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TC/TG/MTG/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/MTG/TRG No. TC 7.5 DATE June 29, 2016

TC/TG/MTG/TRG TITLE Smart Building Systems

DATE OF MEETING June 28, 2016 LOCATION St. Louis, MO

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Natascha Milesi Ferretti, Chair, (V)	2015	Nick Gayeski, Enabling Technologies Subc. (NV)	2014	Adrienne Thomle (ExO)
Rich Hackner, Vice Chair, (V)	2015	Edward Tsui (NQ)	2013	Alireza Behfar (PCM)
David Yuill, Secretary (NV)	2015	Haorong Li, FDD Subc. (NV)	2011	Arash Guity (G)
Jin Wen, Research Subc. (V)	2015	Xin (Sherry) Hu (V)	2015	Brian James (CM)
Li Song, BOD Subc (V)	2013	Ran Liu, Programs Subc (NV)	2015	Carlos Haiad (CM)
Joshua Rhodes, Smart Grid Subc. (V)	2015	Vern Smith, Handbook Subc (NV)	2015	Carol Lomonaco (CM)
Mike Galler, Webmaster (NV)	2011			Chariti Young (CM)
Carol Lomonaco (V)	2015			Dan Veronica (CM)
Brian James (V)	2015			Dave Shipley (CM)
Yuebin Yu (V)	2014			Eric Neuberg (G)
Glenn Remington (V)	2013			Fadi Alsaleem (CM)
Peter Armstrong (NQ)	2015			Gang Wang (CM)
				Heather Platt (G)
				Howard Chong (G)
				James Sweeney (CM)
				Jia Huang (PCM)
				Jie Zhao (CM)
				Jinchao Yuan (G)
				Joe Furman (G)
				Kimberly Barker (G)

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

				Koosha Kiamehr (G)
				Kris Kinney (CM)
				Kristin Cetin (CM)
				Liping Wang (CM)
				Mayumi Miura (CM)
				Melanie Derby (G)
				Michael Munroe (G)
				Mike Brambley (CM)
				Penfi Li (G)
				Sean Gouw (G)
				Steve Weeks (G)
				Sukru Erisgen (CM)
				Tom Lawrence (ExO)
				Wangda Zuo (CM)
				Xiaohui Zhou (CM)
				Yunhua Li (G)
				Zheng O'Neil (CM)

DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:

TAC Section Head: Tom Lawrence	SH7@ashrae.net
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	See ASHRAE email alias list for needed addresses.
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

**ASHRAE TC 7.5 Smart Building Systems
2016 Annual Meeting
St. Louis, MO
Minutes**

Date: Tuesday, June 28, 2016

Meeting called to order by Chair Natascha Milesi-Ferretti

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

10 of 12 voting members were present, including non-quorum: Natascha Milesi Ferretti, Rich Hackner, Peter Armstrong, Carol Lomonaco, Brian James, Glenn Remington, Yuebin Yu, Li Song, and Joshua Rhodes

2 members were absent: Sherry Hu, Edward Tsui (Non Quorum)

Quorum achieved. (10/11)

3. 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.

4. Approve agenda and Approval of Orlando 2016 Meeting Minutes

Motion to approve

Orlando 2016 Meeting minutes with minor changes to announcement about cleaning roster

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

5. Announcements

- Congratulations to David Yuill, who received the 2016-2017 ASHRAE New Investigator Award.
- There are two new MTGs. MTG.IAST- Impact of ASHRAE Standards and Technology and MTG.OBB- Occupant Behavior in Buildings (Bing Dong). TAC Chair Tom Lawrence noted that these entities are created to do a certain job, and disbanded.

- Feedback on TC websites is requested
- There are new email aliases for subcommittee chairs
- CEC has two new formats: Debate and Panel
- We have the capability to host web meetings and remote meetings
- Thank-you letters are available for employers
- Hightower and Research Award nominations are due September 1st

6. Liaison Reports

TC 1.4 Chariti Young – Guideline 13 has a section on specifying FDD. Guideline 36 came from RP-1455 is in public review. Please review it and provide feedback. We have several co-sponsored research projects: RP-1587: Control Performance Assessment; RP-1746: Field Test of Advanced Sequences on Air-side is wrapping up. RP-1711: Water-side advanced sequences of operation had only one bidder so ASHRAE will re-post it, hoping for more bidders. RP-1661.

TC 1.5 Mike Galler: they used the remote login and it worked flawlessly. They're revamping their handbook chapter and welcome input from TC 7.5.

TC 7.3 Mike Brambley – 1) They voted in favor of co-sponsoring RTAR-1781. 2) They are proposing a new SPC on Test Method to Measure and Score the Operating Performance of a Constant Air Volume unitary system. 3) A PES has made a recommendation for a bidder on TRP-1650: Training Requirements for Sustainable, High Performance Building Operations.

SPC 207P Mike Brambley – No votes because there was no quorum. There was discussion on focusing on getting a standard out that deals with economizer diagnostics FDD, then continuing to develop further standards for refrigerant side and airflow fault FDD standards, numbered 207.1, 207.2, etc.

GPC 36 Chariti Young – It is out for public review; please go review and comment!

MTG.OBB – Zheng O'Neill – the MTG on occupancy behavior in buildings met for the first time in St. Louis. There are collaborators from several entities within ASHRAE and outside. Bing Dong proposed a seminar and asked for co-sponsorship from TC 7.5.

CEC Melanie Darby noted that there's a special track – Controls, Smart Building Systems, etc. – is a track for Long Beach.

7. FDD Subcommittee Report (Haorong Li)

Yuebin Yu reported on the FDD Subcommittee meeting. Minutes from the meeting are appended.

8. Enabling Technologies (Nick Gayeski)

Peter Armstrong reported on the Enabling Technologies subcommittee meeting for Nick Gayeski. The minutes of this meeting are appended.

9. Smart Grid (Josh Rhodes)

Josh Rhodes reported on the meeting. The minutes are appended.

10. Building Operations Dynamics (Li Song)

Li Song reported on the meeting. The minutes are appended.

- WS-1661 is conditionally approved by RAC with minor edits

11. Research (Jin Wen)

Jin Wen reported on the research subcommittee meeting. Minutes are appended.

12. Program (Ran Liu)

Xiaohui Xhou reported for Ran Liu on the Program subcommittee meeting. Minutes are appended.

13. Handbook

Glenn Remington reported for Vern Smith. Minutes are appended.

14. Standards (Rich Hackner)

No discussion of standards, because SPC 207p had been discussed earlier by the liaisons.

15. Web Page (Mike Galler)

No discussion.

16. Old Business

No discussion.

17. New Business

A reservation was made for 12 for dinner.

18. Adjournment

Motion by Rich to adjourn, seconded by Brian. Meeting adjourned at 6:00 pm.

ASHRAE TC 7.5 Smart Building Systems
2016 Annual Conference, St. Louis MO

Agenda of Building Operations Dynamics Subcommittee Meeting

Date: Monday, June 27, 2016
Time: 4:300-5:15 p.m.
Location: 223(2)

1. Roll Call and Introductions
2. Program Proposals

Program	Title	Lead	Newest update
1	What to do with optimal control?	Peter Armstrong	Peter will work on it for Las Vegas and Li will be one of the speakers.
2	Seminar 59 (June 29 9:45)	Joshua D. Rhodes	Accepted for St. