

**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 ---January 31, 2016**

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

**DATE OF MEETING: January 26, 2016                      LOCATION: Orlando, FL**

<b>Voting Members and Executive Committee Members Present</b>	<b>Voting Members and Executive Committee Absent</b>	<b>Ex Officio, Corresponding Members and Guests Present</b>
Natascha Milesi Ferretti, Chair, (V)	Nick Gayeski, Enabling Technologies Subc. (NV)	Adrian Wallace (CM)
Rich Hackner, Vice Chair, (V)	Jin Wen, Research Subc. (V)	Agami Reddy (CM)
David Yuill, Secretary (NV)	Haorong Li, FDD Subc. (NV)	Andreas Athienitis (CM)
Li Song, BOD Subc (V)		Barry Bridges (CM)
Joshua Rhodes, Smart Grid Subc. (V)		Brian James (CM)
Mike Galler, Webmaster (NV)		Carlos Haiad (CM)
Ran Liu, Programs Subc (NV)		Carol Lomonaco (CM)
Vern Smith, Handbook Subc (NV)		Dave Shipley (CM)
Carol Lomonaco (V)		David Blum (CM)
Brian James (V)		Gang Wang (CM)
Xin (Sherry) Hu (V)		George Yaeger (CM)
Yuebin Yu (V)		Glenn Remington (CM)
Glenn Remington (V)		James Gray (CM)
Peter Armstrong (V, NQ)		Jia Huang (CM)
Edward Tsui (V, NQ)		John House (CM)
		Li Song (VM)
		Mikhail Gorbounov (CM)
		Mike Brambley (CM)
		Mike Galler (CM)
		Paul Raftery (CM)
		Peter Armstrong (CM)
		Ran Liu (CM)
		Sam Loggia (CM)
		Srinivas Katipamula (CM)
		Tea Zakula (CM)

Voting Members and Executive Committee Members Present	Voting Members and Executive Committee Absent	Ex Officio, Corresponding Members and Guests Present
		Tom Lawrence (CM)
		Vern Smith (CM)
		Vishal Garg (CM)
		Wangda Zuo (CM)
		Xiaohui Zhou (CM)
		Yaoyu Li (CM)
		Zheng O'Neil (CM)

(V) = voting member

(PCM) = provisional corresponding member

(CM) = corresponding member

(G) = guest

**DISTRIBUTION:**

ALL MEMBERS AND CORRESPONDING MEMBERS OF TC

TAC CHAIR: Thomas Lawrence

TAC SECTION HEAD: Adrienne Thomle

ALL COMMITTEE LIAISONS AS SHOWN ON TC ROSTERS:

Research: Phil Haves

Standards: Rick Larson

CTT: Mike Cooper

Special Publications: William Fleming

Handbook: Bryan Becker

Staff Liaison (Research/Tech Services): Michael Vaughn

ALI/PDC.: Cameron Labunski

DATE: January 26, 2016

TC NO. 7.5 TC TITLE: Smart Building Systems

CHAIR: Natascha Milesi Ferretti VICE CHAIR: Rich Hackner

TC Meeting Schedule

Location, past 12 mo.	Date	Location, planned next 12 mo.	Date
Chicago, IL	1/27/15	St. Louis, MO	6/28/16
Atlanta, GA	6/30/15	Las Vegas, NV	1/31/17

TC Voting Member Status

	Name	Until	Present
1	Natascha Milesi Ferretti	2016	Yes
2	Rich Hackner	2019	Yes

3	Jin Wen	2019	No
4	Glenn Remington	2017	Yes
5	Josh Rhodes	2017	Yes
6	Yuebin Yu	2017	Yes
7	Li Song	2017	Yes
8	Xin (Sherry) Hu	2019	Yes
9	Brian James	2019	Yes
10	Carol Lomonaco	2019	Yes
NQ	Peter Armstrong	2019	Yes
NQ	Edward Ka Cheung Tsui	2017	Yes

ASHRAE 2016 Winter Meeting – Orlando, FLA – January 23-27, 2016

Chair	Natascha Milesi-Ferretti
Vice Chair/Standards	Richard Hackner
Secretary	David Yuill
Handbook Subcom. Chair	Vern Smith
Research Subcommittee Chair	Jin Wen
Program Chair	Ran Liu
Buildings Operations Dynamics Subcom. Chair	Li Song
Smart Grid Subcom. Chair	Josh Rhodes
Enabling Technologies Subcom. Chair	Nick Gayeski
Fault Detection Diagnostics Subcom. Chair	Haorong Li
WebMaster	Mike Galler

**ASHRAE TC 7.5 Smart Building Systems  
2016 Annual Meeting  
Atlanta, GA  
Orange A, Orlando Hilton  
Minutes**

**Date: Tuesday, January 24, 2016**

Meeting called to order by Chair Natascha Milesi-Ferretti

1. Call to Order (Milesi Ferretti)
2. Self Introductions of Members, Guests and Liaisons
3. Roll Call

11 of 12 (including non-quorum) voting members were present: Natascha Milesi Ferretti, Rich Hackner, Edward Ka Cheung Tsui, Peter Armstrong, Carol Lomonaco, Brian James, Sherry Hu, Glenn Remington, Yuebin Yu, Li Song, and Joshua Rhodes

1 member was absent: Jin Wen

Quorum achieved. (11/12)

4. 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.

5. Approve agenda
6. Approval of Atlanta 2015 Meeting Minutes

**Corrections: Liaison listings**

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**Motion to approve**

Atlanta 2015 Meeting minutes with minor changes to liaison listings

**- Rich moved and Yuebin seconded. 9-0-0-1 Chair not voting.**

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7. Announcements

- The Hightower Award went to Steve Duda
- No Service to ASHRAE Research recipient
- 4 new MTGs were formed
- Give feedback on the updated website to Mike Galler
- All mandatory positions now have aliases
- CEC wants feedback on technical program submission process
- Half of our voting members roll off in 2017, so we should add some additional voting members
- We have cleaned up the roster to remove bad emails and uninterested members
- Seminar and forum proposals for St. Louis are due Feb 8<sup>th</sup>
- RAC is prioritizing research related to Residential Sector
- Society offers ways to hold subcommittee meetings by webinar and phonecall. This can free up meeting time to avoid potential conflicts and can allow members who can't travel to contribute to the TC.

8. Old Business

a) Project Committee and Ongoing Research Reports

- i. **SPC 207P – Dave Shipley:** We are behind our original schedule. There is still a lot of work to be done and we are making good progress. There were two motions voted upon: one to modify changes to purpose and scope; a second was to do some validation of the standard.
- ii. **RP-1615 – John House:** We're about nine months in. The scope involves a literature review, a survey to understand common systems and faults in supermarkets, evaluate two existing methods using fault free and faulty data to see how well they work. There were two PMS meetings recently, including one in Orlando. Some challenges include finding survey respondents and getting data sets that are reliable and have faults in them.

