

**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: First draft ---February 11, 2014**

**TC/TG/TRG TITLE: Smart Building Systems**

**DATE OF MEETING: January 21, 2014              LOCATION: New York, NY**

<b>Members Present</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>E-Officio Members and Additional Attendance</b>
Natascha Milesi Ferretti, Chair, (V)	2013	Meli Stylianou, (V)	2016	Gary Shamshoian
Zheng O'Neill (V)	2014	Hiroei Mikami, Member Non-Quorum (V)		Denise Francis
Michael Brambley, Handbook Subc., (NV)	2008	Li Song, Building Operations Dynamics Subc (V)		Yan Chen
Carlos Haiad, (V)	2015	Mike Galler, Webmaster (NV)		Charles Miltiades
Rich Hackner, Secretary, (NV)				Heejin Cho
Steve Blanc (V)	2015	Harong Li Fault Detection and Diagnostics Subc., (NV)	2017	Zoltan Magyar
Xiaohui Zhou, Program Subc. (NV)				Yuebin Yu
Krishnan Gowri, Smart Grid Subc., (NV)				
David Yuill, (V)	2017			

<b>Members Present</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>E-Officio Members and Additional Attendance</b>
Robert Sonderegger, (V)	2015			
Adrienne Thomle, Section 7 Head				
Joshua Rhodes (V)	2017			
Glenn Remington, (V)	2017			
Edward Tsui (V)	2017			
Yuebin Yu (V)	2017			
<b>Corresponding Members Present</b>		<b>Corresponding Members Absent</b>		
		Andrew Windham	2013	
Kristin Heinemeier, (CM)	2011	Allen Weidman, (PCM)	2011	
Agami Reddy (CM)	2006	Narendra Amarnani, (CM)	2004	
Chariti Young, (CM)	2002	Don Bailey, (CM)	2008	
David Bornside, (CM)	2004	Fred Bauman, (CM)	2009	
		Christopher Benson, (CM)	2011	
Srinivas Katipamula, (CM)	2005	Michael Bobker, (CM)	2008	
Phil Haves (CM)	2005	Nick Gayeski, (PCM)	2011	
Dan Veronica, (CM)	2011	Ram Narayanamurthy, (CM)	2010	
Edward Tsui	2013	Marijn Braadbaart, (PCM)	2010	
Jin Wen, (CM)	2011	Michael Brandemuehl, (CM)	2007	
Mayumi Miura	2013	Dave Branson, (CM)	2001	
Barry Bridges, (CM)	2002	James Braun, (CM)	2007	

<b>Members Present</b>	<b>Appt</b>	<b>Members Absent</b>	<b>Appt</b>	<b>E-Officio Members and Additional Attendance</b>
Daihong Yu (CM)	2012	Peng Xu, (CM)	2011	
Danny Taasevigen (CM)	2013	Martha Brook, (CM)	2006	
Dave Shipley (CM)	2012	James Butler, (CM)	2002	
Ian Nelson (PCM)		Joon Ho Choi	2011	
John House	2008	Brian Coffey, (CM)	2009	
Tea Zakula	2012	Robert Coleman, (CM)	2008	
Hung Pham	2001	Maria Corsi, (CM)	2003	
Carol Lomonaco (CM)	2013	Charles Culp, (CM)	2000	
		Arthur Dexter, (CM)	2005	
		Sharon Dinges, (CM)	2006	
		Piotr Domanski, (CM)	2005	
		Kirk Drees, (CM)	2008	
		Jay Eldridge, (PCM)	2011	
		Sukru Erisgen, (PCM)	2011	
		Mohsen Farzad, (CM)	2005	
		Clifford Federspiel, (CM)	2006	
		James Gartner, (CM)	2007	
		Eunice Hameyie, (PCM)	2010	
		David Holmberg, (CM)	2011	
		Ahmad Husaundee, (CM)	2006	
		Mark Johnson, (CM)	2004	
		Ashok Kadakia, (CM)	2006	
		David Kahn, (CM)	1996	
		George Kelly, (CM)	2001	
		Michael Kintner-Meyer,	2007	
		Curtis Klaassen, (CM)	2008	
		Jan Kreider, (CM)	2008	
		James Kummer, (CM)	2008	
		Jean Lebrun, (CM)	2008	
		Scott LeClair, (CM)	2008	
		Kuei-Peng Lee, (CM)	2008	
		Hui Li, (CM)	2010	
		Mingsheng Liu, (CM)	2003	
		Darrell Massie, (CM)	2003	
		Peter May-Ostendorp, (PCM)	2010	
		John Mitchell, (CM)	2000	
		Shahid Naeem, (PCM)	2010	
		Ron Nelson, (CM)	1998	
		Richard Ng, (CM)	2008	
		Leslie Norford, (CM)	2006	
		Robert Old (CM)	2011	
		Hung Manh Pham, (CM)	2001	
		William Pienta, (CM)	2006	
		Kinga Porst, (CM)	2002	

Members Present	Appt	Members Absent	Appt	E-Officio Members and Additional Attendance
		Michael Pouchak, (CM)	2003	
		Andrew Price, (CM)	2003	
		Barry Reardon, (CM)	1999	
		Jeffrey Schein, (CM)	2007	
		Russell Secor, (CM)	2008	
		John Seem, (CM)	2003	
		Dipak Shah, (PCM)	2010	
		Peter Simmonds, (CM)	2008	
		Vernon Smith, (CM)	2011	
		Pornsak Songkakul, (CM)	2002	
		Matthew Tyler, (CM)	2011	
		Arun Vohra, (CM)	2006	
		Paul Wacker, (CM)	2008	
		Josh Wall, (CM)	2011	
		Stuart Waterbury, (CM)	2011	
		Thomas Webster, (CM)	2009	
		Jonathan West, (CM)	2008	
		James Winston, (CM)	1996	
		Jonathan Wright, (CM)	2008	
		Gene Strehelow, (CM)	2006	
		Shui Yuan, (PCM)	2009	
		Li Zhang, (CM)	2010	
		Stephen Treado (CM)	2012	
		David Blum	2012	
		Hashem Akbari	2013	
		Itzhak Maor	2012	
		Jerine Ahmed, (CM)	2007	
		Peter Armstrong	2012	
		Xiufeng Pang, (CM)	2011	
		Osman Ahmed, (CM)	2006	

