

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND
AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400**

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO. TC 7.5 DATE: January 23, 2008

TC/TG/TRG TITLE: Smart Building Systems

DATE OF MEETING: January 22, 2008 LOCATION: New York City, NY

Members Present	Appt	Members Absent	Appt	E-Officio Members and Additional Attendance
Voting Members		Voting Members		Reinhard Seidl
Michael Brambley, Chair (V)	2006	Jonathan Wright, IM (V)	2007	Janice Peterson (TAC Section Head)
Robert Old, (V)	2006	Todd Rossi, (V)	2006	Gregor Henze
Steve Blanc, (V)	2004			Zheng O'Neill
William Healy, Wireless Application Subc., (V)		Corresponding Members		Vladimir Vukovic
Rich Hackner, Building/Utility Interface Subc., (V)	2006	Osman Ahmed, (CM)	2006	
Carol Lomonaco, Secretary, Program Subc., (V)	2007	Jerine Ahmed, (CM)	2007	
Jin Wen, FDD Chair, (V)	2007	Agami Reddy, (CM)	2006	
Peng Xu, Vice Chair, Research Subc., (V)	2006	Barry Rearden, (CM)	1999	
Vernon A. Smith, (V)	2006	Narendra Amarnani, (CM)	2004	
Haorong Li, (V)	2007	Dave Branson, (CM)	2001	
	2007	Marty Burns, (CM)	2002	
Corresponding Members		Jim Butler, (CM)	2002	
Chariti Young, (CM)	2002	Charles Culp, (CM)	2000	
Xiaohui Zhou, (CM)	2003	Arthur Dexter, (CM)	2005	
John House, Handbook	2006	Piotr Domanski, (CM)	2005	
Natascha Castro, Webmaster, (CM)	2004	Mohsen Farzad, (CM)	2005	
Srinivas Katipamula, (CM)	2005	Mark D. Johnson, (CM)	2004	
David Bornside, (CM)	2004	David Kahn, (CM)	1996	
Carlos Haiad, (CM)	2004	Michael Kintner-Meyer, (CM)	2007	
Barry Bridges, (CM)	2002	Mingsheng Liu, (CM)	2003	
Gene Strehlow, (CM)	2006	Darrell Massie, (CM)	2003	
Keith Temple, (CM)	2003	John Mitchell, (CM)	2000	
Michael Brandemuehl, (CM)		Ron Nelson, (CM)	1998	
James Braun, (CM)	2007	Hung Manh Pham, (CM)	2001	
		Kinga Porst, (CM)	2002	
		Mike Pouchak, (CM)	2003	
		Andrew Price, (CM)	2003	
		Ashok N. Kadakia, (CM)	2006	
		Glenn Remington, (CM)	2002	
		James Winston, (CM)	1996	
		Martha Jo Brook, (CM)	2006	
		Philip Haves, (CM)	2005	
		James W. Gartner, (CM)	2007	
		Maria Corsi, (CM)		

Members Present	Appt	Members Absent	Appt	E-Officio Members and Additional Attendance
		Sharon Dinges, (CM)	2006	
		Cliff Federspiel, (CM)	2006	
		John Seem, (CM)	2003	
		Ahmed Husaunndee, (CM)	2006	
		George Kelly, (CM)	2001	
		William Pienta, (CM)	2006	
		Les Norford, (CM)	2006	
		Arun Vohra, (CM)	2006	
		Pornsak Songkakul, (CM)	2002	
		Jeffrey Schein, (CM)	2007	
		Menelaos Stylianou, (CM)	2007	
		Shengwei Wang, (CM)	2007	

(V) = voting member

(CM) = corresponding member

DISTRIBUTION:

ALL MEMBERS AND CORRESPONDING MEMBERS OF TC/TG/TRG,

TAC CHAIR: Patricia Graef

TAC SECTION HEAD: Janice Peterson

ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:

Program: William Klock

Standards: Jerry W. White Jr.

Research: Patrick Hughes

Special Publications: Mark Fly

CTT: Joseph Anderson

Staff Liaison (Stds): Claire Ramspeck

Prof. Dev.: Gordon Holness

Staff Liaison (Resch/Tech Srv): Michael Vaughn

"These draft minutes have not been approved and are not the official, approved record until approved by this (council/committee)."

ASHRAE TC Activities Sheet

DATE: January 22, 2008

TC NO. TC 7.5

TC TITLE: Smart Building Systems

CHAIR: Mike Brambley

VICE CHAIR: Peng Xu

TC Meeting Schedule

Location, past 12 mo.	Date	Location, planned next 12 mo.	Date
Dallas, TX	1/30/07	Salt Lake City, UT	6/24/08
Long Beach, CA	6/26/07	Chicago, IL	1/27/09

TC Subcommittees

Subcommittee	Chair
Secretary	C. Lomonaco
Fault Detection and Diagnostics	J. Wen
Wireless Applications	B. Healy
Building/Utility Interface	R. Hackner
Research	P. Xu
Program	C. Lomonaco
Handbook	J. House

Program List for 2008 New York City Meeting:

Title	Chair	Status
Seminar: Issues in "Real" Wireless Network Applications	Carol Lomonaco	01/23/2008

Current Research Projects

1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)
Completed.

1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

1312-RP, "Tools for Evaluating FDD Methods for AHUs" – WS-1312. Contractor Selection in Denver. (Phil Haves, PMSC Chair)

2007 – 2008 Research Plan

Priority	Project	Contributors	Status
1	Fault Detection and Diagnostics for Centrifugal Chillers – Phase 3: Real-Time Implementation	WS Contributors Srinivas Katipamula. RTAR Contributors: Srinivas Katipamula, John House, Todd Rossi, Jim Braun, Natascha Castro	The TC 7.5 executive meeting will be held after the full TC meeting on Jan. 21, 2008, to discuss a contractor recommendation for this project.
2	Demand response optimization protocol and integrated training	Rich Hackner	Rich Hackner, TC has approved to submit this RTAR.
3	Reduce Simultaneous Heating and Cooling	Peng Xu	Peng Xu. TC7.5 probably will do an electronic vote on approval of this RTAR between now and Salt Lake City's ASHRAE meeting.
4	“What If” Emulation Tool for Training and Strategizing on Building Operations	Steve Blanc	Approved by TC vote at the NYC Jan. 2008 meeting.
Not Prioritized per NYC Mtg Jan. 2008	FDD for Supermarket Refrigeration	RTAR Contributors Daniel Choinere and John House	Approved in Denver. Discussed in Quebec City. Revised work statement to be drafted for Dallas. TC 10.7 is assisting and will cosponsor. Rolls off the RAC list in August 2007. Need to narrow the scope a bit. John House will provide another draft in Long Beach meeting.
Not Prioritized per NYC Mtg Jan. 2008	Development of metrics to evaluate benefits of sensor networks in buildings (new title)	RTAR Contributors Jin Wen and Agami Reddy. Revised by Bill Healy	Approved and voted on at Long Beach meeting.
Not Prioritized per NYC Mtg Jan. 2008	“What If” Emulation Tool for Training and Strategizing on Building Operations	Steve Blanc	Received comments. Need to define a clear application, education, FDD? Steve will revise the document.
Not Prioritized per NYC Mtg Jan. 2008	Status and benefits of demand response program for residential buildings	Jin Wen, Srinivas, Bill, Palieuta,	More work

Priority	Project	Contributors	Status
Not Prioritized per NYC Mtg Jan. 2008	Locate and identify IEEE 802.15.4 RF sources	Bob Old	Need justification and value to ASHRAE. Need a clear HVAC application.
Not Prioritized per NYC Mtg Jan. 2008	Whole-Building FDD	Les Norford	On hold. Les is still interested in pursuing the idea.
Not Prioritized per NYC Mtg Jan. 2008	Conceptual Design of a Self-Configuring HVAC Control System	Michael Kintner-Meyer	Revised draft WS discussed in Denver. Revisions planned. Tabled indefinitely. The RTAR has rolled off the RAC list.

Co-Sponsorship

None.

Technical Papers from Sponsored Research

RP-1011

Kintner-Meyer, M, Burns, M. 1999. "Utility/Energy Management and Control Systems (EMCS) Communication Protocol Requirements" Final report for ASHRAE Research Project RP-1011. Available on the TC 7.5 web site.

Kintner-Meyer, M.; Burns, M. 2000. Utility/Customer Information Services Part1: Descriptions of Services and Discussion on Interoperability for Service Implementation. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

Kintner-Meyer, M. Burns, M. 2000. *Utility/Customer Information Services Part 2: Data Object Modeling and Mapping to BACnet*. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

RP-1020

Norford, L. K., J. A. Wright, R. Buswell, and D. Luo. 2000. "Demonstration of Fault Detection and Diagnosis Methods in a Real Building (ASHRAE 1020-RP)." ASHRAE 1020-RP Final Report.

Luo, D., L. K. Norford, S. R. Shaw, and S. B. Leeb. 2002. "Monitoring HVAC Equipment Electrical Loads from a Centralized Location – Methods and Field Test Results." ASHRAE Transactions Vol. 108(1).

Shaw, S. R., L. K. Norford, D. Luo, and S. B. Leeb. 2002. "Detection of HVAC Faults via Electrical Load Monitoring." International Journal of HVAC&R Research, 8(1):13-40.

Norford, L.K., J. A. Wright, R. A. Buswell, D. Luo, C. Klaassen, and A. Suby. 2002. "Demonstration of Fault Detection and Diagnosis Methods for Air-Handling Units (ASHRAE 1020-RP)." International Journal of HVAC&R Research, 8(1):41-72.