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**Motion to approve a no-cost extension until April 30, 2017 to RP-1615**

- **Rich moved and Li second. 8-0-1-1 Chair not voting.**

**One member, Yubein, abstained because he is the PI of the project.**

**Motion passed.**

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b) Subcommittee Reports

- i. **Fault Detection and Diagnosis Subcommittee – Yuebin Yu for Haorong Li:** RTAR 1781 – Methods to evaluate AFDD strategies for AHU systems. It was accepted with comments.

A research idea was put forward by Nick to compile a list or summary of FDD methods. He sent it to Phil and received some comments.

Yuebin and Haorong developed an idea with respect to virtual sensors and sent it to Phil. Phil sent it back with some comments that should be addressed before it is submitted.

- ii. **Enabling Technologies – Natascha Milesi Ferretti for Nick Gayeski:** RTAR 1783 was accepted with comments. Li is ready to move forward to work statement and has two volunteers to help.

Review of metadata with taxonomies, a research idea put forward by Nick, is still in development. It has had comments from Phil.

- iii. **Smart Grid Subcommittee – Josh Rhodes:** Discussed demand response guideline. Had an open discussion about the role of ASHRAE in smart grids; whether ASHRAE should be more of an educational than research contributor in smart grids.

Discussed program ideas for St. Louis: Rich will submit a program on smartgrid innovation. Carlos is going to submit a program on smart grids.

Brian James reported on a Demand Response Guideline Committee that met to propose a new guideline. TCs 7.5 and 9.9 will be involved.

They'll submit in 28 days. Big questions are what do designers need to know w.r.t. demand response.

- iv. **Building Operations Dynamics Subcommittee – Li Song:** Program: submitted four seminars, but one switched to technical session. 1) Impact of operable windows; 2) human behavior in design and operation of residential buildings;

Research: one RTAR was submitted and rejected. Jin will work with him to rework it. Another RTAR to update reference guide of dynamic models. Heejin Cho is the author.

WS 1661 was described by Wangda Zuo on dynamic models for the control of chiller plants with water side economizers.

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**Motion to approve re-submission of WS 1661 to RAC for co-sponsorship from TC 7.5**

- **Li moved and Yuebin second. 8-0-0 Chair not voting.**

**Motion passed.**

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- v. **Research – Xiaohui Zhou reported for Jin Wen:** WS co-sponsorship should engage co-authorship at the writing stage, not just the final stage. Currently RP-1615 received a no-cost extension. 3 RTARs were submitted to RAC: 1781-AFDD methods for AHU has been approved by RAC and 1783-virtual sensors was accepted with comments. 1782 was rejected – learning occupancy through smart sensors. Night setback effectiveness is a planned RTAR by Peter.
- vi. **Program – Ran Liu:** See attached report
- vii. **Handbook – Vern Smith:** We have two chapters – Smart Building Systems (Applications), Supervisory Control Strategies and Optimization Strategies (Applications) and content in two additional chapters.
- viii. **Standards – Rich Hackner:** We already heard updates on SPC 207P and a discussion of a new guideline project on Demand Response and a new Multidisciplinary Task Group (MTG) also on Demand Response.
- ix. **Webmaster – Mike Galler:** A new website design for TCs was rolled out.

c) Committee Liaison Reports

**TC 1.5 Mike Galler**---New subcommittee on cybersecurity. They thought there may be some interest from 7.5 members. Mike Galler is the chair of the subcommittee. Handbook is completely rewriting their handbook. Need to get in touch to keep our content in their chapter. Krishnan Gowri is their HB subcommittee chair.

d) Society Liaison Reports

**Research Administration Committee (RAC) – Phil Haves:** There's money. Good projects will get funded if they come in. There's a reserve that they'll tap into if there's good research.

We're encouraged to come up with applications projects. That means being clear about how we get to the point of having an impact. Also, they're open to taking existing results and taking them toward application, like software development, for example.

They're keen that co-sponsoring TCs have early involvement in development of RTAR or WS. They're keen that we think outside the box of the TC.

URPs are on hold at the moment because the process is being reviewed. They particularly don't like TCs going around the work statement process.

e) Roster Updates

Provisional corresponding members who would like to move to corresponding member status should contact Natascha to request this change. Natascha sent them all an email to ask if they're interested.

9. New Business

No new business was discussed.

10. Upcoming Deadlines

Deadlines were given for program submission for St. Louis and Las Vegas.

11. Next Meeting

Sunday, June 26, 2016, St. Louis, MO

12. Adjournment

Motion by Rich to adjourn, seconded by Brian. Meeting adjourned at 5:57 pm.

**ASHRAE TC 7.5: Smart Building Systems Research Subcommittee Meeting**  
**Monday, January 25, 2016, 5:15 – 6:15 p.m.**

AGENDA

1. Roll Call and Introduction 5:15-5:18
2. Announcements 5:18 – 5:20
  - RAC updates:
    - ASHRAE is interested in more applied research;
    - WS co-sponsorship should start at the writing stage, i.e., should engage co-authors from co-sponsoring TCs
3. Status of current Research Projects and overview of Research Plan 5:20 – 5:30
  - a. Report on RP 1615  
John House reported on the status of 1615. It ran into some challenges: 1) they had difficulties recruiting the right survey samples who have the right background to answer the questions. There were good suggestions during PMS meeting, including several additional data sources. 2) how to test these AFDD methods; 3) what methods to test – 1 data driven and 1 physics based were suggested in the PMS meeting. Original ending date is end of June 2016. It will request a NCE in main meeting. TC 10.7 is a co-sponsor.  
**Action 1 in main meeting: vote for NCE for 1615**
  - b. New WS candidates
    - i. TC 4.7 WS-1661 “Development and Validation of Dynamic Models for the Control of Chiller Plants with Water Side Economizer” would like to seek co-sponsorship. This WS has been reviewed by RAC with comments. The revised WS, RAC comments, and responses have been sent to voting members last night.  
**Action 2 in main meeting: invite Wangda Zuo to introduce WS and vote for co-sponsorship.**
    - ii. A new WS from Yuebin Yu is developed (title: Energy Audit using Smart Phones with Low Cost IR Cameras). Will send to Phil for comments.
  - c. Three RTARs (1781, 1782, 1783) were submitted to RAC in August. Two (1781, 1783) accepted and one rejected (1782). See next page for details. The two accepted RTARS will be developed into WS. The one rejected will be revised for resubmission. Volunteers were solicited for the rejected one.
4. Brief review of RTARs/ WS under development 5:30 – 5:50
  - a. There will be a new RTAR from Heejin for vote, if not in main meeting, then in between meetings. See next page for details.
  - b. Other active RTARs were discussed. One dropped because it is already funded via other sources.