(V) = voting member

(CM) = corresponding member

(PCM) = provisional corresponding member

*These draft minutes have not been approved and are not the official, approved record until approved by this committee.*

**DISTRIBUTION:**

ALL MEMBERS AND CORRESPONDING MEMBERS OF TC

TAC CHAIR: Walter Grondzik

TAC SECTION HEAD: Adrienne Thomle

ALL COMMITTEE LIAISONS AS SHOWN ON TC ROSTERS:

Research: Phil Haves

Standards: Rick Larson

CTT: Chad Moore

Special Publications: William Fleming

ALI/PDC.: Hugh McMillan

Staff Liaison (Stds): Stephanie Reiniche

Staff Liaison (Research/Tech Services): Michael Vaughn

DATE: January 21, 2014

TC NO. 7.5 TC TITLE: Smart Building Systems

CHAIR: Natascha Milesi Ferretti VICE CHAIR: Steve Blanc

#### TC Meeting Schedule

Location, past 12 mo.	Date	Location, planned next 12 mo.	Date
Denver, CO	06/22/13	Seattle, WA	06/30/14
New York, NY	01/21/14	Chicago, IL	1/27/15

#### TC Voting Member Status

1x	Natascha Milesi Ferretti (until 06/30/2015)	Yes
2x	Steve Blanc (until 06/30/2035)	Yes
3x	Zheng O'Neill (until 06/30/2014)	Yes
4x	Carlos Haiad (until 06/30/2015)	Yes
5x	Robert Sonderegger (until 06/30/2015)	Yes
6x	Glenn Remington (until 6/30/2017)	Yes
7x	Josh Rhodes (until 6/30/2017)	Yes
8x	Yuebin Yu (until 6/30/2017)	Yes
9x	Meli Stylianou (until 06/30/2016)	No
10x	Li Song (until 6/30/2017)	No
11x	David Yuill (until 6/30/2017)	Yes
INTL	Hiroei Mikami (until 6/30/2017)	No
INTL	Edward Ka Cheung Tsui (until 6/30/2017)	Yes

ASHRAE 2014 Winter Meeting – New York, NY – January 18-22, 2014

Chair/Standards	Natascha Milesi-Ferretti
Vice Chair/Research Subcom. Chair	Steve Blanc
Secretary	Richard Hackner
Handbook Subcom. Chair	Mike Brambley
Program Chair	Xiaohui Zhou (Joe)
Buildings Operations Dynamics Subcom. Chair	Li Song
Smart Grid Subcom. Chair	Ram Narayanamurthy
Enabling Technologies Subcom. Chair	Nick Gayeski
Fault Detection Diagnostics Subcom. Chair	Yuebin Yu
WebMaster	Mike Galler

**ASHRAE TC 7.5 Smart Building Systems  
2014 Winter Meeting  
New York, NY  
Madison, Hilton Hotel  
Draft Minutes**

**Date: Tuesday, January 21, 2014**

Meeting called to order at 3:30 pm by Chair Natascha Milesi-Ferretti

1. Roll Call and Introductions. Review VMs, CMs, and PCMs.

10 of 12 voting members were present: Natascha Milesi Ferretti, Carlos Haiad, Steve Blanc, Robert Sonderegger, Glenn Remington, Yuebin Yu, Edward Ka Cheung Tsui, David Yuill, Zheng O'Neil, and Joshua Rhodes (arrived after roll call)

2 Members were Absent: Meli Stylianou and Hiroei Mikami

Quorum achieved.

Review of VMs, CMs, PCMs to be done at this meeting for new roster submission. Changes to take effect after Annual meeting.

2. TC 7.5 Scope

Chair read scope of Technical Committee.

Scope

Technical Committee 7.5 is concerned with the following topics

- Performance and interactions of smart building systems (SBS)
- The impact of smart building systems on the total building performance
- Methods for achieving more intelligent control and operation of building processes, including supervisory control strategies and the optimization of dynamic building components and systems
- Interactions of smart buildings with utilities
- 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 Denver Summer 2013 Meeting Minutes

**Corrections:**

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**Motion to approve with minor corrections**

Denver 2013 Meeting minutes

**- Steve Blanc moved and Edward Ka Cheung Tsui second. 8-0-0 (12) Chair not voting.**

\*\*\*\*\*

4. Announcements

- See attached Chair breakfast notes and files for details
- Action Item: Natascha to send note regarding benefits available from high point total for TC. Possible benefits automatic seminar/forum slot available for the next meeting or other benefit(s).
- Follow the ASHRAE Code of Ethics.
- Need to update personal ASHRAE bios.
- List of upcoming conferences and events is available.
- Need to indicate whether YEA members are attending the TC meetings

5. Liaison Reports

TC1.5 ---Currently, no liaison

Chariti Young---TC 1.4---Guideline 13 expected to send updates for comment in March. Interested in TC 7.5 comments. RP-1597 received the final report. RP-1455 nearing completion in June? Possible for more communication with Building Operation Dynamics subcommittee. Send contact information for Li Song to Chariti - Completed. URP 1633 PMS asked for a no cost extension to July. TC 1.4 approved the extension.

David Bornside---TC 1.6---Continues to work on standard definitions to be updated in Wikipedia.

Mike Brambley---TC 7.3---They voted on their handbook material. Rich/Mike will upload materials for review but would need it within a month so the deadline would be the middle of February. Committed to providing references to each TC's sections

Kristin Heinemeier---SPC 207 chair. Main and subcommittees have already met. Committees are still grappling with a number of complicated issues. Draft standard is progressing with a goal to finalize within the next year.

6. Fault Detection and Diagnosis Subcommittee (Yuebin Yu)

Full details of the subcommittee meeting are available in the attached minutes.

