efficiency, capacity and longevity of the equipment.
- Shayne Holderby made comments about his concern that technicians with very limited time could well spend excessive time collecting and recording data which would compete with the primary purpose they were there for whether in installation or maintenance services.
- Donald Prather, ACCA, pointed out that he believed that if all of the ACCA Standard 5 procedures were followed and all the data points the standard identified were collected, everything would be provided which Rob pointed out to do the comparison of rated vs. operating values. It did leave off with telling you how to do that comparison. The procedures outlined the need to collect and document the manufacturer's data as well as measurements taken in the field.
- Dale Rossi said he firmly supported the standards. The standards typically now provided a minimum level. He didn't want the idea lost that one could offer services beyond those minimum standards, often called premium services. Like the value comparisons Rob had referred to.
- Chris Ganimian pointed out that there were a couple of advantages to reducing the amount of data needed or not collecting duplicate data. It would be more appealing to the technician being asked to collect the data. From a utility program perspective, it could help lower the TRC or total resource cost - ratio of energy efficiency measure cost-effectiveness - for a utility program. The less data which needs to be collected would translate into fewer man-hours for collection. The job for this group was to vet out what measurements needed to be taken in the field. It was very critical to capture what the manufacturer's expected performance ratings were and compare that to what the tested performance was. see ##### below
- Adam Scheer, PG&E, said that a lot of the data being discussed could be valuable but was limited in its utility if the evaluation was done a long time after the data was collected. That might be way beyond what this working group would get into but thought I should point that out.



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- Chris Ganimian added, building on Adam's comment, that the measurements being used during the evaluation needed to be the same measurements employed during the installation. The installation practices, in his opinion, should be the same across implementation (installation), EM&V and program evaluation.
- Pete Jacobs explained from his EM&V perspective that evaluation studies were often done at a different level of rigor from standard data collection from day-to-day operations. Well beyond what they'd expect any normal installation, maintenance or service tech to do. e.g. To evaluate refrigerant charge, they evacuate the system and weigh the refrigerant because that's the most reliable method they know. This is applied on a sample basis and as such can be justified for the often extensive time and effort it took, sometimes 10X. That degree of effort just wouldn't make sense to deliver on a regular service basis. To the extent that there could be pre-measure reliable data available, that would just help everybody. And, they'd need to keep the final metrics in mind as they tried to determine the data elements needed so that they or others could ultimately determine those metrics to allow pre/post comparisons.
- Dale Rossi wanted to make clear that there was a large difference between real energy savings and "claimed" energy savings. (Staff note added: Claimed energy savings probably referred to utility program work papers written to and for CPUC/ED approval which were discounted from real savings which customers might actually be provided on an individual unit/building basis. The discounts were based on a variety of factors such as established DEER averaged savings, confidence level in technician proper implementation, assumptions of compliance with Title 24 requirements and AHRI manufacturer performance ratings.)
- Rob Falke commented that this focus on actual performance that would allow a before/after comparison was a key element that was missing from current standards and utility program evaluations. As Dale Rossi indicated, in California for decades the current approach has been a negotiated "claimed savings" to utility program individual energy efficiency measures. Working from a performance perspective would provide information which people could more readily understand.
- Chris Ganimian stated, regarding utility programs, programs were judged on their energy savings that were proven to be delivered "above code." Title 24 and the mechanical codes just don't occur often in this cost driven business. He understood that the vast majority of new installations didn't involve permits being pulled or Title 24 compliance levels of performance being verified. Programs were hampered in this assumption that the current baseline required the assumption that all installations complied with Title 25 requirements which just wasn't the case. Utility programs were forced to "claim savings" based on unrealistic and unsubstantiated baselines of Title 24 compliance. It stifled the improvements which could be taking place and also grossly underestimated the savings which was taking place.
- Pete Jacobs suggested that Chris was addressing what was really an overarching policy issue and, though very important, they'd better try to focus on the data specification and hope that effort could help address the larger issue in the future. That the discussions about policy and baseline be moved to the appropriate committees to be worked.
- Ben Lipscomb mentioned that there was a new legislative assembly bill, AB 802, which did address re-establishing a new approach to energy savings which might affect baseline. Going forward savings would, as he understood the bill, be calculated from the existing condition as indicated at the building meter. He suggested they think about how the output of this group could dovetail with that policy change and put some of the expressed ideas into practice.