5. TC 7.5 research new ideas, Road Map 5:50—6:05

- a. A road map meeting will be held in June 2016 using TC's own time. Questions to be asked during the road map discussion will be distributed by May 2016 to steering committee members.

6. New Business 6:05 - 6:15

- A TC 2.4 WS seeks co-sponsorship and co-authors. Volunteers identified. The topic is on evaluation of low-cost particulate sensors for building ventilation control, energy efficiency, and IAQ. The main task is to compare these low cost sensors against lab-grade sensors.
- A TC 1.4 RTAR seeks co-sponsorship and co-authors. Current title: "Night setback effectiveness" possible change to "Night preconditioning effectiveness" because the same models would be used.

Action 3: Need to identify volunteers. Invite Peter Armstrong to discuss the idea and see volunteers.

7. Adjourn

6:15

RAC Meeting:

March 1<sup>st</sup> for Spring meeting; May 15<sup>th</sup> for June meeting;

August 15<sup>th</sup> for Fall meeting; Dec 15<sup>th</sup> for Jan meeting.

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

**Active RTARs:2; Draft RTARs:7**

**Active Projects:1**

Subc	Project	Contributors/PI	Status
FDD	<b>1615 RP</b> FDD Methods for Supermarkets	PI: Yuebin Yu and David Yuill PMS Chair: John House	CHI—J. House reports on results of PES. ATL- 1 <sup>st</sup> PMS meeting completed. On track ORL – a 2 phase projects. Had some challenges 1) with survey subjects and answers. Good suggestions during PMS meeting. Several data sources suggested. 2) how to test these methods; 3) what methods to look at – 1 data driven and 1 physics based. End of June 2016 is the original ending date. Will request a NCE in main meeting. TC 10.7 is a co-sponsor.
FDD	<b>RTAR 1781:</b> – Methods to Evaluate AFDD Methods for Air Handling Unit Systems	Jin Wen	CHI – Jin Wen has new version for submission. Atlanta – Voted; submitted to RAC. RAC accepted with comments for WS. ORL – WS in preparation
ET	<b>RTAR -1782:</b> “Learning occupancy presence in residential buildings through smart meter data”	Bing Dong and Zheng O’Neill	Voted in Atlanta; Submitted for RAC to review. RAC <b>rejected</b> .  “it is not clear if ASHRAE should lead or others (EPRI, etc.) and how much research is needed to detect or model the occupancy based on smart meter data...”  ORL – discussed with Phil and solicited comments (comments on whether available technologies and other literatures have been integrated in the RTAR). Smart thermostat might learn occupancy.  Behavior based action from Utility company – if you know occupancy patterns then send messages etc.
ET	<b>RTAR-1783:</b> Develop cost and performance indices to evaluate effectiveness of virtual sensors in HVAC applications	Li Song	Voted in Atlanta; Submitted for RAC to review. RAC accepted with comments. ORL – WS in preparation
FDD/ET	<b>Draft RTAR</b> -Energy Audit using Smart Phones with Low Cost IR Cameras	Yuebin Yu, Zheng Song	New RTAR presented in Dallas NYC – Much discussion of goals of the RTAR and WS, product development not a good option. SEA – neither author here, held over to Chicago. CHI—discussion of RTAR in FDD meeting. Waiting for comments. ATL – no discussion ORL – has full WS – will send to Phil – focusing on fundamental knowledge
FDD/ET	<b>RTAR</b> -Realized Value of Virtual Sensing Technology in the Operation of Packaged Air-Conditioning	Yuebin Yu, John House	New RTAR presented in Dallas NYC --More discussion SEA – neither author here, held over to Chicago. CHI – Yuebin explained RTAR. ATL – no discussion ORL – John will help on this RTAR and will send to Jim Braun for his inputs

Subc	Project	Contributors/PI	Status
BOD	Draft RTAR – Updating Reference Guide for Dynamic Models of HVAC Equipment	Heejin Cho	SEA --Is this tech transfer? Update of Jean LeBrun’s work from 1990’s All kinds of tech transfer hurdles to leap over. Would this be better as a tool kit? BOD discussion on toolkit option, changing scope and budget and timing of research. ATL – need to be revised completely. <b>ORL – Heejin will give a revised version tonight.</b>
ET/FDD	RTAR Metadata and Taxonomy to Support FDD in Smart Buildings	Nick Gayeski	SEA NEW submitted for consideration by Subcomms CHI – Nick discussed wants feedback. Explained purpose ATL- Phil did not think the need and significance to ASHRAE are clear. Had discussion in ET subcommittee. Nick will revise <b>ORL – Nick is continuously updating it.</b>
Co-Sponsor	TC 4.7 WS 1661- Development and validation of dynamic models for the evaluation of chilled water system control strategies in the ASHRAE handbook	Wangda Zuo	Co-sponsoring with TC – 4.7 WS is returned with comments. Wangda will provide updated <b>WS for TC review during Orlando.</b>
Co-Sponsor	TC 2.4: WS evaluation of low-cost particulate sensors for building	Brent Stephens	<b>ORL: – need co-authorship too – against lab-grade equipment to review their performances...</b>
Co-Sponsor	TC 1.4 RTAR Current title: "Night setback effectiveness" possible change to "Night preconditioning effectiveness"	Peter Armstrong	<b>ORL: Seek co-authorship.</b> Objective: show how to credibly model energy and comfort impacts of night preconditioning. (also effectiveness of simple through MPC controls?)
Parking Lot			
BOD/ET	Possible CoSponsorship – Eval of Low Cost Particle and CO2 sensor for IAQ systems	Nick Gayeski Brent Stevens Josh Rhodes 2.4	SEA --TC 2.4 in the lead. CHI --Started in SEA co-sponsorship with 2.4 Scope too large not looking for Co-sponsorship right now. Validation of sensors first.
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	Literature Review and Survey of existing FDD methods and data	Nick Gayeski, Jin Wen	ATL - FDD literature review and central location for download data/methods etc. (collection of methods) – existing Not only compiling but assessment of new technologies (indicating last large scale study is 2005) Characterization (qualitatively) evaluate. IEA 34.
FDD	Idea - Whole Building FDD through smart-meters (champion?)		