Need to form a PES and PMS for WS 1615 FDD Methods for Supermarkets

Vote to Approve WS 1615 FDD Methods for Supermarkets

**Motion to approve with minor corrections**

**- Carlos Haiad moved and Steve Blanc seconded. 10-0-0 (10) Chair voting.**

PES volunteers were identified.

**Motion to Approve and resubmit WS 1671 Distributed Optimal Control of Building Energy Systems**

**- Steve Blanc moved and Carlos Haiad seconded. 7-1-2 (10) Chair voting.**

**Note on "No" vote: Glenn Remington indicated that he is uncomfortable with the language of contractor scope being "should" vs. "shall."**

PES volunteers were identified.

7. Enabling Technologies Subcommittee ( Natascha reporting for Nick Gayeski)

Full details of the subcommittee meeting are available in the attached minutes.

8. Smart Grid Subcommittee (Ram Narayanamurthy reporting)

See minutes/notes from subcommittee meeting.

SPC 201P Facility Smart Grid Information Model being reviewed and made ready for publication.

9. Buildings Operations Dynamics Subcommittee (Natascha reporting for Li Song)

See minutes/notes from subcommittee meeting

Seeking suggestions for changing the subcommittee scope. Contact Li with any input.

10. Research (Steve Blanc)

See minutes/notes from subcommittee meeting

- Announcements
- **Work Statements**

See attached minutes for more details.

11. Program (Xiaohui Zhou (Joe))

For New York meeting TC 7.5 submitted six seminars and one forum. Three seminars and one forum were accepted.

For future meetings we will need to match the Meeting “Tracks” with the subcommittee topics to improve odds that seminars/workshops/forums will be accepted.

Following is the list of TC 7.5 Seminar Topic Ideas for the Seattle conference prepared at the New York meeting.

Sub Committee	Type	Chair (speakers)	Proposed Title	Status
<b>BOD</b>	Conference Paper	Chair: Jin Wen	Control Strategy Simulation Testbeds / Simulation Tools  -Drexel w/ pv, different controllers, energy plus models etc. as a development tool  -LBNL  -NIST Vcvt?  COBIE (army corps of engineers)	<b>Co-sponsoring</b> with TC 1.4  Control Theory and Application.  Prepare for Seattle
<b>BOD</b>	Seminar	Chair: Xiufeng Pang	Model-based Commissioning	Prepare for Seattle
<b>NBT</b>	Seminar	Chair: Nicholas Gayeski	Smart Transducer with Embedded diagnostics	Prepare for Seattle
<b>FDD</b>	Seminar	Chair: Carol Lomonaco; 3 speakers ready	Applications and Successful stories of FDD	Prepare for Seattle
<b>FDD</b>	Seminar	Chair: Danny Taasevigen; 3 speakers and topics ready.	Analyzing Building Performance to Guide/Direct Maintenance	<b>Co-sponsoring</b> with TC 7.3 O&M  Prepare for Seattle  For Track 8
<b>SG</b>	Seminar	Chair: David Holmberg	Green Button / Open ADR / (Open EIS)	Re-submit for Seattle?
<b>SG</b>	Seminar	Chair: Srinivas Katipamula	Transactive Controls/Energy for HVAC Engineers	Prepare for Seattle

This is a reminder that the deadline for submitting seminar/workshop/forum session applications to ASHRAE is: **2/13/2014**.

The link for submission is: <http://ashraem.confex.com/ashraem/s14/cfp.cgi> . This link also provides information on Tracks, Submission Procedure, and other information for preparing the submission.

As usual, each seminar session needs to prepare Four Learning Objectives and Ten Questions and Answers. Here are the milestones of the conference preparation process:

Feb. 13	Seminar, Forum, and Workshop Program Proposals Due
Feb. 21	Conference Paper Accept/Reject Notifications
Feb. 25	Technical Papers Final Review
March 5	Conference Paper Accept/Reject Notifications
March 25	Notifications of Seminar, Forum, and Workshop Accept/Reject Distributed
May 6	Upload of PPTs Begin
June 2	All PPTs Due Online
June 28	Speaker's Lounge Opens

Please let Joe know if you are not familiar with the submission requirements, process, etc.

He will send out another reminder about a week before the deadline, but now you should think about the speakers and topics for your session, if you have not have all your speakers lined up.

12. Handbook (Mike Brambley)

See Handbook Minutes from Mike Brambley.

Leads requested to review their sections for handbook section. February 7<sup>th</sup> is the due date. Ready for TC review by May 1<sup>st</sup> and final vote by the end of May (prior to Seattle meeting).

13. Web Page (Mike Galler not in attendance)

No updates

14. Old Business

No Old Business

15. New Business

Carlos mentioned the increase in Speaker Registration Fees. Feedback being taken back and reviewed regarding the sensitivity to charging speakers for registration.

URP 1633 PMS asked for a no-cost extension to July. TC 1.4 approved the extension.

16. Adjournment

Meeting adjourned at 6:04 pm

**TC 7.5 Fault Detection and Diagnosis Subcommittee Meeting Minutes**  
**2014 Annual Meeting, New York, New York**  
**Sunday, Jan. 19, 2014**  
**3:00pm - 4:02pm**  
**Riverside Ballroom (S3)**

The meeting was called to order by Yuebin Yu, followed by reading the purpose statement of FDD subcommittee.

1. The meeting started with quick self-introductions of the attendees.
2. 20 copies of the meeting agenda and 20 copies of two RTARs were distributed to the attendees. Time allocation was clarified.
3. The main topics covered included the research RTARs/WSs (45 minutes), open discussion (5 minutes), program (5 minutes), handbook and other issue (7 minutes).  
\* Words in Red are remarks from Yuebin Yu.

Research:

Currently, the subcommittee has six active/pending RTARs/WSs (RWs) in the pipeline. Two of them are in the process for Work Statement. The champion of each RW provided a brief update of the current status.