From Chris Ganimian's comments above about TRC - total resource cost for utility programs



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http://www.cpuc.ca.gov/NR/rdonlyres/58129C08-C0EC-4C0F-926C-327F1A710537/0/ClarificationofSeveralCostConceptsinCPUCDemandSideCostEffectivenessTestsFinal.pdf

The tests used to evaluate the cost-effectiveness of CPUC’s demand-side programs are described in California’s Standard Practice Manual (SPM¹). Two of the tests described in the SPM that are primarily used by the CPUC in determining demand-side cost-effectiveness include the *Total Resource Cost (TRC)* test, which is the measure of cost-effectiveness from what is sometimes referred to as a “societal” perspective (more precisely, the TRC is measured from the perspective of the utility and all its customers) and the *Program Administrator Cost (PAC)* test, which is the measure of cost-effectiveness strictly from the perspective of the “Program Administrator,” which is usually, but not always, the utility.

Table 1 summarizes the basic costs and benefits used in the TRC and PAC tests, as defined in the SPM.

Table 1

	TRC	PAC
Administrative costs	COST	COST
Avoided costs of supplying electricity	BENEFIT	BENEFIT
Measure Costs (capital costs)	COST	COST
Incentives paid*		COST
Increased supply costs	COST	COST
Participant Costs**	COST	
Tax Credits	BENEFIT	

* As explained in this paper, the term 'incentive' is often used more generally than the strict definition of incentives included in the SPM. For the purposes of this table, 'incentives paid' does not include any rebates or any other costs of purchasing equipment.

** Includes participant capital costs, installation costs, value of service loss, and transaction costs. and is sometimes corrected to eliminate free ridership.

- S14 - Data Specification Format
 - Rather than ONE BIG SPREADSHEET, develop a series of relational tables to minimize repetitive data entry/updating
 - Example:
 - Measurement protocols define instruments, accuracy and sensor placement
 - All measurements made under a defined protocol are linked to the instrument accuracy and sensor placement information
 - Exceptions entered only as needed

Data Specification draft Spreadsheet

Pete Jacobs suggested that with the limited remaining time, it might be better to have more members take a close look at the spec and provide him with their input prior to the next meeting. He'd go back and revise the draft spec based on that feedback. They could then plan to go through the draft in more detail at that next meeting. He asked if that made sense to members.



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Dale Rossi asked that they get back to Ben's question about what they were trying to achieve, about some guiding metrics. Otherwise, it was difficult to know what data would be important if you were not clear on what you were trying to achieve with the data.

Pete's understanding was that they were trying to identify the data required to determine system efficiency and capacity.

Norm Stone, Clean Energy Horizons, was sensitive to data collection they'd devise possibly being too onerous for technicians to do. He was very interested, with technicians in mind, that they determine that hand full of measurements taken in the field that could help determine the energy use before and then after any installation or maintenance operation is completed. A solid sense of the efficiency improvements that were achieved.

Dale Rossi commented that the data requirements for air distribution analysis were more complicated and difficult than those needed to analyze the refrigeration cycle.

Rob Falke wondered whether members might provide data goals, overall or from their specialty, and maybe a few suggestions of critical reading from their various perspectives and the working group could evaluate that. Or, would that be a too large a flood of information?

Pete agreed with the suggestion. It might drive them toward a solution more quickly. That might be quicker than going back and forth between various spec versions.

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.

Closing Comments/Adjournment

Pete Jacobs thanked everyone for a great discussion and also those who provided email suggestions. The group decided that the next meeting should be held after the WHPA In-Person meetings which would be held the week of November 2. Pete suggested they once again hold an online poll to select a best day/time for the second two hour meeting.

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

The meeting was adjourned at 3:00 pm PDT.

* * * * *

Summary of Pending and New Action Items and Key Decisions

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.



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