Subc	Project	Contributors/PI	Status
ET	Ideas -- Connectivity in the home?	Nick Gayeski	CHI – Much discussion no resolution
SG	Development of models for better peak load predictions		CHI—New idea.
SG	Idea – DR guideline related ideas		ATL – estimate thermal response etc.
SG	Idea --Instantaneous voltage and current load from bldgs. For SG	Ralph Muehleisen Argonne NL	CHI – New Idea
BOD	Idea - Model accuracy impact study on model predicted control	Andreas Athenitis	Positive responses are received from Andreas for both program and research. More details to be discussed in Seattle. SEA – No discussion ATL – will have a RTAR ORL – idea funded in Canada. Dropped.
Co-Sponsor	Idea -	TC 7.3	ATL – Mike Brambly mentioned an idea about building maintainance and FDD
Co-Sponsor	WS 1661 – MODELICA supervisory control	TC 1.4 Phil Haves	ATL – active WS

Regarding WS-1615:

There is a research project, 1467-RP, that is complete except for the final report, which was a study of the relative loads and interaction between the case refrigeration and HVAC loads and energy in supermarkets. TC10.7 sponsored, and I am the PMS chair. Mike Brandemuehl from Colorado was the contractor. It might be helpful for you to understand the relative loads and how they are coupled since this is one of the topics mentioned in your work statement.

ASHRAE TC 7.5 Smart Building Systems  
2016 Annual Meeting, Orlando, FL

Fault Detection and Diagnostics Subcommittee meeting

Prepared by Yuebin Yu

Sunday, June. 24, 2016

3:00pm-3:45pm in room Lake Eola B, Hilton

**Scope:** The FDD Subcommittee of TC 7.5: Smart Building Systems aims at exploring and developing technologies to help detecting and diagnosing common faults existing in building HVAC systems. The scope of this subcommittee includes (a) identifying and sponsoring research projects to develop new FDD technologies, evaluate existing FDD technologies; provide recommendations to building operators and practical engineers; and develop supporting tools for researchers in FDD areas; and b) organizing programs to disseminate research findings and advancements in FDD areas among ASHRAE members.

1. Project(s): There is one active research project related to FDD and sponsored by TC7.5 and TC10.7, Fault detection and diagnostics for supermarkets- Phase I, 1615 RP. The project was granted to University of Nebraska-Lincoln and launched in April 2015. They have a teleconference meeting on 1/14<sup>th</sup> and a follow up meeting here at Orlando. The main discussions are about the information survey and data collection, as well as targeted FDD algorithms.
2. RTAR, WS and ideas:
  - 2.1. Jin Wen updated the status of an RTAR-1781 **Methods to evaluate AFDD strategies for air handling unit systems**. It was voted in Atlanta, submitted to RAC and get accepted with comments for WS. Jin Wen will work on the WS.
  - 2.2. Nick Gayeski addressed the status of a drafted research idea RTAR **A Compilation of analysis of existing FDD methods**. Comments were received from Philip Haves about the specific needs of this research. Nick may still continue the idea.
  - 2.3. Yuebin Yu addressed the status of a drafted research idea RATR **Evaluation of energy saving opportunities of using virtual sensing technology in packaged air-conditioning units**. Comments were received from research liaison Philip Haves regarding the targeted problems (oversizing, uncoordinated control, better outdoor air intake control, etc.). Discussions were triggered on the concept of virtual sensor and the use. Yuebin will follow up.
  - 2.4. New ideas: Proposed a series of research project on establishing real-time series data, logged with faults, for different building types and systems. Discussion were triggered regarding the necessity. No conclusion yet before more research and literature review is conducted.
3. Programs: updates from the program chair Ran Liu regarding the seminars in Las Vegas on **FDD in the field**.
4. Ideas in the parking lot:
  - 4.1. "FDD for geothermal heat pumps"

4.2. "FDD strategy for wind generation devices"

4.3. "Standard methods for testing FDD"

4.4. "Low-cost FDD tools for residential systems"

**Program ideas discussion in the future:**

Although there is no programs for this meeting sponsored by this TC, there are three seminars related to FDD;

Srinivas Sriva: FDD for dummies. never submitted for dallas. still go ahead. the seminar will continue. FDD fundamentals and FDD applications: Coral has three speakers. already. end users. save the money. there are a couple of discussion between Coral and Srinivas???

Mike Brambley, FDD tools available today from Mike. Requesting response from the members. Change it to FDD for packaged roof top unit and split residential buildings: what's new: mike mentioned three speakers already. one is about the code, FDD testing, shanggao, from. very low cost.. Lucy wang from UNL. ???

Dallas, august 13th. mini conference for FDD. Denver. ? Mike mentioned that whether it is possible.

Mike: standard. to7p Chicago. terminology, performance matrix. and those committee or working group continue to meet by telephone conference. SPC. to7C tomorrow.???

**Meeting adjourned at 4:00 pm.**

## TC 7.5 Program Report for Orlando, FL 2016

**Ran Liu**

**(liu-ran@outlook.com)**

**01/26/2016**

### I. TC 7.5 Program Submitted and Accepted for Orlando Meeting

**Red** indicates accepted/scheduled programs that TC 7.5 sponsored or co-sponsored at Atlanta conference.

Sub Committee	Type	Session Chair / Speakers	Proposed Title	Status
<b>NBT</b>	Seminar 41	Kristen Cetin / Josh Rhodes	Residential Smart Appliances: Enabling Electric Grid Resilience and Demand Response	<b>Accepted</b> For Orlando (submitted)
<b>BOD</b>	Seminar 58	Bing Dong	Considering Occupancy Behavior in Design and Operation for Residential Buildings	<b>Accepted</b> For Orlando (submitted)
<b>BOD</b>	Seminar 31	Liping Wang/Ran Liu	Impact of Operable Windows on Building Performance	<b>Accepted</b> For Orlando (submitted)
<b>BOD</b>	Technical paper 7	Andreas Athienitis/Vasken Dermardiros	Development of Reduced Order Thermal Models of Building Integrated Active PCM-TES	<b>Accepted</b> For Orlando (submitted as technical paper)
<b>BOD</b>	Technical paper 7	Andreas Athienitis/Jennifer A. Date	Impact of Thermal Model Resolution on Peak Heating Demand Calculation under Different Set Point Profiles	<b>Accepted</b> For Orlando (submitted as technical paper)
<b>BOD</b>	Conference Paper 21	Zheng O'Neil / Fuxin Niu	Bayesian Network Based HVAC Energy Consumption Prediction Using Improved Fourier Series Decomposition	<b>Accepted</b> For Orlando. (submitted as conference paper)
<b>FDD</b>	Conference Paper 17	Zheng O'Neil / Fuxin Niu	An Energy Plus/Open Studio Based Fault Simulator for Buildings	<b>Accepted</b> For Orlando. (submitted as conference paper)

### **Co-sponsorship**

Sponsor Committee	Type	Session Chair / Speakers	Proposed Title	Status
TC 1.4 Control	Seminar 7	Joseph Kilcoyne	Energy Submetering	<b>Accepted</b>

Theory & Applications			Fundamentals: Benchmarking, Baselineing and Beyond!	For Orlando
TC 1.9 Electrical Systems	Forum 1	Randall Higa	Got Demand Response? How Should Buildings be Designed to Connect to the Smart Grid?	Accepted For Orlando

## **II. Program Subcommittee Chair Training Notes**

### 1. Program options

#### Technical papers

First priority (25-30 pages) CEC not involved

11 sessions at Orlando

#### Conference papers

Secondary priority (8 pages) CEC involved

22 sessions at Orlando 90%-95% acceptance rate

TC can help: Group together for conference paper submission. Need a volunteer from TC to chair the session.