RP-1043

Bendapudi, S., Braun, J.E., and Groll, E.A., "A Dynamic Model of a Centrifugal Chiller System – Model Development, Numerical Study and Validation," ASHRAE transactions, Vol. 111, Pt. 1, 18 pages, 2005.

Final report for ASHRAE Research Project RP-1043, "Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers" is available on the TC 7.5 web site.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "The Sensitivity of Chiller Performance to Common Faults," International Journal of HVAC&R Research, Vol. 7, No. 3, pp. 263-279, 2001.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "A Survey of Common Faults for Chillers," ASHRAE Transactions, Vol. 108, Pt. 1, 2002.

RP-1139

Andersen, K.K., and Reddy, T.A., 2002. "The Error in Variable (EIV) Regression Approach as a Means of Identifying Unbiased Physical Parameter Estimates: Application to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.3, pp. 295-309, July.

Reddy, T.A. and Andersen, K.K., 2002. "An Evaluation of Classical Steady-state Off-line Linear Parameter Estimation Methods Applied to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.1, pp.101-124.

Reddy, T.A., Niebur, D., Andersen, K.K., Pericolo, P.P. and Cabrera, G., 2003. "Evaluation of the Suitability of Different Chiller Performance Models for Online Training Applied to Automated Fault Detection and Diagnosis", International Journal of HVAC&R Research, Vol.9, No.4, pp. 365-384, October.

Reddy, T.A., Andersen, K.K. and Niebur, D., 2003. "Information Content of Incoming Data During Field Monitoring: Application to Online Chiller Modeling", International Journal of HVAC&R Research, Vol.9, no.4, pp.385-414, October.

TC Sponsored Symposia, Transactions, Poster Sessions (past 3 years, present, planned)

Title	Date (Given or Planned)
Software Tools for Enhanced Building Operation (House)	Dallas, 1/07
Automated Fault Detection and Diagnostics (FDD)	Long Beach 6/07
Formulation of Generic Methodology for Assessing FDD Methods and Its Specific Adoption to Large Chillers	Long Beach 6/07

TC Sponsored Seminars (past 3 years, present, planned)

Title	Date (Given or Planned)
Load Management: Why You Should Care and What Technology is Emerging (Katipamula, TC 1.4 and TC 7.4 co-sponsor)	Chicago, 1/06
User Experience with HVAC Fault Detection and Diagnostics – Part 1 (Cherniack, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06
User Experience with HVAC Fault Detection and Diagnostics – Part 2 (Thomle, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06
Emerging Wireless Technologies (Brambley)	Dallas, 1/07
Approaches to Deploying Wireless Technologies (Wen)	Dallas, 1/07
Fault Detection and Diagnostics – But What About Correction (Katipamula)	Dallas, 1/07
Issues in “Real” Wireless Network Applications (Planned)	NYC, 1/08
Challenges and Lessons-Learned from Exchanging Data/Information Between EMCS and FDD Tools (Planned)	NYC, 1/08
FDD ---But What About Correction? (Planned)	TBD
Challenges and Lessons Learned From Showing Data From FDD (Submitted and accepted as Seminar 27 “Exchanging Information Between EMCS and FDD Tools for Better Building Performance: Challenges and Lessons Learned” (Wen) for SLC 6/08)	TBD
Part II: Issues in “Real” Wireless Network Applications (Planned)	TBD

TC Sponsored Forums (past 3 years, present, planned)

Title	Date (Given or Planned)
What the utility wants to do to your building and how you will benefit (Kintner-Meyer, TC 7.4 co-sponsor)	Denver, 6/05
Wireless Sensing and Control: Where is it Needed and What Should it Control? (Brambley, TC 1.4 co-sponsor)	Chicago, 1/06
Fault Detection and Diagnostics: Are You Ready to Put it in Your Building? (Brambley, TC 1.4 and 7.6 co-sponsor)	Dallas, 1/07
How Secure Is Your Wireless Control Network? (Planned) [[aka “How Secure and Reliable Is Your Wireless Control Network? (Planned) for NYC]]	TBD

TC Sponsored Public Sessions (past 3 years, present, planned): None

Journal Publications (past 3 years, present, planned): None

**Main TC 7.5 Meeting
ASHRAE TC 7.5, Smart Building Systems
January 22, 2008**

1. Call to Order, Roll Call, and Introductions

The meeting was called to order at 3:34p.m. with Chairman Michael Brambley presiding and Carol Lomonaco as Secretary.

Michael Brambley read the scope of TC 7.5 and handed out the agenda for the main meeting. Everyone introduced themselves. The signup sheet for the General TC 7.5 Meeting was passed around for everyone to sign. Also, the server is being setup and the agenda as well as other documents will be on the server.

Carol took the role call for all the voting members for TC7.5. A quorum was not established. Participants continued to enter the room. Carol retook the role call for voting members; nine members were present, establishing a quorum.

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Motion : “Approve Amended Long Beach TC 7.5 Meeting Minutes”, by Bill Healy, seconded Rich Hackner, no further discussion, Vote: 8-0-1 chair not voting (Vernon Smith came in and was included in the vote.)
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After the vote, Jin Wen came in the room, increasing the voting members present to 10.

Janice Peterson, our liaison, was present. Michael asked to now discuss a request from Carlos Haiad to hold a special meeting/workshop.

Michael asked about Carlos’ idea to hold a meeting/workshop to get feedback from the supermarket refrigeration (i.e., for ice machines, display cases etc.) industry (to harvest ideas to drive a future RTAR), directly to Janice Peterson (during the main meeting) and she said to ask Michael Vaughn. Carlos asked if he could put on the invitation“... that ASHRAE TC 7.5 members will participate”. The objective is to gather information for TC7.5 to help us better formulate an RTAR in the area of supermarket refrigeration. **Michael Brambley will take this as an action item and ask Michael Vaughn.**

Chair announcements (by Michael Brambley: Chair)

Michael Brambley made the following announcements:

-An executive meeting of TC7.5 will be held immediately following this meeting for the purpose of considering the recommendations of the Project Evaluation Subcommittee (PES) for a Request For Proposal (RFP) that was out for a project that TC7.5 is sponsoring. The participants will be voting members of TC7.5 and members of the PES. Members of the participating bidders (even if they are voting members of the committee) will not be allowed to attend the executive meeting. Michael Brambley wants to try to adjourn the TC7.5 Main Meeting by 5:30 p.m. today Tuesday January 22, 2008, in order to start the executive meeting, because conflicts that some PES members have with other meeting at 6:15. Note that is one half hour earlier than normally scheduled so that we could possibly meet.

-Carol Lomonaco reported on an email ballot that was held between the Long Beach Meeting and the New York City Meeting to approve the minutes of the Dallas meeting. The motion was to approve the Dallas minutes as revised and presented in the file distributed with the ballot: Michael Brambley distributed the ballot on July 30, 2007. The Dallas Meeting Minutes were approved by a vote of 10-0-1, Chair not voting and one member not available for the ballot.

A second email ballot was held between meetings. Because additional information was needed Peng Xu would report the results near the end of these announcements.

-Michael Brambley invited anyone who would like to become a Corresponding Member (CM) of TC7.5 for 2008-2009 (who is not already one) to pass a business card or a note with your contact information and your ASHRAE Member number to Michael.

-Michael reported that during the Section 7 Chair's breakfast meeting, during the discussion of TC websites, TC7.5 was given a gold star as the best web site in Section 7 for the second meeting in a row by Janice Peterson. Michael said Janice Peterson sited TC7.5's website as a model for other TCs to follow as they develop their own website. Natascha Castro was thanked for her efforts as TC7.5's website creator and webmaster.

-US Green Building Council (USGBC) has approximately \$1M in research funds, A call for proposals is expected the week of January 25, 2008. This is something that preparers and authors of RTARs and Work Statements may want to keep in mind for the future.

-Program liaisons would like feedback from the committees (apparently changes are coming) and Program Subcommittee chairs (in this case Carol Lomonaco is the Program Chair for TC7.5). In addition to accepting information from them periodically, program chairs should also be communicating back and forth to the Program Committee Liaison. Any questions or comments about Program should be passed on to Carol and she will communicate them to the Program Committee.

-Michael Brambley talked with Moe Hosnee, Chair of the ASHRAE Program Committee, about program concerns that were given directly to Michael, specifically lack of information communicated to sessions chairs. Moe said that he would look into this. He thanked Michael for the input and indicated it would be considered when the Program committee met.

-Handbook is moving into the Internet age and ASHRAE has released a tool called Handbook Central. It is somewhat patterned after ASHRAE's Manuscript Central.

-ASHRAE technology awards: if you have ideas for revitalization, please forward them to Michael. They want to spur development and highlight new technology.

-ASHRAE satellite broadcast, April 16, 2008 from 1p.m. to 4p.m. "Integrated Building Design." See the ASHRAE site (www.ashrae.org) for registration and more information. These programs have become very popular.

-TRG7 "Tools for Sustainable Building Operations, Maintenance and Cost Analysis", is looking for some help. Reinhard Seidl (from TRG7) spoke that they are seeking to improve the operations and maintenance of buildings and also to improve the design of buildings. There are probably 20 different TC's that overlap with the TRG7 subject area. TRG7 will map where

ASHRAE effort is at and perhaps combine some of the efforts "to get more punch for the buck."
Contact Reinhard Seidl if interested.

-Peng Xu reported on the second email ballot held this summer for approval of the RTAR "What if" Emulation Tool for Training on Building Operators." The ballot was distributed on July 26, 2007. The motion passed with a vote of 10 votes in favor of RTAR, 0 against, 1 abstaining (no response from a voting member not available due to vacation or out of the office), and Chair not voting.