3.a. “FDD Methods for Supermarket” [WS Champion: Zheng O’Neil]

The comments from the RAC on the WS after the 2<sup>nd</sup> submission have been addressed through conducting more research and contacting the research team at Danfoss directly. It has been clarified that the scope defined in the WS was not covered in their past and existing research; and they are also interested in the topic described in the WS. Another issue raised by the RAC is the distributed system and system with CO<sub>2</sub> as the refrigerant should be included. The WS has been further revised with the reference from Danfoss and added the emerging CO<sub>2</sub> system in the description. Two supermarkets should be included to demonstrate the FDD methods. In addition, the RAC suggested getting co-sponsorship from TC 10.7. The WS has been forwarded to the research chair of TC 10.7 for a vote. We may know the result from them by now. (The RP-1596 finished was on the indoor air quality of big box super markets.)

It is ready for a vote in the main TC7.5 meeting.

PES and PMS members need to be identified at this meeting.

3.b. “Reducing Simultaneous Heating and Cooling in Commercial Buildings” [RTAR Champion: Danny Tassevigen. Stage: WS development WS-1697]

The RTAR was conditionally accepted and right now is in the WS stage of the first draft (to be finished in the next couple of weeks). We were asked to seek co-sponsorship/ and input from TC 1.4 (controls) and TC 7.6 (building performance). We may send via an email ballot to catch the deadline for the next submission. This topic is of concern for all the TCs but from quite different points of view.

3.c. “DIY Energy Assessment Using Smart Phones with Low-cost IR Cameras for Residential Buildings” [Champion: Yuebin Yu and Song Zhen]

The topic was brought up by Yuebin and Song Zhen in 2013 at the Dallas winter meeting. While the RTAR has not been approved by the committee yet, we have both the RTAR and WS developed. Yu briefly introduced the research idea. Very useful comments were provided from the TC7.5 members, including:

Steve Blanc:

- How far are we going with smart buildings to doing auditing tools for residential buildings (policy issue) [I don't have answer to this. Zheng: A smart building shall be equipped with different sensors. Is it feasible to facilitate DIY energy auditing using the sensor data? For example, meter and temperature sensor data shall be useful.]; a lot of conversation currently taking place on the internet like kickstarter about the infrared camera [My answer is the research is not just about low-cost infrared camera, rather it can be generalized to any kind of infrared camera for automating the process. Zheng: These are not just IR cameras. They are smart IR cameras, in the sense that they are equipped with multi-core CPUs, GUPs, and connected to backend servers on the cloud. The fundamental question is: Can the typical user navigate through the energy auditing process with the help of this computation infrastructure? Even more, can they compete with professional auditors using a pencil-and-paper method? This is a benchmark question like asking a computer to play chess with human.]; and also other remote audits in commercial buildings;
- It will move very quickly, how can we handle the timeframe that we may need to conduct this in at ASHRAE, which could be much slower? [Agreed. And are we really competing against the commercial world? Zheng: It is ASHRAE's role to make standards or guidance for emerging new applications like this. The commercial developers can build products quickly, but they cannot justify the inspection results.]
- How many people are actually doing this right now? [We contacted a couple of energy auditing companies. The answers they provided to us are that they are doing this as a manual process. Need to be confirmed.]
- Can we keep up with it? How do we position ASHRAE? [no answer to this. Maybe change the point of view]

Robert Sonderegger:

- It is a very timely application. Commercial aspects of the RTAR, like software, server, IR sensors [a newest May 2013, called mu thermal camera] [We actually checked the same website when they were raising funds for the sensor and we were developing the RTAR; our answer to that is we are not investigating how to obtain the thermal image with a thermal camera, rather we are concerned about what quality of image we can use and automate the assessment process to rule out the subjective impacts.]
- Meanwhile, the project duration for 22 months might be too long before it is outdated by commercial developers [No comments, I admit we don't know how long it will take a commercial developer to do this.];
- A need to cut in TC7.6 (building performance who also do auditing) [We will check with TC7.6 to evaluate it if necessary. Zheng: If we believe the energy auditing can be achieved with only one smart IR camera, then it is within the full scope of TC7.6. If we also study the feasibility of using meter or sensor data, then it is covered by both TC7.5 and TC7.6.]

Nicolas:

- Infrared camera companies might be doing this already. Need to change the tone like: ASHRAE defines the capability of the IR camera, how the data gets collected, how the data should be analyzed, how the results should be presented, etc., rather than giving the prototype. [I agree. Will work on it.]

Phillip Haves:

- RAC will be sensitive to this if it is related to product development. [Agreed. We will change the tone and the theme.]

Xiaohui Zhou

-The title should be revised to reflect the fact that the IR camera can only handle building envelop. [Agreed. At this moment, it is the main tool and mainly for building envelope. If the project can be defined as phases, it might be proper. I will discuss with Zhen Song.]

Srinivas Katipamula

-Suggest we focus on as in the objective: Looking at what an average user can do, requirements on sensor quality, etc., not product development at all. [Agreed. The overall RTAR is not about the product development, rather it is about the algorithms of processing the image, modeling, etc. Still, it should be revised to fit more in ASHRAE's scope. I will discuss this more with Zhen Song.]

Overall, the scope and goal will be redefined to avoid the commercial side.

3.d. "Realizing value of virtual sensing technology in the operation of packaged air-conditioning units" [Champion: Yuebin Yu and Haorong Li] (seek for co-sponsorship from TC1.5)

This RTAR was championed by Yuebin Yu and Haorong Li since ASHRAE meeting in 2012. It was discussed a little bit at past meetings. While we believe that this RTAR is proposing something different from the team in EEB-HUB (based on their publications), it has not been confirmed.

Robert Sonderegger:

-Why aren't manufacturers doing this if it is possible to improve the efficiency? Who will the customers be? [The resistance is from the reality. 90% of packaged units are constant speed, with simple on-off control, and existing. It may take five more years to gradually retire them. The market is used to it. The real customers at this moment will be the building owners who own the constant speed RTUs and pay the bill for the wasted energy. RTU manufacturers may be in the second tier that might be interested.]

Phillip Haves:

-Explain Virtual Sensing in the RTAR for better readability. [Agreed. It will be addressed in the RTAR.]