Seminar, workshop, forum lower priority compared to the paper sessions, but still important. Feb 8 deadline for submission.

### 2. TC chair responsibilities

Maintain plenty program ideas

Communicate with session chairs and speakers

Assist submitting programs

Contact the conference program chair with any questions regarding the programs

### 3. Session chair responsibilities

Develop abstracts for seminars, workshops, and forums. Identify speakers

Put together learning objectives for the session, collect the information from the speakers

Submit the program and make sure all contents are appropriate

Assist the speakers with developing the topics and uploading slides

Refer to Speaker's Resources for information regarding the presentation.

<https://www.ashrae.org/membership--conferences/conferences/speakers-resources>

### 4. CEC policy

Need to provide financial support information for conference paper starting St Louis

Invited expert speaker could waive the registration fee, limited 5 per conference  
Real time feedback for workshop and forum, through smart phone

### **III. ASHRAE Annual Conference June 25 - June 29, 2016 | St. Louis, MO**

“A new ‘Smart Building Systems’ track for this conference addresses the revolution in information technology applied to the built environment,” said Tom Kuehn, Conference Program Chair. “Weather and time of day utility rate forecasting, distributed sensors and remote monitoring and control are all included in the track.. Topics key to personal success are included in the ‘Professional Skills Beyond Engineering’ track. Programs describing advances in refrigeration technology are given special emphasis and other tracks cover more conventional topics.

Programs are sought for the following tracks: Advances in Refrigeration Systems and Alternative Refrigerants; Fundamentals and Applications; HVAC Systems and Equipment; Smart Building Systems/Remote Monitoring and Diagnostics; Indoor Environment: Health, Comfort, Productivity; Professional Skills Beyond Engineering; and Renewable Energy Systems and Net Zero Buildings. Programs are also sought for the fourth annual Research Summit, which reports results on any aspect of ASHRAE-related research. In addition, programs focusing on practical applications and utilizing case studies are requested.

Programs are requested for the following program types: Seminars, which include 1-4 presentations on a similar topic; Workshops, which allow equal time for 1-2 presentations and discussion; and Forums, which are discussion-based sessions with no presentations.

A call for programs (non-paper based presentations) is now open through February 8, 2016. To submit a Seminar, Workshop or Forum proposal, click on one of the green buttons under Begin a Submission on the upper lefthand side of this page.

ASHRAE recently closed a call for papers. 123 conference paper abstracts were approved. The papers submitted are currently being reviewed.

The ASHRAE 2016 Annual Conference will take place in St. Louis, MO, at the America’s Center Convention Complex and Renaissance St. Louis Grand Hotel, June 25-29, 2016. The 2016 ASHRAE Annual Conference will attract some 2,500 attendees and meeting participants.

- **Track 1: Advances in Refrigeration Systems and Alternative Refrigerants**

***Track Chair: Frank Schambach***

**Email:** [frankschambach@mindspring.com](mailto:frankschambach@mindspring.com)

This track seeks papers and programs that explore the wide range of refrigeration systems under development with special emphasis on the use of alternative refrigerants in vapor compression machines to address environmental concerns.

- **Track 2: Research Summit**

***Track Chair: Jeffrey Spitler***

Email: [spitler@okstate.edu](mailto:spitler@okstate.edu)

The fourth annual Research Summit seeks papers that report results on any aspect of ASHRAE-related research including heating, cooling, ventilation, other energy uses in the engineered environment and associated environmental aspects.

- **Track 3: Fundamentals and Applications**

*Track Chair: David E. Claridge*

Email: [dclaridge@tamu.edu](mailto:dclaridge@tamu.edu)

Fundamental information and applications of fundamentals related to all aspects of HVAC&R are welcome. This can range from psychrometric properties and processes to combustion, controls, HVAC system and envelope fundamentals and beyond.

- **Track 4: HVAC Systems and Equipment**

*Track Chair: Alan Neely*

Email: [alan\\_neely@pghcorning.com](mailto:alan_neely@pghcorning.com)

This track will include presentations on best practices to implement traditional, non-traditional, and hybrid approaches to achieve successful HVAC&R systems design. Objectives include high performance systems and equipment, LEED certified designs and sustainable buildings.

- **Track 5: Smart Building Systems/Remote Monitoring and Diagnostics**

*Track Chair: Samir Traboulsi*

Email: [traboulsi.samir@gmail.com](mailto:traboulsi.samir@gmail.com)

Smart buildings address HVAC&R equipment operation (chiller sequencing, soft start), integration into complete systems and can potentially interface with multiple building complexes and micro grid operation. This track includes papers on advanced communication protocols, system integration, BMS tools, data management and analysis.

- **Track 6: Indoor Environment: Health, Comfort, Productivity**

*Track Chair: Dennis Alejandro*

Email: [denzjac@yahoo.com](mailto:denzjac@yahoo.com)

Buildings and other enclosed spaces are increasingly required to provide safe, healthy environments in an energy efficient manner. Papers in this track will review the balance between

environmental health and energy efficiency in buildings and help define future education, policy and research directions.

- **Track 7: Professional Skills Beyond Engineering**

**Track Chair: Rachel Romero**

**Email:** [rachel.romero@nrel.gov](mailto:rachel.romero@nrel.gov)

This track seeks to ensure professional skills are being developed and maintained beyond engineering essentials. Emphasis will be placed on meeting the professional development and business needs of today and converting them into the building blocks of tomorrow's success.

- **Track 8: Renewable Energy Systems and Net Zero Buildings**

**Track Chair: Kevin Gallen**

**Email:** [kevin@gallenengineering.com](mailto:kevin@gallenengineering.com)

Wind, hydroelectric and solar are just a few of the alternative and/or renewable energy sources that are being used in HVAC design as we strive for Net-zero and high efficiency buildings. This track will address recent advances in alternative energy systems and equipment and new design strategies for achieving Net-zero buildings.