-The IP Address for the wireless server connection at the meeting was announced as 192.168.0.99 for our current TC7.5 Main "Wireless" Meeting. TC 7.5 is trying to hold paperless meetings. There is an FTP server for everyone can connect, download the files to your computer, disconnect, and then refer to the files for the TC meeting from your computer.

Subcommittee Chair Reports:

Fault Detection and Diagnosis (FDD) Subcommittee Report – Jin Wen

A new version of RTAR-Draft “A Building Systems Emulation Tool for Building Operators” by Steve Blanc was discussed. The output of this work is an automated (software) tool so that building operators (including building engineers) to emulate and train to provide broader knowledge to building operations. It will help develop a software tool. Steve has updated the RTAR.

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Motion: To approve the RTAR titled “A Building Systems Emulation Tool for Building Operators” by Jin Wen, a second is not needed says Charity Young because it came from a TC 7.5 subcommittee.

Michael Brambley asked if there was further discussion related to the motion.

Dave Bornside commented that the title “A Building Systems Emulation Tool for Building Operators” was limiting and recommended that the title be expanded to be more generic. Jin Wen said in the end, TC1.4 did not vote to co-sponsor this RTAR so it was felt that the title did not have to be changed. Dave Bornside commented that TC1.4 wanted the title to be more general because it was felt it would have a better chance of being approved by RAC.

Dave Bornside made one other comment to everyone that “the title is limited because he felt that the tool would be used by multiple personnel.”

Barry Bridges asked what is meant by operators. Is it the person on duty from midnight until 6 am who responds to (building) alarms? Barry stated that it seems like more than the operator is involved---maybe a higher level administrator. Is the question to remove “for building operators”? Is anyone who operates the building the Building Operator? How about “for Building Operations” instead of “Building Operators”? Charity Young said TC1.4 was hung up on the title only---not the content of the RTAR. Jin Wen and others accepted the title change. Steve Blanc and others had no problems with the title “A Building Systems Emulation Tool for Building Operations”.

Jin Wen accepted the suggestion as a friendly amendment and restated the motion as follows:

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Motion: Approve the RTAR for “A Building Systems Emulation Tool for Building Operations” by Jin Wen. No further discussion.

Vote: 9-0-0 chair not voting (10 voting members present)

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Jin Wen then discussed two new RTARs.

New RTAR “Reduce Simultaneous Heating and Cooling”

The goal of this RTAR is to analyze the problem in large commercial buildings. The scope is to identify how big of problem is and then to estimate the potential savings. Then develop a method to detect the fault and develop tools for designers to avoid this problem of simultaneous heating and cooling.

Peng Xu asked if we should vote for this RTAR. Jin Wen suggested submitting it later, David Bornside wanted to review this RTAR because of applications in Europe. Michael Brandemuehl pointed out that the next deadline for submitting RTARS for RAC consideration is March 3, 2008. TC7.5 could do an email electronic vote if the RTAR is ready by March 3, 2008.

Jin Wen introduced a second new RTAR entitled "Heating System FDD." This RTAR is authored by Jin Wen. It was originally authored by Srinivas Katipamula. The purpose of this RTAR is to evaluate problems with the heating systems. Tasks include identification of faults such as leaking valves, stuck valves, coil fouling and coil blocking. Also, tasks include identifying existing and new FDD methods for heating systems, and to evaluate these methods through simulation and experimental studies. Also, the term heating system needs to be defined still. Jin Wen said the RTAR is not ready to be voted on yet at NYC. Jin will seek more input from people who are involved with heating systems and understand faults. An updated RTAR will be ready for Salt Lake City (2008 ASHRAE Summer Meeting).

Jin reported that the subcommittee discussed a new and old idea of fault detection and diagnostic for supermarkets. This RTAR "Fault Detection and Diagnostic Methods for Supermarkets" authored by John House had been actually approved by RAC a few years ago, but the focus was in dispute. There was not really a lot of input. Carlos Haiad proposed to hold a focus meeting with industry people and ASHRAE members (after Michael Brambley checks with Michael Vaughn). John House will be happy to receive any comments. Carol Lomonaco asked whether the RTAR is still listed on RAC's list as RTAR-1429? Jin Wen stated that the RTAR number has expired, and John House thought it was taken off RAC's list.

Jin reported that the program for FDD will be discussed when Carol Lomonaco discusses program later in the meeting.

Research Subcommittee Report – Peng Xu

Peng reported that there is \$2.3 Million ASHRAE research budget for 2008-2009. There are several deadlines to be aware of for RTARs and Work Statements (WS). The deadlines are March 3, May 15, August 15, and Oct. 15, 2008. The long term research process for ASHRAE is still going on sustainability and they encourage people to develop RTARs and WSs in that area.

Current Research Reports:

During the TC7.5 Research subcommittee meeting, the three (3) current research projects were discussed.

1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service

(Todd Rossi, PMSC Chair) Todd Rossi was unable to attend the TC meeting, but he presided over the meeting of the PMS for 1274-RP with the contractor held Saturday morning.. Keith Temple was at the TC7.5 main meeting and reported on the PMS meeting.

The PMS requests a no cost extension until July 2008. Michael Brambley, a member of the PES for 1274-RP said “The measurements are completed and there is a preliminary draft of the report. The contractor said that they could deliver the report by April 2008 but the PMS suggested that we request a short extension until probably July 2008 so this is not rushed too much, there is adequate time for the PMS to review the report and provide another round of comments, and for the contractor to have the report ready for approval at the Salt Lake City Meeting. So the request for the extension really came from the PES rather from the contractor.

Steve Blanc (also a member of 1274-RP PES) stated that the PES asked that a number of explanatory parts be added to the report that the PES felt would make the report more useful. The PES wanted to make some items a little more generalized.

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Motion: “TC 7.5 request a no cost extension until July, 2008 for 1274-RP” made by Peng Xu, seconded by Bill Healy. No discussion. It was approved by a vote of: 9-0-0, chair not voting. The motion passed.
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(David Bornside asked during the meeting if anyone minded if he took pictures for the TC7.5 website. Carol Lomonaco also reminded everyone in the room that she was recording the meeting to aid her in producing the main TC7.5 Meeting minutes. No one objected.)

Action Item: Peng will convey our TC7.5 vote for a no-cost extension of 1274-RP to Michael Vaughn”

The Second project:
Evaluation and Assessment of Fault Detection and Diagnostic (FDD) Methods for Centrifugal Chillers—Phase III

It was reported that the project had been put out for bid, and proposals received and evaluated

by the Project Evaluation Subcommittee. It was reported that the recommendation by the PES for a contractor was to be discussed and voted on at this evening's TC 7.5 executive session and we should not really talk any further about this.

The third project (second currently on-going project) is 1312-RP Tools for Evaluating FDD Methods for AHUs.

1312-RP: Tools for Evaluating FDD Methods for AHUs

Phil Haves, PMS chair, Reported that he had a meeting this morning with the contractor. Phil reported that the project started in September 2005 and it is expected to end on August 31, 2008 (the one year no cost extension was voted for and passed at the Long Beach ASHRAE meeting). A model has been developed. Since the last meeting experiments were performed to measure the effects of different faults on system behavior. The next step is to validate the individual component models and then the system model by comparing the performance predictions with measurements from the Iowa Energy Center's Energy Resource Center (ERS). In general the agreement is good. There may be one or two issues. The project is more work than originally anticipated. Jin Wen, the contractor, will try her best to finish the project by August 31, 2008. No action taken.

Research Plan for TC7.5

The Research Plan for TC7.5 was reviewed and discussed next.

Peng said that he has sent around a Research Plan "post" Long Beach Research Plan (doc file) list. Only the first four projects are prioritized. Also, Peng Xu read the list from his file of proposed priorities for the TC7.5 2007-2008 Research Plan. The following is the list (where Priority 1=highest):

Proposed Priority	Project	Contributors/Status
Priority =1	FDD for Chiller Diagnosis Phase III	The TC 7.5 executive meeting on Jan. 21, 2008 will discuss a contractor recommendation for this project.
Priority =2	"Demand Response Optimization Protocol and Integrated Training"	Rich Hackner, TC has approved to submit this RTAR.
Priority =3	Reduce Simultaneous Heating and Cooling	Peng Xu. TC7.5 probably will do an electronic vote on approval of this RTAR between now and Salt Lake City's ASHRAE meeting.
Priority =4	"What if" Emulation Tool for Training and Strategizing on Building Operations"	Steve Blanc. TC7.5 has approved this RTAR.

Peng Xu discussed the rest of the non-prioritized projects from the 2007-2008 Long Beach Plan. The next table gives the order in which the projects were discussed and an updated status. The projects will be carried over to the 2008-2009 Research Plan without a priority. Note: those

that were dropped are noted in the Contributors/Status column in the table below.

Project	Contributors/Status
Status and Benefits of Demand Response Program for Residential Buildings	Jin Wen, RTAR needs more work.
Development of Guidelines for the Use of Wireless Technologies in Building Application	Bill Healy, Question on who is the audience, draft RTAR Salt Lake City.
Wireless Control for Mission Critical Environments such as Pharmaceutical Manufacturer	Carol Lomonaco, new idea discussed in TC7.5 Research Subcommittee, first draft of RTAR will be for Salt Lake City
Control Network Faulty Behavior	Cliff Federspiel, dropped because no one is interested. Charity Young reported that TC1.4 has something related to this.
Whole-Building FDD	Les Norford, Les is in Singapore. There is a draft RTAR for this project.
Conceptual Design of a Self-Configuring HVAC Control System	Michael Kintner-Meyer, Michael is no longer interested. This project will be dropped.