Jin Wen:

-Dr. James E. Braun's team has a project related to virtual sensing in packaged air-conditioning units funded by the DOE. Cite any literature from them if related. [Yuebin Yu will contact Dr. James. E. Braun directly to clarify whether there is any duplication.]

We will rewrite the RTAR to be more problem-oriented rather than solution oriented. We will focus more on the purpose of identifying the solution to rudimentary low-efficient control and oversizing in packaged air-conditioning units.

3.e. "Whole Building FDD" [RTAR Champion: Xiufeng Pang, David Yuill]

Same as in the last report. David will email to check if any progress has been made.

[in the last report: Per David's feedback, the RTAR has stalled for a while. It is still in the very first stage of developing the RTAR. There were some discussions between the authors. It was found that more research is needed. Many things are going on in the commercial world and certainly we don't want to repeat what the commercial world is already doing.]

3.f. Discussion on ideas on the parking lot

"Standard methods for testing FDD" [Initiated by: Jin Wen]

FDD for packaged air-conditioning units in ASHRAE Standard Project Committee (SPC207) related to as Title 24. A complicated issue with site-assembled AHU system (sensors, component, control configuration, etc.). A potential project to survey the literature, identify the

methodology (active/passive), case study, etc., which might then lead to a FDD standard. 1<sup>st</sup> draft has been prepared. Call for volunteers.

#### 4. Open discussion on new ideas

“Virtual sensor evaluation method/guideline” [Initiated by: Li Song]

Take a leadership role to set up a standard on what properties are required for virtual sensors. Draft rules or criteria to evaluate and guide the use of virtual sensors, which are considered as an analogue to physical sensors. A lot of commercial products on virtual sensors are already there or applied in FDD. Virtual sensors are not just mathematical models. Should this be application dependent? Steve mentioned the case with significant use of virtual points (mapping points [Are they the same thing as the virtual sensors we are discussing here which are applied only when physical sensors are difficult, very expensive, or impossible to obtain?]) Maybe we can refer to other fields such as the chemical process industry and see whether or not they have this kind of guideline.

David Yuill - There are already guidelines regarding to uncertainty analysis, error propagation, etc.

Jin Wen - The uncertainty related to the model. [TBD] virtual sensing could be misunderstood or abused by customers without a guideline.

Daihong Yu - The topic can focus on both the inputs and outputs of virtual sensors.

Xiaohui Zhou - It should be reversed starting from the requirement of outputs then you backwardly calculate the need of inputs.

Michael Brambley - Something (methodology, terminology, etc.) associated with determining the uncertainty of virtual sensor measurements on the input, propagation, results and whether it is reliable or not. Generalizing something like guidance to the end user will be valuable. It might go into the Smart Building section in the handbook.

We will continue the discussion on this and form a RTAR.

#### 5. Program update

Last meeting four seminar topics were on the list for the future per Xiaohui Zhou. Later three have been submitted and two were accepted. One organized by Michael Brambley, “FDD for Packaged RTUs and Splits - What is New?,” was held in this New York meeting. One organized by David Yuill, “Workshop: DOE Intelligent Building Operation on FDD”. Four presentations in total on Tuesday morning.

Following two may be reconsidered:

[Srinavas and Carol chair: “About Application and Successful story for FDD”. Try New York 2014. Missed. Maybe next time in Seattle.

Kristin Heinemeier chair “Fault Detection and Retro-commissioning...” maybe follow up for Seattle.

Srinavas chair: “Fundamental FDD”. Ask for help from John House to identify the speakers. Try Seattle 2014. John mentioned it is a good idea.]

#### 6. Handbook on FDD

Main section on Smart Building is drafted. It is behind the schedule.

One topic about a special publication in 1996 from TC7.5 FDD subcommittee “FDD for HVAC Systems” [collection of transaction papers]. It is outdated and should consider either a revision, rewrite, or drop the special publications.

Srinavas – We should update it.

John House – There are more publications already there. Maybe fund a research project for this activity. Updating it with a new version is reasonable.

Michael Brambley – We may just make a special publication on FDD. Publication Committee will take it. TC can work on it in emerging hot topics.

**The meeting was adjourned around 4:02pm.**

ASHRAE TC 7.5 Smart Building Systems  
2014 Winter Meeting, New York, NY  
**Enabling Technologies Subcommittee Meeting Minutes**

1. **Scope:** The Enabling Technologies Subcommittee of TC 7.5: Smart Building Systems aims at exploring and developing technologies which will enable the development, implementation and commercialization of smart building applications such as fault detection and diagnostics, model-predictive control and optimization, and smart grid applications such as automated demand response. Three focal points of this subcommittee are i) smart transducers, such as sensors and actuators which provide diagnostic information, ii) communications, such as wireless devices and protocols enabling greater data exchange, and iii) embedded metadata, such as embedded equipment and system information to enable smart building applications. On these topics, the scope of this subcommittee includes identifying and sponsoring research projects, evaluating existing technologies, providing recommendations to building operators and practical engineers, developing supporting tools for researchers in these areas, and organizing programs to disseminate research findings and advancements among ASHRAE members.

**Discussion:** The title of the subcommittee may still be too broad, but the three areas of focus - smart transducers, communications, and building metadata - are sufficiently specific to guide the conversation of the subcommittee. Suggestions for revised title names are welcome, but will not change the focus of the subcommittee. There is an interest to also include topics around software applications and cloud computing in the subcommittee. Although these are not focal points for the subcommittee at this time, ideas pertaining to software applications and cloud computing technologies which impact the enablement of smart building systems will be included in the scope.

2. Liaisons/Other TCs

**Recommendations:** This subcommittee should be tracking the work of the BACnet committee AP data modeling working group, Facility Smart Grid Information Model, Computer Applications, Emerging Technologies, SGPC20 HVAC process data exchange requirements and SPC 205 Standard Representation of packaged unit models.