## **Conference Program Chair: Tom Kuehn**

Email: [kuehn001@umn.edu](mailto:kuehn001@umn.edu)

### **Staff Support**

For information on the technical program, special events, special sessions and general conference inquiries

**Tiffany D. Cox**

Assistant Manager of Conference Programs

**Email:** [tcox@ashrae.org](mailto:tcox@ashrae.org)

### **Technical Support**

For technical problems or for help in submitting an abstract online, [email Tech Support](#)

## **Schedules for St. Louis**

January 26, 2015	Conference Paper Accept/Revise/Reject Notifications
February 8, 2016	Seminar, Forum and Workshop Proposals Due
February 15, 2016	Revised Conference Papers/Final Technical Papers Due

February 26, 2016	Conference and Technical Paper Final Accept/Reject Notifications
March 23, 2016	Seminar, Forum and Workshop Accept/Reject Notifications
May 6, 2016	Upload of PPTs Begins
June 6, 2016	All PPTs Due Online
June 22, 2016	Final Day for Commercialism Revision Upload

Link for submitting programs for St. Louis:

<http://ashraem.confex.com/ashraem/s16/cfp.cgi>

#### **IV. ASHRAE Winter Conference Jan. 28 - Feb 1, 2017 Las Vegas, NV**

Programs are requested for the ASHRAE 2017 Winter Conference tracks: Fundamentals and Applications; HVAC&R Systems and Equipment; Water-Energy Nexus; Commercial and Industrial IAQ; Mission Critical Design and Operation; Effects of Climate Change on HVAC&R; Energy Efficient Industrial Buildings; and Building Operation and Performance.

ASHRAE offers two types of paper submissions:

- **Conference Paper Abstracts due March 14, 2016.** Upon acceptance, papers will be due July 6, 2016. These “final” papers undergo a single-blind review, are submitted as a PDF and have an eight single-spaced page maximum length.
- **Full Technical Papers due April 18, 2016.** Papers submitted for review must be both technically accurate and clearly written. These papers undergo a rigorous double-blind review and can be a maximum of 30 double-spaced pages.

- **Track 1: Fundamentals and Applications**

***Track Chair: Chuck Curlin***

**Email:** [ccurlin@shultzeg.com](mailto:ccurlin@shultzeg.com)

Engineering fundamentals are the foundation to understanding modeling, design, construction and operation of HVAC&R applications. This track provides opportunities for papers and presentations on theories, models, designs and shared experiences for both theoretical and applied concepts.

- **Track 2: HVAC&R Systems and Equipment**

***Track Chair: Michael Collarin***

**Email:** [Michael.Collarin@parsons.com](mailto:Michael.Collarin@parsons.com)

Selection of equipment and design of systems is critical for effective HVAC&R operation, and for achieving building operators' goals. The papers and programs in this track will assist designers and building operators in the use of traditional, non-traditional and hybrid equipment and systems; with an emphasis on high performance, sustainable and LEED-certified buildings.

- **Track 3: Water-Energy Nexus**

*Track Chair: Gary C. Debes*

Email: [gcdebes@verizon.net](mailto:gcdebes@verizon.net)

The interdependencies between our water and energy systems are clear and are becoming more prominent as development requires the use of more resources while over-use and climate change make some resources scarcer. On the macro level, water is used in all phases of energy production and electricity generation (including renewables); and energy is required to extract, convey and deliver water, and to treat wastewaters prior to their return to the environment. On the micro level, the water-energy nexus is a major consideration for the HVAC&R community in determining equipment and system selection and design as well as building operation. This track will present papers and programs highlighting recent research on this issue as well as technologies and designs intended to reduce the gap between energy and water efficiency.

- **Track 4: Commercial and Industrial IAQ**

*Track Chair: Kevin Marple*

Email: [kmarple@benzco.com](mailto:kmarple@benzco.com)

Indoor Air Quality is a vital consideration in the built environment. As people spend increasingly more time in industrial and commercial facilities, IAQ is closely linked to occupant comfort, satisfaction, productivity and health. This track will offer papers and programs to inform building owners and operators on the value of improving IAQ.

- **Track 5: Mission Critical Design and Operation**

*Track Chair: Carrie Anne Crawford*

Email: [carriecrawford@eeace.com](mailto:carriecrawford@eeace.com)

As societies become more dependent on mission critical facilities, the design and operation of these facilities has undergone rapid change. This track will present papers and programs which will highlight advances in technologies, controls, design and operation of mission critical facilities to meet their increasing loads while also minimizing their impact on energy/water usage.

- **Track 6: Effects of Climate Change on HVAC&R**

*Track Chair: Rocky Alazazi*

**Email:** [mralazazi@yahoo.com](mailto:mralazazi@yahoo.com)

Climate change will have an increasing effect on the design and operation of the built environment. How does the HVAC&R community design for buildings today that are intended to be highly functional and efficient well into a future where today's standards, codes and practices may not be sufficient to meet tomorrow's climatic conditions? This track seeks papers and programs that will inform the selection of strategies, designs and approaches that will increase building resilience and facilitate climate adaptation.

## • **Track 7: Energy Efficient Industrial Buildings**

**Track Chair: Corey Metzger**

**Email:** [corey.metzger@resourcece.com](mailto:corey.metzger@resourcece.com)

Industrial facilities often have different HVAC&R requirements than do commercial and institutional facilities. Oftentimes these are a result of the processes that occur within industrial facilities as well as the life safety issues these processes create. This track will present papers and programs that will inform how energy efficiency can be achieved without compromising life safety considerations.

## • **Track 8: Building Operation and Performance**

**Track Chair: Cynthia Moreno**

**Email:** [cindym@tmmechanical.com](mailto:cindym@tmmechanical.com)

Modeling has become an essential factor in the design of all aspects of many buildings. Often the operational results of the building do not match the modeled outcome that the owner/operator expected. This can lead to much "finger pointing" or worse. This track will present papers and programs to update modelers, designers, contractors and owners/operators on how to better match building performance with modeled expectations.

## **Conference Program Chair: Leon Shapiro**

Email: [Leon.Shapiro](mailto:Leon.Shapiro)

### **Staff Support**

For information on the technical program, special events, special sessions and general conference inquiries

**Tiffany D. Cox**

Assistant Manager of Conference Programs

**Email:** [tcox@ashrae.org](mailto:tcox@ashrae.org)

March 14, 2016	Conference Paper abstracts due
April 18, 2016	Technical Papers Due
April 4, 2016	Conference Paper Abstract Accept/Reject Notifications
June 6, 2016	Website Opens for Seminar, Forum and Workshop Proposals
July 6, 2016	Final Conference Papers Submitted for Review (Includes Bio, Learning Objectives and Methods of Assessment)
August 8, 2016	Seminar, Forum and Workshop Proposals Due
September 7, 2016	Seminar, Forum, Workshop Accept/Reject Notifications