Action Item: Carol Lomonaco to draft RTAR for “Wireless Control for Mission Critical Environments such as Pharmaceutical Manufacture r”

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Motion: To vote for 2008-2009 Research Plan for TC 7.5 as it is on the document as prioritized for #1 through #4, moved by Peng Xu and Seconded by Jin Wen, Discussion: Michael Brambley had one question. Do we have all RTARs that are far enough along and ready to send to RAC or ready to vote on before Salt Lake City via email? Peng said that only one RTAR would be ready to vote on between now and Salt Lake City via email. Michael checked with all of the TC7.5 Subcommittee chairs and found that everyone was in agreement with how many RTARs the TC needs to vote on before Salt Lake City. Motioned passed by a Vote of: 9-0-0 (chair not voting)

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Wireless Applications Subcommittee Report – Bill Healy

Bill Healy discussed RTAR 1430: “Development of Metrics to Evaluate Benefits of Sensor Networks in Buildings”. This was an RTAR that was re-submitted to RAC about a year ago. The feedback from RAC was they rejected it. RAC asked that this RTAR not be re-submitted. Bill will pull this RTAR 1430 because RAC or someone said it was too vague. The RTAR was not specific on what was needed to be on the research project. Bill said that the idea of RTAR is still valid. Someone in the future could still pick up this topic. If you have sensor networks in general, how do you know when it is a benefit to install it in your building for a particular application? A new RTAR would have to be written from scratch.

Bill Healy discussed another idea (from the TC7.5 Wireless Subcommittee Meeting) for developing easier more cost effective methods for potential users of wireless technologies to test in their own facility. (This is a general idea and no one has championed it yet.) The idea here is that currently to judge your own facility it requires a lot of expensive equipment and usually some expert knowledge. Perhaps there is a way to develop a quicker and easier way to assess your facility for the use of wireless technology. Bill encouraged anyone who is interested to contact him. The next step would be to develop an RTAR.

The second (rough) draft RTAR “Development of Guidelines for the Use of Wireless Technologies in Buildings” was discussed in the subcommittee meeting. At the last ASHRAE meeting, it was discussed and agreed that perhaps there is a need for a document that users of wireless technologies could look at and figure out what the issues are that they need to deal with. Some other questions it might address are: What standards should they be looking at? How do you install wireless controls? Bill got some feedback which asked who was the intended audience. People who have ideas are to contact Bill Healy.

Action Item: Bill Healy, Focus on user groups “who will use the wireless controls,” and then figure out what the focus should be. Then the focus will be what guidelines do they need. If you have used wireless technology to contact Bill for who is actually going to use this guideline.

The other topic that came up in the TC7.5 Research Subcommittee Meeting and is listed on today’s TC7.5’s Research Plan is “Wireless Control for Mission Critical Environments such as Pharmaceutical Manufacturers.” Carol Lomonaco is the lead on this RTAR. The general idea is that some critical facilities require some validation of how wireless systems are going to perform. If you are going to use wireless controls in such a system, what complications does it add for these critical facilities? Send your thoughts on this topic to Carol Lomonaco.

There were no items that needed to be voted on for the TC7.5 Main committee or action items to further discuss.

Michael Brambley commented that a lot of work has been done in the Wireless Subcommittee and now we need to get a successful RTAR submitted and approved.

Building/Utility Interface Subcommittee Report – Rich Hackner

Two RTARs were discussed that are in progress.

The first RTAR in progress is RTAR “Status and Benefits of Demand Response Program for Residential Buildings”. Jin Wen is the champion for this RTAR. It was approved by TC 7.5.

The other RTAR is for commercial buildings “Demand Response Optimization Protocol and Integrated Training”. This RTAR is championed by Rich Hackner. It was approved by TC 7.5 before and will be submitted in March 2008.

Program will be discussed by Carol Lomonaco later.

Program Subcommittee Report – Carol Lomonaco

Carol announced that TC7.5’s sponsored Seminar 87 will take place tomorrow, Wednesday. The seminar is titled “Issues in Real Wireless Network Applications,” to be held Wednesday, January 23, 2008, 1-2:30 p.m..

Next we discussed TC7.5 Program Plans for the Salt Lake City ASHRAE Summer Meeting June 2008. The program plans are:

“Challenges and the Lessons Learned from Sharing Data from FDD Applications”
(Seminar, Chair: Jin Wen),

“Issues in Real Wireless Network Applications, Part II”
(Seminar, Chair: Carol Lomonaco)

Carol spoke about having an “Aggregators Panel” for the Chicago January 2009 ASHRAE Winter meeting. Rich Hackner will be Chair. Rich asked the group to contact him with any other speakers to make up the panel. Rich is to double check the potential speakers because there was some discussion concerning whether one or more of the names were correct.

Carol also read aloud other ideas for program that were listed on the Program Subcommittee. The potential program ideas do not need any action at this meeting but they are noted so everyone can see what is still on the program cue. They are as follows:

Seminar, Lead: Carlos Haiad, when?
Understanding Your Electric Utility’s Meter Mumbo Jumbo Programs

Forum, Lead: Cliff Federspiel, when?
So Why Settle for Faulty Behavior on Control Networks?
(Need to verify with Cliff if he is still willing to lead this or should it be dropped.)

Seminar, Lead: Jin Wen, Chicago Meeting
FDD---But What About Correction?

Seminar, Lead: Bill Healy, Chicago Meeting
Measurements of Actual Wireless Systems in Buildings.

Carlos Haiad asked about program on residential meters. There was some discussion.

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Motion: To Approve for the Salt Lake City Meeting in June 2008 as “Priority=1 Challenges and the Lessons Learned from Sharing Data from FDD Applications (Seminar, Chair: Jin Wen), and Priority=2 “Issues in “Real Wireless Network Applications, Part II” (Seminar, Chair: Carol Lomonaco)
Moved by: Carol Lomonaco, Seconded by Bob Old.
No discussion.
Vote: 8-0-0; (chair not voting, Peng Xu left early). Motion passed.

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Lastly, Bill Healy reported being asked about the topic of Homeland Security, specifically regarding how building automation systems might be used. Is it of interest to TC7.5? Does the

Homeland Security fit in with of Smart Building Systems? (Bill stated that Homeland Security issues were big five years ago but have fallen off the radar screen.) Bill mentioned the particular topic of “First Responders Accessing Building Systems Michael Brambley asked if the Homeland Security topic deals in some way with “Smart Building Systems?” If it does, then it (Homeland Security) fits in this TC. How do you interface with your building from the outside? Bill answered that in that sense, it is somewhat like a smart building. Steve Blanc’s comments that maybe in the last Orlando ASHRAE’s meeting there was a seminar on a Homeland Security related topic. Michael Brambley could suggest a speaker, too. Contact Bill Healy if you are interested.

Handbook Report – John House

The meeting convened at 3p.m. on Monday, Jan. 21, 2008.

John House reported that the first material for TC 7.5 was published in the Applications ASHRAE handbook in “Chapter 39 Operations and Maintenance Management.” It is a small amount of material but it is a good starting point for TC 7.5.

The current plan is to expand on what TC7.5 did with adding material to the Applications handbook.

Thus John House spoke about the plan for each of TC7.5’s three subcommittees to identify the material that we can contribute to the handbook and where it might best be positioned. For example, for the wireless applications area there may be a summary of standards and their implications for building applications that may be pertinent for buildings.

And the same goes for Building Utility Interface and FDD. John House needs people to give some thought to this.

The first action is identifying the new material to be put in the handbook.
(John requested that those interested see him after this meeting if you would like to help with handbook material.)

John House wants to initiate dialog with those interesting in helping by March 1, 2008.

The second action would be once we had some new material to try and find the best place to put in the existing chapters in the ASHRAE handbooks rather than creating new chapters or handbooks.

Volunteers to help with content from our TC 7.5’s three subcommittee are:

- 1) FDD - Jin Wen, Jim Braun, Vernon Smith and Haorong Li
- 2) Wireless Applications – Bill Healy, Bob Old, Michael Brambley
- 3) Building Utility Interface – Bob Old, Carlos Haiad, Steve Blanc, Rich Hackner, and Michael Bobker

Contact John House if you think you have material ready to go for any of the handbooks.

Michael Brambley mentioned that he is on TC7.3 “Operations and Maintenance Management”. TC7.3 is responsible for that Chapter that TC7.5’s FDD material is in now. TC7.3 will start the development of their revisions to that handbook this summer. TC7.3 will have two years to prepare the revisions. Michael volunteered to help and be the liaison between TC7.3 and TC7.5 unofficially. Michael assumes that when he rolls off as TC7.5 Chair that he will become TC7.5 Handbook Subcommittee Chair.

Next after Handbook, we discussed two items on Program that we missed during the Program Chair’s (Carol Lomonaco) report.

Carol Lomonaco announced that PDH credits for Salt Lake City ASHRAE meeting program are going to be available. The Program would have to be submitted early to be approved for PDH credits--- Carol did not have the dates and details that came from an ASHRAE email with her.

Rich Hackner said he did the early submittals for another TC for the PDH credits for New York City. The approval process that he went through was not that difficult.

Michael Brambley had two things to discuss that are related to TC7.5 Program. He mentioned that he had asked Moe Hosnee about TG1 that had six program sessions at this meeting (New York City ASHRAE Meeting). Moe said that the PDH credits may help get more programs approved. If you get into the PDH cue, then you are more likely to get into the (program) schedule. Michael mentioned that perhaps if we let ASHRAE Program Committee know in advance that we are going to submit program for PDH credits, it may help TC7.5 get more program approved.