3. Program Proposals

- Bill Healy: “Sensing Technologies to Enable Smart Homes” for New York. Speakers from NIST, PNNL, and EPRI have been lined up. Bill Healy.
- Nick Gayeski: “Smart Transducers with Embedded Diagnostics” for June meeting. Speakers from Armstrong, Schneider Electric interested.
- Jerine Ahmed: Potential program was discussed on the role of cloud-based communication on smart meter technology.
- Future areas of interest:
  - Smart Transducers –plug-n-play optimal control/diagnostics, transducers with embedded metadata/IP connectivity
  - Communications – Growing applications/successful niches for wireless, security of wireless, advantages/disadvantages of wireless
  - Building Metadata - Existing metadata taxonomies, building ontologies, data exchange formats

4. Research

- Review of HVAC metadata taxonomies to produce guidelines for support of FDD, MPC and optimization
  - BuildingSmartalliance, NIBS. NTIS US Department of Commerce project, Project Haystack, commercial vendors approaches, Facility Smart Grid Information Model, BIM community
  - Specifically around enabling Smart Building Systems in operations particularly FDD, MPC, optimization, and ADR.

5. Handbook

- Bill Healy contributing to new Smart Building Systems chapter, and Wireless Applications

ASHRAE TC 7.5 Smart Building Systems  
2014 Winter Meeting, New York

**Smart Grid Subcommittee Meeting Minutes**  
**Riverside Ballroom (S3)**

**Date:** Sunday, Jan 19, 2014

**Time:** 4:30 – 5:15 p.m.

1. Roll Call and Introductions – Meeting called to order at 4:45 p.m.
2. Liaisons reports – SPC 201, NIST SGIP, BACnet, others
  - SPC-201 is being finalized for publication. Public review planned for later in 2014.
  - SEP 2.0 is now under the IEEE Working Group.
  - SGIP has a working group on sub metering requirements standard development coordinating ANSI –C12, NEMA and SAE working groups.
3. Role of ASHRAE in Smart Grid - New ASHRAE Initiatives
  - SPC-201 is being considered by ISO/IEC for an international standard, Standards ISAS is developing procedures for adoption/adaptation of standards by other countries and organizations.
4. Research Ideas – Discussion
  - Nick Gayeski to lead the RTAR development for Standard Reference Data for FDD.
  - Revision of Guideline Project Committee for SGPC-14, for revising guideline: Carlos/Joshua
5. Program Proposals for Seattle
  - Transactive Energy 101 for HVAC engineers, Chair: Srinivas
6. Other topics – Future Goals and Leadership of Subcommittee
  - Ram Narayanamurthy will assume the chair role for the Seattle meeting
7. Adjournment – Meeting adjourned at 5:10 p.m.

ASHRAE TC 7.5 Smart Building Systems  
2014 Winter Meeting, New York, NY

**Minutes of Building Operations Dynamics Subcommittee Meeting**  
**Riverside Ballroom (S3)**

**Date: Monday, Jan20, 2014**

**Time: 4:00-4:45 p.m.**

1. Roll Call and Introductions
2. Subcommittee scope updates  
By Gary Shamshoian:

Building Operation Dynamics Subcommittee of TC7.5 focuses on the importance of indoor comfort conditions and building/campus/enterprise energy consumption through HVAC system design, dynamics, controls, occupant interactions, and building operational strategies.

Hashem Akbari has volunteered to provide an improved draft.

**Update on 1/20/2014:** Li is open to receive comments and improvements.

3. Program Proposals

Program	Title	Lead	Updates 1/20/2014
1	Building Operation Dynamics-High Mass Buildings	Andreas	Li will follow up with Andreas.
2	Model-based Commissionings	Xiufeng Pang	Zheng will follow up with Xiufeng. The deadline is February 2014.
3	How BAS Can Enhance RCs	Carol Lomonaco	Will prepare for Winter 2015. The deadline is August 2014.
4	What to do with Optimal Control	Josh Wall	Li will follow up with Josh Wall.
5	Presentation on Simulation Tools	Jin Wen	Possibly a conference section in Seattle
6	A seminar or a rach with TC7.9	Li Song	Li will follow up with TC7.9 chair.
7	LEED Building Energy Performance Model Evaluations	Josh	Josh will talk with Joe about the possible program.

#### 4. Research

Research	Title	Lead	Updates on 1/20/2014
RTAR	Bio-sensing Visual Environment Control in the Workplace	Joon-Ho Choi	Joon-Ho Choi will contact Steve Taylor in TC1.4 for possible co-sponsorship.
WS	Distributed Control	Josh Wall	Revised draft will be discussed in the TC meeting.
New	Model Accuracy Impact Study on Model Predicted Control	Andreas	Li will follow up.
New	Simulation Based Optimization for Integrated Whole Building Control	Hashem Akbari	Li will follow up.

#### 5. Handbook

Chapter 41 review committee is led by Nick.

#### 6. Other topics

Code	Title	Date Published	Status	RP	Responsible Group	Needs rev? (2009 survey)	In Rev?	TC Contact or Author
387	Reference Guide for Dynamic Models of HVAC Equipment	1998	ACTIVE	RP-738	TC 07.05	Y	-	Peng Xu, (510)486-4549, <a href="mailto:pxu@lbl.gov">pxu@lbl.gov</a> no longer involved

This looks like a publication that originated from Building Operation Dynamics when that was a TC itself. It was absorbed by TC 7.5 and this responsibility is now under the purview of the Building Operation Dynamics subcommittee.

Could you get your subcommittee to make a recommendation to the full TC 7.5 regarding the committee's position on action regarding this special publication? The committee should recommend one of the following: 1) updating the document, 2) not updating it but recommending that ASHRAE continue to sell it because the content is still current and relevant, or 3) discontinuing the special publication.

**Updates on 1/20/2014:** Committee has agreed that the publication is still viable. However, revisit will be needed for a possible future RTAR to expand the existing publication. The revisit is led by Heejin Cho and Wen Jin.