### **V. Program Ideas for St. Louis:**

Sub-Committee	Type	Session Chair / Speakers	Proposed Title	Status
Research	Forum	Jin Wen	Smart Building – The Future of Building Technology: Definition and Roadmap	Won't submit again. Find other time in research session in St. Louis
NBT	Seminar	Xiaohui Zhou or Jin Wen	Two Emerging Software Platforms: Building Energy Management Open Source Software (BEMOSS) and Open Source Transactional Networks Software VOLTTRON	Re-submit for St. Louis
NBT	Seminar	Srinivas Katipamula	Improving Energy Efficiency of Commercial Buildings thru Data Analytics	For St. louis
NBT	Seminar	Nick Gayeski	Edge computing, Cloud Analytics, and On-Premise Systems – Architectures for Smart Building Systems	For St Louis
BOD	Seminar	Josh Rhodes	Solar Decathlon 2015 -- Successes, failures, and lessons learned from the bleeding edge of residential systems	Re-submit for St. Louis
SG	Seminar	Rich Hackner	Smart grid ready building owners, managers and operators: What do you need to know?	Combined for one For St Louis
SG	Seminar	Rich Hackner	Smart Grid Implementation in the Heartland	
SG	Seminar	Carlos Haiad	The Impact of Zero Net Energy Home on the Electric Grid	For St Louis
SG	Seminar	Glen Remington can be a speaker but need somebody else to lead. Carlos Haiad, Daivd Holmberg are potential speakers	How FERC, Utilities, Regulating Bodies Operate and How Demand Respond	For St. Louis possible if enough speakers identified

## VI. Program Ideas for future

Sub-Committee	Type	Session Chair / Speakers	Proposed Title	Status
<b>NBT</b>	Seminar	Bill Healy	Sensing Technology for Smart Homes	For future
<b>NBT</b>	Seminar	Nick Gayeski / Speakers from Armstrong	Smart Transducers with Embedded Diagnostics	For future
<b>NBT</b>	Seminar	Carlos Haiad	The role of cloud-based communication on smart meter technology.	For future
<b>BOD</b>	Seminar, co-sponsor TC 7.9	Song Li & Carol Lomonaco	How BAS can Enhance Existing Building Commissioning	For future
<b>BOD</b>	Seminar	Peter Armstrong	What to Do with Optimal Control? Peter Armstrong will chair and provide a speaker. Li can provide one also.	For future
<b>BOD</b>	Seminar	Andreas Athienitis	Model accuracy impact study on model predictive control	For Las Vegas
<b>BOD</b>	Seminar	Xin (Sherry) Hu	Data Driven Energy Auditing, Measurement and Verification	For future
<b>FDD</b>	Seminar	Kristin Heinemeier / Kristin & Jon Douglas, someone from TC 7.9?	Fault Detection and Retro-commissioning: Where is the Line and Does it Matter?	Session chair was not at the TC meetings. For future
<b>FDD</b>	Workshop	Kristin Heinemeier	Lab Methods for verifying that FDD tools for RTUs really work: Will Standard 207 really work?	Session chair was not at the TC meetings. For future
<b>FDD</b>	Seminar	Glenn Remington	Case Studies: Using FDD for smarter facility operations / Lessons Learned from FDD implementation	For future
<b>SG</b>	Seminar	David Holmberg/ Carol Lomonaco?	Green Button / Open ADR	Program has been submitted multiple times but not accepted. For future

# ASHRAE TC 7.5 Smart Building Systems

## 2016 Annual Meeting, Orlando, FL

### Enabling Technologies Subcommittee Minutes

Prepared by Nick Gayeski

**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 practicing engineers, developing supporting tools for researchers in these areas, and organizing programs to disseminate research findings and advancements among ASHRAE members.

**Related Committee activities:** 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.

#### 1. Research

- Current RTARs
  - i. A Review of Metadata and Taxonomies to support FDD. No update.
    - 1. Negative feedback from RAC, including that it failed to explain the need, benefits or specific work to be done and therefore value to ASHRAE.
    - 2. Volunteers to revise include Bing Dong, James Sweeney, Kyle Hasenkox, Andrew ? from Appalachian State.
    - 3. Solicit the support of other committees, including BACnet DMG, TC1.5/BIM.
    - 4. Refer to RP on Utility/EMCS data representation from 1998
    - 5. Ask Phil Haves for guidance to make it of interest to RAC, frame it in BACnet context?
  - ii. RTAR 1783: Procedural criteria to evaluate the effectiveness of virtual sensors
    - 1. Accepted with comments. Li to revise it and get research liaison input for WS
- RTAR topics in need of development
  - i. The potential for low power wide area networks to support smart building systems.
    - 1. Research LoRA Alliance, [www.lora-alliance.org](http://www.lora-alliance.org).
    - 2. Purported 15km range, penetrates building materials.
- Parked ideas:
  - i. Embedded metadata/diagnostics: A Review of Metadata and Taxonomies to support Model-Predictive Control. To be drafted after similar FDD RTAR.
  - ii. Resolving the issues with wireless cybersecurity and reliability
    - 1. TC1.5 has a cybersecurity group which this subcommittee should be aware of
    - 2. IEEE has guidance on smart home devices and appliances
    - 3. DOE has funded Virginia Tech to develop a protocol/framework by which smart home devices can auto-recognize and compile data into hardware devices

4. Carlos Haiad will talk to his contacts at IEEE to ask if there is a need for ASHRAE to contribute to or extend the guidance of IEEE for smart building applications

## 2. Program

- Programs to be proposed for St. Louis
  - i. Joe Zhou: Open source platforms for HVAC. Srinivas Katipamula, Jin Wen
  - ii. Nick Gayeski: Edge computing, Cloud Analytics, and On-Premise Systems – Architectures for Smart Building Systems. Examples of embedding analytics/smart building applications in devices/transducers, on-premise controllers and servers, or cloud platforms. Intel? Bellimo? KMC? KGS? Discussion around the security, reliability and appropriateness for analytics on different technology scales. For example, high frequency data sampling and analysis done close to the ‘edge’, on a hardware device, vs cross-building or portfolio analytics that happen at the cloud.
- Parked ideas waiting for the right conference track. Are any upcoming conference tracks right for these?
  - i. Nick Gayeski: “Smart Transducers with Embedded Diagnostics”. Speakers from Armstrong, Schneider Electric interested.
  - ii. Carlos: Potential program was discussed on the role of cloud-based communication on smart meter technology.
  - iii. Bill Healey: “Sensing Technologies to Enable Smart Homes” for New York. PNNL and EPRI speakers. Target for Orlando Modern Residential Systems
- Move to Smart Grid as Program idea. Needs a champion.
  - i. Distributed intelligence at a building portfolio scale
    1. The concept was briefly discussed about buildings communicating to each other to accomplish optimization, e.g. load optimization, load shifting, peak load reduction and other smart building applications.
    2. Research project by Agami Reddy and Les Norford, De-Regulation in Pennsylvania in 2000s. What was going? Program? Needs? negotiate with end user to bundle loads together... what tools and capabilities needed to be developed. Market changed and this became less relevant.
    3. Today, Utilities in Illinois have ability to pool load of certain customers... and bid it. A Mechanism exists to organize this group.
    4. Rich Hackner comment: Do you target a preexisting group of buildings and manage load, or choose a group that will allow you to control load? Two different problems.
    5. Glenn Remington is doing work like this work now, but not automated. Possible speaker?