The second thing Michael Brambley asked of Moe Hosnee was “what is the trick to get a Forum scheduled.” Michael asked this question because TC7.5 tried to get a forum scheduled for several meetings and we have not been successful. Moe said that there are so few Forum spots available. ASHRAE actually added another timeslot to schedule forums at the New York City ASHRAE meeting. The problem Moe said was that every TC proposes forums because they are easy to put together. And one of the key factors is “the priority that you give that forum” and the second key factor is “does it align with the theme of the meeting?”

Web – Natascha Castro

The format of the TC7.5 website is the same. Anyone can make suggestions on the website. Contact Natascha Castro. Photos will be posted. Natascha Castro was asked by Carol to strip the email addresses from the New York City minutes. The question was also raised whether the official scope of TC7.5 is out on the website?

TC1.4 gives the subcommittee chair the privilege to upload material on their website. However, Natascha commented that TC7.5's website is on NIST's site so there will be no change in the way we administer the website. If anyone sees a problem with posting any material for TC7.5's website, bring it up at the Salt Lake City ASHRAE meeting. Natascha has been doing an excellent job in getting the materials posted on the TC7.5 website.

Homeland Security

Had some discussion earlier from Bill Healy. See section above on TC7.5 Program Subcommittee reported at the main TC7.5 meeting.

Old Business

-Nothing to report on old business.

-Michael Brambley asked if there were any liaisons in the room?

TC1.5 liaison is present – but has nothing to report. Xiaohui Zhou from TC1.5 will report in the future.

(There were lots of people from TC7.4 in the room.)

Dave Bornside from TC1.6 Terminology, Standard #166 for Terminology. Revisions to the official ASHRAE terminology is in the works, Michael Brambley asked that all members bring new terminology to the Salt Lake City ASHRAE meeting.

Mike Brambley suggested that the topical subcommittee chairs consider terminology as a part of their agenda for the next meeting in Salt Lake City. In fact, Michael commented that we use terminology that is not a part of the official ASHRAE Terminology List. Dave Bornside said that Standard 134 Graphic Symbols for HVAC should be examined for the need to update the terminology it uses.

Action Item: At the Quebec City ASHRAE meeting there was several liaisons noted. Carol should refer to the meeting minutes from Quebec City (said John House). Carol and Michael Brambley will take the action to review the Quebec City TC7.5 Meeting Minutes and see the liaisons that were listed.

New Business:

-Carol Lomonaco will add Peng's note (as he left the room for the airport): "Peng will convey our vote for no-cost extension of 1274-RP to Michael Vaughn".

- The potential merger of TC7.4 and TC7.5:

Mike Brambley said that over the last several years there has been informal discussion mostly among TC7.4 members including past chairs and so forth about whether TC7.4 and TC7.5 should merge. Michael Brambley has been approached a couple of times about the merger. Michael suggested that TC7.4 develop a merger proposal and bring it to TC7.5 since TC7.4 was originating the proposal. Also, Michael had expressed the opinion that TC7.5 maintain its current scope and whatever TC7.4 might bring to it be added to the scope of the committee. Michael also indicated that it is his personal preference that the name of TC7.5 be retained. Michael mentioned that earlier at this meeting at ASHRAE he met with the immediate past

chair, John House, and Srinivas Katipamula, the current TC7.4 Chair, and Peng Xu, the incoming chair of TC7.5. All sat down and discussed the topic of merger more seriously. Srinivas went away with the action to bring up the topic of TC7.4 and TC7.5 at his TC 7.4 meeting. Depending on where TC 7.4 was on this merger issue, Srinivas would decide whether to bring the issues to the TC7.5 main meeting so that we might consider what the options are.

Michael asked Srinivas to report on what went on at his TC7.4 Main Committee meeting yesterday.

Srinivas commented that more than half the people present at today's TC7.5's main meeting were at the TC7.4 meeting. He said that he brought the issue up for all the committee and those that were at the meeting. A straw poll was taken and everyone voted yes at the TC7.4 meeting. Then there was a motion for the TC chair to appoint an ad hoc group.

Carol Lomonaco asked what the straw vote wording was and Steve Blanc said that it was "A straw vote to propose that we merge TC7.4 and TC7.5". The straw vote was taken and everyone voted yes at the TC7.4 Main Meeting, except two people who did not vote. After the vote at the TC7.4 meeting yesterday, there was another motion made that the current TC7.4 chair appoint an ad hoc group to explore the final scope and purpose of the organizational merger between TC7.4 and TC7.5. Srinivas suggested that TC7.5 now take a straw vote at this meeting.

Michael Brambley asked if there was a motion to take a straw vote.

Steve Blanc made the motion.

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Motion: To have a straw vote including all the people in the room for the TC7.5 Main Meeting for the merger of TC7.5 and TC7.4. ("Yes" would be for a merger, and "No" would be no merger.)

Moved by: Steve Blanc, Seconded by: Someone said a second not needed for a straw vote.
Discussion: Charity Young asked about what the current TC7.4 Building Operations Dynamics scope is. Jim Braun said the TC7.4 scope deals with building operating strategy. So supervisory control, optimization and building operation dynamics. (Jim pointed out that the current TC7.4 scope will not match exactly what he just said.) Dave Bornside read the actual TC7.4 scope aloud for everyone. Jim Braun then commented that there really is quite a bit of overlap between TC7.4 and TC7.5.

Michael asked if TC7.4 discussed any of the ideas (that the smaller group that met privately discussed) about how to form the ad hoc committee. Srinivas said that he would leave it up to the ad hoc committee. Michael said that his opinion is that TC7.4 come into TC7.5 as a new subcommittee rather than re-structuring TC7.5 entirely. Michael said that he felt that everyone at the private meeting shared that view. Srinivas said that they talked about the idea of possibly keeping the same time slot that TC7.4 currently uses. John House said that TC7.5's topical subcommittees on Sunday afternoon would be left alone. Then the TC7.4 meeting usually held on Sunday night would meet on Monday afternoon. Steve Blanc suggested that the ad hoc committee meeting decide on the meeting time slots too.

Straw Vote: (Merge TC7.5 and TC7.4) 26-1-0 (27 people in the room). (Peng Xu left early and the TC7.5 chair voted).

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There was lots of lively discussion about the creation of the ad hoc group. Who appoints the members?

Action: Mike Brambley (as Chair for TC7.5) has the action item to appoint members to the ad hoc group from TC7.5. The Chair TC7.4 will appoint some of the members for the same ad hoc group.

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Michael Brambley requested that all voting members of TC7.5 vote on the merger of TC7.5 and TC7.4.

Vote: 7-1-0, chair not voting.

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Adjourn

Motion: Move to adjourn the main TC 7.5 meeting early and to go into Executive session by Steve Blanc, Seconded by Rich Hackner. Adjourned at 5:36p.m. January 22, 2008.

Appendices

- A. Call to Meeting and Agenda
- B. Scope and Organization
- C. Fault Detection and Diagnostics Subcommittee Meeting
- D. Wireless Applications Subcommittee Meeting
- E. Building Utility Interface Subcommittee Meeting
- F. Research Subcommittee Meeting
- G. Handbook Subcommittee Meeting Minutes
- H. Program Notes
- I. 1274-RP PMSC Notes
- J. 1312-RP PMSC Notes
- K. List of Subcommittee and Committee Attendees

Appendix A. Call to Meeting and Agenda

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle, NE, Atlanta, Georgia 30329-2305

404-636-8400 | Fax 404-321-5478

Reply to: Mike Brambley
K5-16, PO Box 999
Pacific Northwest National
Laboratory
Richland, WA 99352

January 12, 2008

Dear TC 7.5 Member, International Member, or Corresponding Member:

TC 7.5 on Smart Building Systems will meet in New York City according to the following schedule:

TC 7.5	Smart Building Systems	Tuesday	3:30-6:00p	Hilton/Bryant (2)
TC 7.5	Fault Detection & Diagnosis	Sunday	3:00-4:00p	Hilton/Concourse G (C)
TC 7.5	Wireless Applications	Sunday	4:00-5:00p	Hilton/Concourse G (C)
TC 7.5	Building/Utility Interface	Sunday	5:00-6:00p	Hilton/Concourse G (C)
TC 7.5	Research	Monday	2:00-3:00p	Sheraton/Carnegie East (3)
TC 7.5	Handbook	Monday	3:00-3:30p	Sheraton/Carnegie East (3)
TC 7.5	1312-RP PM	Tuesday	8:00-9:30a	Hilton/East Suite (4)
TC 7.5	1274-RP PM	Saturday	10:00a- 12:00p	TBD

TC 7.5 is sponsoring the following program session:

Seminar 87. Issues in Actual Wireless Networks

Wednesday, January 23, 2008, 1 p.m. to 2:30 p.m., Room 101A

Chair: Carol Lomonaco

Attached are agendas for meetings of the full committee and the subcommittees of TC 7.5. I look forward to seeing you in New York.

Mike Brambley
Chair, TC 7.5

AGENDA
ASHRAE TC 7.5, Smart Building Systems
2008 Winter Meeting
New York, NY

AGENDA

Location: Hilton/Bryant (2)
Date: Tuesday, January 22, 2008
Time: 3:30 - 6:00 p.m.