#### 7. Adjournment

# **ASHRAE TC 7.5: Smart Building Systems Research Subcommittee Meeting**

**Monday, January 20, 2014, 4:45 - 5:45 p.m.**

**Location: Sheraton New York, NY**

**Meeting Room: Riverside Ballroom (S3)**

## **Outline Minutes of Meeting**

1. Review of and additions to agenda: TC7.5 -- none were offered. 4:45 – 4:48
2. Announcements – Chair outlined the topics covered in the Research Breakfast meeting. This included a new RTAR form and some discussion of the ASHRAE research process. The Research Chair has the slides from the breakfast. Phil Haves reminded the committee of the importance of having formal votes on all research initiatives passed to RAC. Both New RTARs and WSs, and those returned by RAC for editing. 4:48 – 4:50
3. Status of current Research Projects and overview of Research Plan– The plan is included below. A review of the plan and the ideas list, and a discussion of several of the WS and RTARs was involved. The specifics are on the research plan. 4:50 – 4:55
4. TC 7.5 research new ideas, new topics a few ideas were added to the research ideas list (attached) 4:55 – 5:10
5. Brief review of RTARs/ Workstatements under development – See the research plan. 5:10—5:30
6. New Business – None offered. 5:30 – 5:45
7. Adjourn 5:45

The Research Plan and Ideas List are included below.

## ASHRAE TC 7.5: Smart Building Systems **DRAFT** Research Plan

### Active RTARs:1

### Active WS:2

Subc	Project	RTAR Contributors	Status
FDD	WS-1615- FDD Methods for Supermarkets	Zheng O'Neill (Chair) Manrola(10.7) Daihong Yuebin Yu	<p>RTAR voted on at Louisville 6/2009 (9-0-1-CNV)  <a href="#">1615-RTAR approved 6/2010</a> in Albuquerque with <a href="#">RAC comments</a>  <a href="#">Draft WS ready</a> for TC vote in Chicago 1/2012                      TC approved (6-0-1-CNV) for submission to RAC                      4/12 RAC returned with comments:</p> <ul style="list-style-type: none"> <li>• Describe envisioned methodology</li> <li>• Better define tasks</li> <li>• Cite more existing researchers as qualified bidders</li> </ul> <p><a href="#">New draft WS</a>, version 7 ready. <a href="#">RAC Comments addressed</a> and Sec. 7 Research Liaison comments addressed.                      Due for TC vote in Dallas- MUST BE SUBMITTED AND APPROVED FOR BID BY JULY 1, 2014 OR TOPIC WILL BE DROPPED PERMANENTLY.                      Zheng O'Neil has addressed comments of RAC in update.                      Should be ready to resubmit after January meeting  <b>Voted this out to resubmit to RAC</b></p>
SG	1543 RTAR Demand Response Optimization Protocol and Integrated Training	Rich Hackner (Chair) David Wilts David Ejadi	<p><del>4/12 RTAR/WS was rejected by RAC.</del></p> <p><del>Extensive comments, would need a fresh rewrite and a new champion.</del></p>
BOD	WS-Real-Time Optimal Control in a Distributed Environment.	Josh Wall	<p>Original RTAR 2005-26                      Review and approve in Orlando and vote in Orlando 2010 meeting.                      -Submit RTAR and WS simultaneously to RAC.  <a href="#">Revised RTAR</a> and <a href="#">revised Workstatement</a> prepared for Chicago                      TC approved (6-0-1-CNV) for submission to RAC</p> <p>4/12 RAC returned with comments:</p> <ul style="list-style-type: none"> <li>• Describe major outcomes</li> <li>• Obtain co-funding</li> <li>• Better define task 3</li> <li>• Cite more qualified bidders</li> </ul> <p>Comments addressed and due for TC vote in Dallas- MUST BE SUBMITTED AND APPROVED FOR BID BY JULY 1, 2014 OR TOPIC WILL BE DROPPED PERMANENTLY.  <b>NYC – Wall revised and resubmitted to address RAC comments. Voted this out to resubmit to RAC</b></p>
<b>FDD</b>	RTAR-Whole-Building FDD	Xiufeng Pang	<p>New draft RTAR prepared for Chicago                      Update needed.  <b>NYC -- more discussion about breadth of definition.</b></p>
FDD	WS 1697 RTAR- Reduce Simultaneous Heating and Cooling in Commercial Buildings	Zheng O'Neill Danny T.	<p>-Voted in Louisville June 23, 2009 (9-0-0 CNV)                      -Re-submit to RAC at Orlando 2010 meeting.  <a href="#">New draft RTAR V3 prepared for Dallas</a>  <b>NYC --RTAR completed and approved now a WS. Zheng will edit to address comments, submit to RAC and do WS.</b></p>

Subc	Project	RTAR Contributors	Status
FDD/ Wireless?	RTAR-Energy Audit using Smart Phones with Low Cost IR Cameras	Yuebin Yu, Zheng Song	New RTAR presented in Dallas NYC – Much discussion regarding goals of the RTAR and WS, product development not a good option.
FDD/ Wireless?	RTAR-Realized Value of Virtual Sensing Technology in the Operation of Packaged Air-Conditioning	Yuebin Yu, Haorong Li	New RTAR presented in Dallas NYC --More discussion
FDD	Draft RTAR – Methods to Evaluate AFDD Methods for Air Handling Unit Systems	Jin Wen	Draft of a start of RTAR distributed at NYC.
SG	RTAR Status and Benefits of Demand Response Program for Residential Buildings (Energy Management System for Residential Houses)	Jin Wen (rev: Srinivas K)	More work needed to be done on the draft RTAR. <b>New champion needed.</b> Bill Palicuta identified as potential contributor. Update needed.
FDD	Low Cost FDD tools for Residential Systems	Haorong Li (rev: Bill Healy)	RTAR will be developed for San Antonio Update?
BOD	Model predictive controls	Nick Gayeski (A. Athenitis)	Nick developed outline and will write RTAR using input from MPC-related program for Dallas meeting. Update?
FDD	Validation of SPC207P Method of test...	Kristin Heinimeier	SPC 207P to develop RTAR/outline for San Antonio. Lead identified, Update needed.
	XML	Mike Pouchak	Possible collaboration with 7.5 Update needed
WL	Assessment tools and the use of wireless in the field	Zheng Song, Bill Healy	<del>New idea in Dallas.</del>
WL	Use of memory capabilities in wireless sensors for distributed control	Yuebin Yu	<del>New idea in Dallas.</del>
WL	Energy Harvesting sensors		<del>New idea in Dallas.</del>
WL	Use of wireless sensors for temporary installation to collect data in retro-ex projects		<del>New idea in Dallas.</del>
WL	Use of wireless devices for home energy systems		<del>New idea in Dallas.</del>
FDD / ET	Data Ontology issues Standard Reference Data for FDD	Nick Gayeski	NYC -- New idea - discussion about scope of work. SPC20 co-sponsor? RTAR in Seattle?
SG	Guideline for Standard Reference Data for FDD	Nick Gayeski	NYC -- New idea - discussion about scope of work. Will become part of larger RTAR.