## 3. Handbook

- Future Assignment: Need a volunteer Reviser for ASHRAE Handbook Applications 2019 specific to wireless applications. New content for expanded Enabling Technologies scope (smart transducers and Smart Building metadata)

ASHRAE TC 7.5 Smart Building Systems  
2016 Winter Conference, Orlando FL

**Minutes of Building Operations Dynamics Subcommittee Meeting**

**Date:** Monday, January 25, 2016

**Time:** 4:300-5:15 p.m.

**Location:** Orange B (LL) Hilton

1. Roll Call and Introductions

2. Program Proposals

Program	Title	Lead	Newest update
1	Building operation dynamics-high mass buildings	Andreas Athienitis	Orlando---Technical Session 7, Wednesday 8:00am: Advancement in energy modeling
2	How BAS can enhance RCXs?	Carol Lomonaco	Orlando---Was not submitted for Orlando. Dropped.
3	What to do with optimal control?	Peter Armstrong	Orlando---Was not submitted for Orlando. Peter still wants to work on it.
4	LEED building energy performance model evaluations	Joshua D. Rhodes	Orlando---Was not submitted for Orlando. Dropped
5	Modeling and simulation of occupancy behavior in buildings	Bing Dong	Orlando---Wednesday 8:00am Seminar 58 (chair: Bing Dong; 4 speakers): Considering occupancy behavior in design and operation of residential buildings
6	Impact of operable windows on building performance	Liping Wang	Orlando---Monday 9:45am (Chair: Liping; Speakers: Liping and Ran Liu)
7	Scenes from the Solar Decathlon - DOE student competition projects	Joshua D. Rhodes	Orlando---Submitted, but was not accepted. Joshua will improve it for St. Louis
8	Model accuracy impact study on model predictive control	Andreas Athienitis	Orlando---It is already a well-funded project. Andreas will provide a seminar for the work he has done in the area.

3. Research

Research	Title	Lead	Newest updates
RTAR	Learning occupancy presence in residential buildings through electrical meter data	Bing Dong	Orlando---Rejected
RTAR	Updating reference guide for dynamic models of HVAC equipment	Heejin Cho	The subject was raised to make 20-year old reference guide more comprehensive for recently developed technologies.  Orlando---Still working on revisions and will be ready for TC's review 1/26.  Phil's comments to get sales amount of the existing reference guide.
RTAR	Model accuracy impact study on model predictive control	Andreas Athienitis	Orlando---It is already a well-funded project. Andreas will provide a seminar for the work he has done in the area.
WS	Development and Validation of Dynamic Models for the Evaluation of Chilled-Water System Control Strategies in the ASHRAE Handbook	Wangda Zuo	WS is returned with comments.  Orlando---Wangda came to the TC subcommittee members and explained what were revised in the subcommittee meeting.
Leads	How building thermal dynamics influence grid operations in a short time step?	Raised by Jin.	Orlando---Need a champion for this subject. Edison funded several thermal mass projects to LBNL. Glen Remington will have more discussion to clarify the concepts in St. Louis.

4. Handbook: TBD.

The section of Supervisor Controls in the handbook is supported by the BOD.

As an additional to online handbooks: Teaching tools (such as Youtube videos) to introduce complex thermal load dynamics for undergraduate students.

- 5. Other topics
- 6. Adjournment

**Draft Minutes**



## **TC 7.5 Handbook Subcommittee**

5:15-6:00 pm, Sunday, 24 January 2016

Lake Eola B (L), Hilton

Orlando, Florida

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Subcommittee Chair Vern Smith called the meeting to order at about 5:15 pm. TC members and guest were requested to sign in using the sign-in roster in circulation from earlier TC 7.5 subcommittee meetings. No changes to the agenda were proposed. There were no handbook liaison reports from TCs 1.4, 1.5, or 7.3.

Since this meeting was the first in a new cycle, the objective was to generate ideas for updates or new subsections. The general discussion did not yield any new topics or suggested modifications. Andreas Athienitis said that he would forward some reference documents on new research from Concordia University that should be used for updates. Vern will contact the lead authors of sections from the previous cycle to ask for suggestions.

The meeting was adjourned early, at about 5:40 pm. The following are recaps of our two chapters.

### **Smart Building Systems (Chapter 61 in 2015 Handbook),**

Chapter Focus: Smart building systems are building components that exhibit characteristics analogous to human intelligence. These characteristics include drawing conclusions from data or analyses of data rather than simply generating more data or plots of data, interpreting information or data to reach new conclusions, and making decisions and/or taking action autonomously without being explicitly instructed or programmed to take the specific action. These capabilities are usually associated with software, but they can also be possessed by hardware with embedded software code, or firmware. The line between systems that are “smart” and “not smart” is blurry, and, for purposes of this chapter, does not need to be absolutely defined. The purpose of this chapter is to introduce readers to emerging technologies that possess some of these smart characteristics.

#### **Current Subsections**

AFDD

Sensing and Actuating Systems

## **Supervisory Control Strategies and Optimization Chapter (Chapter 42 in 2015 Handbook)**

Computerized building and energy management and control systems provide a variety of effective ways to reduce utility costs and energy consumption associated with maintaining environmental conditions and thermal comfort in buildings. These systems can incorporate advanced control strategies that respond to inputs including changing weather, building conditions, occupancy levels and utility rates to minimize operating costs, energy consumption and greenhouse gas emissions while also enhancing occupant comfort. This chapter focuses on the opportunities and control strategies associated with using supervisory control strategies and optimization methods applied to cooling systems, heating systems, air-handling units, and zone equipment.

### **Current Subsections**

Terminology

Methods (Control Variables, Supervisory Control Strategies, Static and Dynamic Optimization)

Control Strategies and Optimization for Cooling Systems

Control Strategies for Cooling Tower Fans

Chilled-Water Reset with Fixed-Speed Pumping

Chilled-Water Reset with Variable-Speed Pumping

Sequencing and Loading Multiple Chillers

Simplified Static Optimization of Cooling Plants

Dynamic Optimization for Cooling Using Discrete Storage

Dynamic Optimization for Cooling Using Thermal Mass or Tabs

Forecasting Diurnal Cooling and Whole-Building Demand Profiles

Black-Box Predictive Cooling Control Strategies

Control Strategies for Heating Systems

Control Strategies for Air-Handling Units

Control Strategies for Building Zones

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**Next Meeting: Sunday, June 26, 2016 St. Louis, Missouri**