1. Roll Call and Introductions
2. TC 7.5 Scope
TC 7.5 is concerned with the performance and interactions of smart building systems, the impact of smart systems on the total building performance, methods for achieving more intelligent control and operation of building processes, interactions of smart buildings with utilities, and documentation of the benefits of smart buildings and smart building systems as they relate to energy consumption, cost of operation, maintenance, occupant comfort, building commissioning, operations, and impact of the SBS on utilities and natural resources.
3. Approval of Long Beach Minutes
4. Announcements
5. Fault Detection and Diagnosis Subcommittee (Jin Wen)
6. Wireless Applications Subcommittee (Bill Healy)
7. Building/Utility Interface Subcommittee (Rich Hackner)
8. Research (Peng Xu)
 - Report on 1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)
 - Report on 1312-RP "Tools for Evaluating Fault Detection and Diagnostic Methods for Air-Handling Units" (Phil Haves – PMSC Chair)
 - New research
9. Program (Carol Lomonaco)
 - PDH Credits for Salt Lake City Sessions
 - Proposed Plan for Salt Lake City
10. Handbook (John House)
11. Web Page (Natascha Castro)
12. Homeland Security
13. Old Business
14. New Business
15. Adjournment

Appendix B.

TC 7.5, Smart Building Systems Scope and Organization **Revised July 1, 2001**

Overall Committee Scope

The Technical Committee on Smart Building Systems (SBS), TC 7.5, is concerned with the development and evaluation of technologies that could enable the widespread application of smart building systems. “Smart” buildings should take advantage of automation, communications, and data analysis technologies in order to operate in the most cost-effective manner. This implies integration of building services such as HVAC, fire, security, and transportation; the automation of many of the operation and maintenance functions traditionally performed by humans; and the interaction with outside service providers such as utilities, energy providers, and aggregators. Currently, three subcommittees form the backbone of the TC’s activities: fault detection and diagnostics, wireless applications, and building/utility interface.

Appendix C.

TC 7.5 Fault Detection and Diagnostics Subcommittee Meeting

New York City, NY: Sunday, January 20, 2008, 3:00-4:00p.m.

Jin Wen (Chair) began the meeting with a review of the meeting agenda and presented the list of ongoing research projects:

1. 1274 RP, "Field Performance Assessment of Packaged Equipment to Quantify the Benefits of Proper Service." [PMSC Chair: Todd Rossi]
2. 1312 RP, "Tools for Evaluation FDD for AHUs" [PMSC Chair, Phil Haves]

The second item of business was a discussion of draft RTARs:

1. **"A Building Systems Emulation Tool for Building Operators"** [RTAR Champion: Steve Blanc]
 - ❖ Background: This RTAR focuses on development of a "what-if emulator for buildings" that helps training, operation, and fdd and for some applications is connected to a real building operation system. The project will provide a feasibility assessment and high-order specification and then software development of a prototype emulator.
 - ❖ Many sections such as Background and Applicability to ASHRAE Research Strategic Plan are revised.
 - ❖ Objectives are also reworded.
 - ❖ This RTAR needs to be voted again in the main meeting.
2. New RTAR: **"Simultaneous Heating and Cooling"** [RTAR Champion: Peng Xu]
 - a. Background: Simultaneous heating and cooling in large commercial buildings is a serious problem particularly in mild climate area, because of long swing seasons. Tasks for this RTAR includes: A stock analysis to understand the magnitude of the problems and estimate potential savings; Develop a diagnosis method to detect the fault; and Develop tools for designers to avoid this problem.
 - b. TC 1.4, .7.3 (operation and maintenance management), 7.4, 7.6 (energy utilization), 7.9 (commissioning) should be sought to be co-sponsors;
 - c. Mike Brambley and Carol volunteered to review the RTAR.
3. New RTAR: **"Heating System FDD"** [RTAR Champion: Jin Wen]
 - a. Background: Faults, such as leaking and stuck valves, coil fouling, and pipe blocking, exist in heating systems. Yet very few studies exist which study the detection and diagnosis methods for heating systems. Tasks for this RTAR include identifying existing and new FDD methods for heating systems; evaluate these methods through simulation and experimental studies.
 - b. The objectives for each sequence of phase need to be clearer. It is suggested to follow the model of the chiller RTAR sequence.
 - c. Relevant TCs and engineers (Glenn Remington – steam system), who are more familiar with heating system, including steam system, will be consulted when developing this RTAR.
 - d. Depending on the expert opinions, it needs to be decided whether steam systems should be included in this RTAR.
 - e. An updated RTAR will be prepared for the Salt Lake City meeting.

The third item of business was a discussion of new research ideas.

The idea of FDD for supermarkets was brought up again by Carlos Haiad. This area received a lot of interest among ASHRAE members and in Europe. Carlos proposed to organize a meeting among practical engineers in supermarket HVAC

and refrigeration areas and among ASHRAE members to collect more inputs. Depending on the comments from practical engineers, there is a potential that a new RTAR can be developed. Haorong Li volunteered to help.

The fourth item of business was a discussion of program. Future program ideas include:

1. Seminar: *Challenges and lessons learned for sharing data for FDD*
 - ❖ Submitted for NYC, but not selected;
 - ❖ TC1.4 and 7.4 are co-sponsoring this Seminar;
 - ❖ Will be re-submitted for Salt Lake City.
2. Seminar: *FDD...Fault Detection and Diagnostics...but What about "Correction?"*
 - ❖ Srinivas will organize it;
 - ❖ Target at Salt Lake City.

Mike Brambly proposed a potential program to organize a contest to utilize the monitoring data from the ASHRAE new headquarter building for FDD. Potential co-sponsoring TCs include TCs 7.4 and 1.5. Comments and suggestions about this program will be solicited among TC members by Mike before next meeting.

The last item of business was a discussion of handbook. Information about FDD is currently included in Application – Operation and Management session. John House (Handbook Subcommittee Chair) asked questions such as 1) whether there should be more material/information about FDD included in the handbook; 2) is there any new information from current and newly finished research projects that should be included in the handbook; and 3) should some FDD information better be included in other chapters of the handbook? Volunteers were identified who will help John to review all handbook chapters to see if there are other chapters that FDD information should be put into.

Appendix D.

TC 7.5 Wireless Applications Subcommittee

2008 ASHRAE Summer Meeting, New York

Sunday, January 20, 2008

Minutes of Wireless Applications Subcommittee

Meeting convened at 4:15 p.m..

Research:

RTAR 1430, "Development of Metrics to Evaluate Benefits of Sensor Networks in Buildings" was discussed. This RTAR was resubmitted to RAC one year ago after the first version was returned. RAC once again returned the RTAR, this time suggesting that the TC not resubmit it. The main reason for this rejection was that the RTAR was too vague and that insufficient detail was given to guide potential bidders on the Work Statement. A suggestion was made to change the proposal to an evaluation of wireless technology for building applications. The topic may overlap with FDD, in essence trying to explore the value of FDD that is enabled by wireless sensor networks. A request was made for someone to lead up a new RTAR based on these ideas. No one volunteered.

A new RTAR was discussed entitled, "Development of Guidelines for Use of Wireless Technologies in Buildings" (Champion: Bill Healy). Bob Old indicated that it wasn't clear who the audience would be for such guidelines. The term "building engineer" caused problems...is it meant for the operations staff at a building, for the system designer, for the consulting engineer, etc. Michael Bobker indicated that the RTAR should be focused on how wireless technology can be used to enhance sustainability. What can wireless accomplish, where would one use it, when is it not practical? The final consensus was that Bill should do some research as to who would make the decisions regarding wireless in buildings. Based on these end users, the RTAR should focus on the issues faced by those people.

In the Program discussion, a potential research topic was discussed. This research project would be aimed at developing an easier and more cost-effective method for potential users of wireless technology to test their own facility.

No additional research projects were discussed.

Program:

New York City meeting: Seminar 87, "Issues in Real Wireless Network Applications, Wednesday, 1-2:30 p.m.

Potential forum that was not accepted for the New York City meeting: "So Why Settle for Faulty Behavior on Control Networks?" chaired by Cliff Federspiel. Cliff was not in attendance to discuss this idea.

Potential forum discussed: What would get you to use wireless? This topic was presented several years ago and had good participation. Perhaps there is an opportunity to put on a similar forum again. No definitive action was proposed. Potential seminar for Chicago, 2009: Measurements of actual wireless systems in buildings. Presenters in this seminar would discuss measurements that have been made to determine how wireless performs in buildings. Potential speakers to ask:

Francis Rubinstein of Lawrence Berkeley National Lab, researchers at UC Berkeley (Carlos Haiad recommended), Steve Blanc may have had a suggested speaker, John Ruiz from Johnson Controls (suggested by Carol Lomonaco), suggestion from Michael Bobker. Bill Healy will contact those people to see if they would be willing to discuss.

Handbook

The subcommittee discussed potential topics related to wireless that could be included in the handbook and potential places for that material. It was suggested that the Computer Applications chapter or the Controls chapter could be good places for the material. It was suggested that a small blurb on Wireless for Sensing and Control could be inserted in one of these chapters. The following people volunteered to look through the chapters of interest to see where we could contribute wireless information: Bill Healy, Bob Old, John House, Michael Brambley.

The meeting adjourned at 5:05 p.m..

Appendix E.

TC 7.5 Building/Utility Interface Subcommittee Meeting 2008 ASHRAE Winter Meeting, New York – January 22nd, 2008 Sunday 5:00-6:00p.m.

The meeting began at 5:00 p.m. with about 15 people in attendance. Please refer to the main TC committee minutes for attendance list.

Rich Hackner, the sub-committee chair, began the meeting. The objectives of the sub-committee are:

This new subcommittee will explore and develop ideas and research work statements to improve the building and utility interactions (and more specifically the electric grid). The research will focus on developing enabling technologies for seamless interaction of smart building components and utilities and other building services. An important aspect of this work is to identify the information that is necessary to support smart building technologies, and to identify the requirements of communication protocols to support the exchange of this information between different building services, between buildings and utilities, between multiple buildings, with outside service providers.