FDD Idea	What is the most effective way to present results to operators? Monthly meetings, weekly emails- in a way that they take action. (related to dashboard- 'data and interfaces- RP)
FDD idea	FDD for datacenters
FDD idea	Whole Building FDD through smart-meters (champion?)
FDD idea	Reduced-model to predict real-time building/zone load
Existing SG idea	Oasis
SG idea	The connection between smart meter and home owners, consumer acceptance, response and benefits – Jeff Haberl
SG idea	Develop guidelines for facility smart grid integration readiness – Dan Sullivan
SG idea	Facility interaction with Smart Grid and strategies for building response to smart grid demands – Wang Shengwei
SG idea	Green button initiatives and what to do with smart grid data – Ram/Krishnan
SG idea	Review and recommendations for adoption of OpenADR, SEP 2.0, METRI/EcoNET and protocols for smart grid implementation – Hiroei Mikami
BOD idea	Persistence of savings in RCX projects – Rich Hackner and Dave Shipley TCs 6.9, 7.3, 7.9. Co-Sample of Rx buildings from 1/3/5/7 years ago and what savings are still there and what additional savings can now be harvested ? How often should we be cycling buildings through the process assuming that you do periodic and not continuous Rx Contact PECL for data
BOD idea	Standard to verify virtual Meter Performance - Soon Li
BOD idea	Verification of Baseline Models and Additional Metrics for Proprietary Software Models

## Notes and Comments

SG -- Guideline for Standard Reference Data for FDD -- Nick Gayeski (Will become part of larger RTAR).

**Minutes of the Handbook Subcommittee**  
**ASHRAE TC 7.5, Smart Building Systems**  
**2014 Winter Meeting**  
**New York, NY**

**Date:** Sunday, January 19, 2014

**Time:** 5:15 – 6:15 pm

**Place:** Riverside Ballroom (S3)

The meeting was convened at 5:10 pm Eastern Time. Revisions to the agenda were requested; none were offered.

- Nick Gayeski reported on the status of Chapter 41, Supervisory Control Strategies and Optimization of the Applications Handbook. Revisions to the chapter are somewhat behind, but Nick has received proposed revisions from a number of revision authors. Nick committed to having the revised chapter submitted for review by the subcommittee by Feb. 7, 2014. The final version for committee vote will be submitted by the end of April with a committee vote by mail ballot planned for May 2014.

Nick also reported that a recommendation was received to make the chapter more accessible to the average ASHRAE reader because it currently launches into optimization methods after only a very brief introduction.

- Mike Brambley reported on the status of the Smart Building Systems chapter. He reported that a draft of each of the major chapter sections was submitted to him and integrated into a single document but the team is well behind the schedule established in June 2013. He also requested that all the section authors carefully review and revise, as appropriate, their sections. Revisions should make sure to include all references that are cited in the section and that all cited references are listed in the References List. Mike also reported that he drafted two rough drafts of the Introduction section, but was not pleased with those drafts and did not have them at the meeting. Bill Healy reminded Mike that the sections authors can help with reviewing and revising the introduction.

Lead Author Team

Srinivas Katipamula (AFDD)

Rich Hackner (Smart Grid Basics)

Bill Healy (Sensor and Actuator Systems)

Mike Brambley (Integration of the sections and the Introduction)

Authors agreed to have revised sections submitted to Mike by February 7. Mike will replace the current sections with the revision and distribute the integrated chapter for review by all the authors. The chapter will be ready for review and consideration of the chapter for approval ballot by May 1. A mail ballot is planned before the end of May.

## TC 7.5 Contributions to Other Chapters Reports

- Bill Healy reported on the status of the TC 7.5 section on wireless technology that is part of TC 1.5's (Computer Applications) Applications Handbook chapter on Computer Applications. Bill has assessed the situation regarding the wireless material and reported that it is a good fit with the TC 1.5 chapter and would not fit well in the new TC 7.5 new Smart Building Systems chapter. He recommends that the wireless section remain in the TC 1.5 chapter.

Bill Healy and Carol Lomonaco will request that their colleagues with expertise in wireless review the section and validate the information.

- Mike Brambley reported on the status of the O&M Management chapter and the Automated Fault Detection and Diagnostics section in it. He reported that TC 7.3 will vote on approval of the revised chapter on Tuesday at New York ASHRAE Conference (later reporting at the full TC 7.5 meeting that TC 7.3 approved it).

Mike committed to providing the AFDD section to Rich Hackner for distribution to TC 7.5 for review. If edits are found necessary, they should be sent to Mike, who will request that TC 7.3 make the requested edits.

Srinivas Katipamula pointed out that the TC 7.3 AFDD section and the TC 7.5 AFDD section of the Smart Building Systems chapter should reference each other. Mike committed to request TC 7.3 to insert such a reference in the O&M Management chapter AFDD section.

There was no new business.

The meeting was adjourned at 5:35 p.m. Eastern Time.

Respectfully submitted,

Michael R. Brambley

## Attachments

### ASHRAE 2014 Winter Meeting – New York, NY – January 18-22, 2014



AGENDA SECTION  
TC-TG-TRG CHAIRS B



2013-RTAR-Form-Exa  
mple-r1.pdf



2013-RTAR-Form-r1  
RX TC75 and TC69 v1