The importance of a stable and reliable electric power grid to life and the economy in the 21st century has been underscored by two major events over the last decade: a major black out on the east coast of North America and wildly varying electricity prices in California during an attempt at restructuring the electricity marketplace. In response to these events many organization (DOE, EPRI, and CEC) have started research activities to find ways to modernize the grid. However, there are significant gaps in the research activities, especially as they relate to buildings. Since buildings consume over 70% of the electric in the U.S., they have to part of the solution to modernize the grid. ASHRAE has traditionally developed technologies, standards, and guidelines for buildings. Therefore, this subcommittee can play a major role in continuing this effort.

RTAR Development

Jin Wen had not had a chance to prepare another draft of an RTAR entitled “Status and benefits of demand response programs for residential buildings.” Jin led a discussion on what might be included in a revised draft RTAR. Jin is looking for comments on the RTAR between now and the next meeting.

Rich Hackner gave a status update on RTAR voted on by the TC at the Long Beach meeting entitled “Demand Response Optimization Protocol and Integrated Training. The objectives of the project would be to document the wealth of ASHRAE and other research that has considered individual demand response and demand control optimization strategies. And to develop a protocol for building owners/operators to “calibrate” their building to determine the steps that they should take to minimize their energy and demand costs within their building. Rich had received comments from Patrick Hughes, Section 7 Research Liaison, and incorporated his comments in the

latest version that was voted on by the TC. We had missed the deadline for submission to RAC to be reviewed at the New York meeting. Rich will talk with Peng to make sure that we meet the next deadline for submission to RAC (March?). Hopefully, we will know by the Summer meeting whether the RTAR has been approved.

Program Ideas

An idea was proposed to have a seminar/panel of aggregators speak in Chicago. Rich will take the lead and check with Comverge, Current, Canon, and Enernoc to see if they might be interested in presenting on their work in aggregating customers for load control and what research needs that they may see for their work area. Rich is looking for contact information for these groups.

Handbook Review

John House and Rich led a brief discussion on what may need to be included in handbook chapters regarding utility/building interface. John will coordinate the review with volunteer help including Rich Hackner, Bob Old, Steve Blanc, Carlos Haiad, and Glen Remington
Remington

Meeting adjourned at 6:00 p.m..

Appendix F.
TC 7.5 Research Subcommittee Meeting
Monday, January 21, 2008, 2:00 – 3:00 p.m.
2008 NYC Minutes

The meeting convened at approximately 2:00 p.m. chaired by Peng Xu

1. The first order of business was to review the agenda and revise if necessary. Copies of the agenda were distributed, after which Mike asked if there were any proposals for revisions. Mike wants to add a strategic research plan at the end. Reinhard Seidl wants to discuss his new research idea of control user interface.
2. Announcements: The second order of business was announcements. Peng asked the Research Subcommittee to review the updated reports for the various topical subcommittees on their research and then for the Research Subcommittee chair to provide a summary report on the status of research at the full committee meeting.

Peng made announcements on the news from the research chair breakfast. ASHRAE needs new RTAR and WS. The funds are there. New research should focus on zero net energy building.

3. Reinhard Seidl: Control user interface. Seeking co-sponsorship from this TC. Carol made the following comments: 1) people do not care; 2) they do not know what they want. 3) What they want is over the entire place; it is hard to define something fitting with everyone's need. Michael made comments that key indicators are not embodied in the system.
4. PMSC Reports on Research Projects: The third order of business was review of the status of the ongoing research projects, reports of which follow.
 - a. 1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service (Todd Rossi, PMSC Chair). Todd Rossi was unable to attend the meeting, but the meeting of the PMS for 1274-RP with the contractor was held Sunday evening.

No cost extension till 2008. The contractor will use a new protocol and test 204 units. PMSC ask for the monthly update. No progress report since Jan.

- b. 1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service (Todd Rossi, PMSC Chair). Todd Rossi was unable to attend the Research meeting, but the meeting of the PMS for 1274-RP with the contractor was held Saturday morning and Todd presided.

The PMS plans to request a no-cost extension till July 2008. The contractor will use a new protocol and test 204 units. PMSC ask for the monthly update. No progress report since Jan.

- c. 1275-RP: Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers—Phase II (Phil Haves, PMSC Chair). Phil

was not able to attend the Research Subcommittee meeting and Srinivas Katipamula reported on his behalf.

This project is completed.

Action: PMS need to fill the close out form. Peng will check with Phil Haves

- d. 1312-RP: Tools for Evaluating FDD Methods for AHUs. Srinivas Katipamula reported on this project. Drexel University is the contractor. Phil Haves is the PMS chair.

The status of the project as of 7 to 8 months ago was as follows. The contractor was putting together a simulation environment for evaluating FDD. They plan to use the dynamic cooling coil model from a TC 7.4 project in the environment. The simulation environment is essentially complete except for debugging a few new modules. After debugging, they will then integrate the cooling coil model.

The contractor has completed the fault free model and is in the process of validating the model with experiment data from Iowa Energy Center. The contractor asked for a no-cost extension either by six month or by one year.

5. The fourth order of business was to briefly review the key RTAR and work statements by the topical subcommittees. RTARs to be voted in the general meeting on Tuesday are as follows.
 - i. Rich Hackner. Demand response optimization protocol and integrated training.
 - ii. A Building Systems Emulation Tool for Building Operators
 - iii. Co-sponsorship Reinhard Seidl, User Interface Design for Improved System Operation

6. New Business

- Mike led a discussion on the future research directions. What are the needed researches in the area of smart building system?
- External data gathering. Internal data, user interface, how to get data in and out
- Security of data exchange.
- Smart building with lots of sensors and how to use these sensors.
- What are the critical sensors missing today?
- Plug and play HVAC control framework.
- System can find the drift sensor and do the automated calibration.
- Two way communications of HVAC components
- Uncertainty propagation.
- How can automated systems to operator's override?
- Personal action to their thermal environment
- Smart building on residential application
- Get all the information together and do something useful for it.
- System using real time simulation

- System with real time utility data displayed to the occupants.
- Example of what is smart building. Many buildings meet LEED standard in design but use lots of energy in real operation. Performance tracking.

7. Adjourned at 3:00 p.m.

Appendix G. TC 7.5 Handbook Meeting

**Monday, January 21, 2008, 3:00 – 3:30 p.m.
New York City, NY Minutes by John House**

The meeting convened on at approximately 3p.m. on Monday, Jan. 21, 2008. There was no agenda for the meeting.

John House reported that the first material for TC 7.5 was published in the Applications ASHRAE handbook in “Chapter 39 Operations and Maintenance Management”. It is a small amount of material but it is a good starting point for TC 7.5.

Thus John House spoke about the plan for each of the three topics that TC7.5’s three subcommittees to identify the material that we can contribute to the handbook where it might best be positioned. For example, for the wireless applications area there may be a summary of standards and their implications for building applications that may be pertinent for buildings.

And the same goes for Building Utility Interface and FDD. John House needs people to give some thought to this.

John House wants to initiate dialog with those interesting in helping by March 1, 2008.

The second action would be once we had some new material to try and find the best place to but in the existing chapters in the ASHRAE handbooks rather than creating new chapters or handbooks.

Volunteers to help with content from our TC 7.5’s three subcommittee are:

- 1) FDD - Jin Wen, Jim Braun, Vernon Smith and Haorong Li
- 2) Wireless Applications – Bill Healy, Bob Old, Michael Brambley
- 3) Building Utility Interface – Bob Old, Carlos Haiad, Steve Blanc, Rich Hackner, and Mike Mobker

Contact John House if you think you have material ready to go for any of the handbooks.

Questions for John House: What is our timeline for revisions? John reported that the ASHRAE books were reviewed every four years.

Appendix H.
TC 7.5 Program Notes
Program Chair: Carol Lomonaco
New York City, NY

Sunday, Jan. 19, 2008 TC 7.5 Subcommittee Meetings

Long Beach TC 7.5 Program

Seminar 87, Weds. Jan. 23, 2008

Issues in "Real" Wireless Network Applications

Carol Lomonaco, Room: Sutton South

1p.m.-2:30p.m.

Other Ideas for Salt Lake City, Chicago, Louisville, and Beyond
Forum

So Why Settle for Faulty Behavior on Control Networks?

Cliff Federspiel, Salt Lake City

Seminar

What's "Real" And What's "Hype" in Wireless Control Networks?

Lead: Mike Brambley, Salt Lake City

Seminar

Understanding Your Electric Utility's Meter Mumbo Jumbo Programs

Lead: Carlos Haiad, Salt Lake City

Forum

Aggregators Panel

Lead: Rich Hackner, Salt Lake City

Seminar

FDD---But What About Correction?

Lead: Jin Wen, Meeting:???

Seminar

Challenges and Lessons Learned from Showing Data From FDD

Lead: Jin Wen, Salt Lake City

(Similar program to TC1.4 says Chariti Young)

Appendix I.

1274-RP PMSC Meeting Minutes New York City, NY January 19, 2008

Author: Todd Rossi

Attendees

Contractor

1. Dan Mort

PMS members

1. Steve Blanc
2. Ken Peet
3. Michael Brambley
4. Todd Rossi (PMS chair, document author)

Changes PMS agreed on:

1. Reviewed number of compete results
 - a. 20 short on baseline and 15 short on post compared to target from last meeting
 - b. Exceeded the minimum statistical threshold from the RFP (151/34) by 33 and 2.
 - c. Agreed to accept results.
2. Clarify the “summary economizer of conditions” bar chart. Clarify % of what population.
3. Normalize efficiency degradation by base value
 - a. Leave normalized EER in report now
 - b. Add results normalized by base EER to remove manufacturing effect.
 - c. Add 4 results (plots, not bars) (beyond table 4.6) showing EER (normalized by base manufactured value and not) by age and nominal capacity.
 - d. Add 95% confidence intervals (error bar) to help draw conclusions about EER variations in appropriate places where these results are shown. Include in plots.
4. Comparison of Pre vs. Post service EER
 - a. Concern about post service EER lower than pre. Add correlation plot with location – looking for contractor dependence.
 - b. Explain in report, who did the work. Relationship to ADM. How they were found. Characterization of the people hired to do the work.
 - c. Add explanation to report explaining why EER may decrease after service. Possibilities:
 - i. Measurement error – do uncertainty analysis
 - ii. Errors in correcting for driving conditions
 1. Normal model is for a different unit
 2. Correction assumes fault states have same driving conditions dependence as no faults – this may not be completely accurate and the difference grows as the faults become more severe.
 - iii. Servicing has legitimate criteria other than improving efficiency

- iv. Service technician performance that is not as good as it could have been – before and after data can maybe reveal more insights.
- d. Add/modify results.
 - i. Add the table comparing pre, post and manf. goal values.
 - ii. Leave plot comparing post to baseline. Change baseline in x axis to pre service.
 - iii. Add plot or two with manufacturer's normalized EER (pre and post).
- 5. Have technical writer add more active versus passive verbs.
- 6. Diagnostic conclusions
 - a. Consider the steps the data went through. Present results at different levels. Make sure abstract and conclusions reflect results as it progresses through these steps before the complete analysis. Concerned that casual report abstract reader will use conclusions based on goal and threshold values that may be controversial. Add plots with distribution of measurements (ET, SH, etc.). Show goal value and bounds for FDD. The steps are:
 - i. This is the data we collected.
 - ii. Compared to goal values
 - iii. Bounds to determine faults – perhaps more than one. Consider ET, SH, etc. vs. efficiency standards.
 - b. Add simple summary # of units with and without faults.
 - c. Add the number of number of units with multiple faults.
 - d. Compare improvement of EER to number of initially detected faults. For serviced units (36) add a table with columns for each fault and check boxes when appropriate.
 - e. Add statistical analysis. What inferences can be made to the broader population of units? For example, if 2/100 units have a problem, can this be differentiate from 0/100? Want ASHRAE members to make good inferences for units outside of study.
- 7. When will project finish?
 - a. Add extension from April to allow vote at next meeting. Expect final PMS meeting in Salt Lake expecting to accept results with no or minor changes.
 - b. Next (last) PMS meeting will be the nominal Saturday 4PM.
- 8. Superheat charging chart
 - a. Substantiate chart used. Residential chart used in report? Compare to Title 24 chart.
 - b. Concern about the substitution of 5F in the bottom. Make sure that the report describes how the diagnostics works in the <5F SH goal region and how the test in the goal/normal range is interpreted. Make sure it's clear that the "normal range" determines high and low thresholds.
- 9. Show the range of driving conditions covered in the study. Plot of each data point on COA vs. RWB. How to consider RDB when non-condensing.
- 10. Average change in EER. Make clear how average was calculated – by unit or by capacity. Calculate both results. Capacity weight related to kWh savings.
- 11. PMS will further review the results and perhaps prepare more suggestions for final report preparations. These comments are the beginning of this process.

Appendix J.

1312-RP Status Report Tools for Evaluating Fault Detection and Diagnostic Methods for Air-Handling Units

January 22, 2008

Philip Haves, PMS Chair

The goal of the project is to develop a simulation-based testing environment for fault detection and diagnosis tools for air handling units. The contractor is Drexel University and the PI is Jin Wen. The project started in September 2005 and is due to finish in August 2008, having been granted a one year no-cost extension.

An HVACSIM+ model of one of the four zone single duct VAV systems at the Iowa Energy Center's Energy Resource Center (ERS) has been produced, based on the component models produced in 825-RP. Several component models have been adapted to represent the particular mechanical equipment and controls at the ERS.

In the summer of 2007, the contractor performed experiments at the ERS to measure the effects of different faults on system behavior, comparing the behavior of a matched pair of VAV systems with the faults implemented in one of the systems. The effects of the different faults were characterized; the next step is to compare the observed behavior with that predicted by the simulation.

The next steps are to perform winter and swing season experiments to measure the effects of different faults on system behavior and to complete the validation of the system simulation model, including faults. The goal of the project is to develop a simulation-based testing environment for fault detection and diagnosis tools for air handling units. The contractor is Drexel University and the PI is Jin Wen. The project started in September 2005 and is due to finish in August 2007.

An HVACSIM+ model of one of the four zone single duct VAV systems at the Iowa Energy Center's Energy Resource Center (ERS) has been produced, based on the component models produced in 825-RP. Several component models have been adapted to represent the particular mechanical equipment and controls at the ERS.

The next task is to validate the individual component models and then the system model by comparing their performance predictions with measurements from the ERS. This will take place in two phases – first a comparison with previous measurements at the facility and then a series of experiments in which the contractor will make the additional measurements required. The following task will be to add faults to the models and validate their implementation.

See Appendix F, 4c

Appendix K.

List of Subcommittee and Committee Attendees

FullName	Organization Name	FDD	Wireless	Building Utility	Research	General Mtg	Handbook
Alan Vinh	NIST			X	X		X
Arun Vohra	US DOE						
Barry Bridges	Sebesta Blomberg					X	
Bill Healy	NIST	X	X	X	X	X	X
Bill Koran	PECI						
Brian Coffey	LBNL						
Carlos Haiad	Southern California Edison	X	X	X	X	X	X
Carol Lomonaco	Johnson Controls, Inc.	X	X	X	X	X	X
Chariti Young	ALC					X	
Chris Scruton	CEC Pier						
Christian R Taber	Trane						
Damian Ljungquist	JDL Business Services		X	X			
Daniel Choiniere	Natural resources Canada						
David Bornside	Siemens Building Tech					X	
David Holmberg	NIST			X			
Donald Prather	ACCA						
Gary Kasper	Honeywell International						
Gene Strehlow	Johnson Controls, Inc.		X	X		X	
George Naim	Target						
Glenn Remington	Pfizer						
Haorong Li	UNL	X	X	X	X	X	X
Hwakong Cheng	Taylor Engineering						

FullName	Organization Name	FDD	Wireless	Building Utility	Research	General Mtg	Handbook
James Butler	Cimetrics Inc.						
James Gartner	Four Seasons Environmental						
Janice Peterson	NEEA					X	
Jeffrey Schein	NIST						
Jerine Ahmed	Southern California Gas Co/San Diego Gas & Electri						
Jim Braun	Purdue University				X	X	
Jin Wen	Drexel University	X	X	X		X	
John House	Iowa Energy Center	X	X	X	X	X	X
John Seem	Johnson Controls, Inc.						
Jonathan Wright	Loughbrough University						
Keith Temple	Field Diagnostic Services				X	X	
Kris Subbarao	Texas A&M						
Krishnan Gawi	PNNL						
Kristin Henemeirer	US Davis						
Lingying Zhao	The Ohio State University				X		X
Martha Brook	California Energy Commission						
Michael Bobker	CUNY	X	X	X			
Michael Brambley	PNNL	X	X	X	X	X	
Michael Brandemuehl	University of Colorado	X				X	
Michael Day	ICE Energy						
Mike Galler	NIST						
Nabil Nassif	Nevada University						
Nancy Jenkins	SCE						
Natascha Castro	NIST	X	X	X		X	

FullName	Organization Name	FDD	Wireless	Building Utility	Research	General Mtg	Handbook
Peng Xu	LBNL				X	X	
Pete Secor	Meshnetics						
Peter Armstrong	MIT	X	X				
Philip Haves	LBNL				X		
Piotr Domanski	NIST	X					
Pornsak Songkakul	Siemens Building Technologies	X	X				
Reinhard Seidl	Taylor Engineering				X	X	
Rich Hackner	GDS Associates	X	X	X		X	
Robert Old	Siemens Building Technologies, Inc.	X	X	X	X	X	X
Roger Lautz	HGA A&E						
Sam Borgson	UC Berkeley						
Sharon Dinges	Trane Global Controls & Contracting						
Shengwei Wang	The Hong Kong Polytechnic University	X	X	X	X		
Srinivas Katipamula	PNNL	X	X	X		X	
Stephen Roth	Carmel Software						
Steven Blanc	PG&E	X	X	X	X	X	
Todd Rossi	Field Diagnostic Services						
Vance Payne	NIST	X	X		X		
Vernon A. Smith	Architectural Energy Corporation	X	X	X		X	
Wayne Webster	Princess Towers Inc						
Xiaohui Zhou	Iowa Energy Center	X	X			X	
Yanda Zhang	HMG						
Yosuke Nishi	Yamatake Corporation						

FullName	Organization Name	FDD	Wireless	Building Utility	Research	General Mtg	Handbook
Zheng O'Neill	UTRC	X	X	X		X	
Lisa Chen	Drexel University (Student)	X	X				
Shun Li	Drexel University (Student)	X	X				
Vladimir Vukovic	Penn State					X	
Kan Lin	Penn State	X	X				
Geogor Henze	Univ. of Nebraska					X	
Yi Jiany	UTRC	X					
Eric Helton	IBACOS	X	X				
Todd Gottshall	Taylor Engineering	X	X				
Jaya Pakashs	NUS	X					
Hofu Wu	Cal Poly				X		
Yiqua Pan	Tonghi University				X		
Anna Zhou	Taylor Engineering				X		
Steven Szymiurski					X		
Kuei-Peng Lee	Nat'l Taipei Univ. of Tech	X			X		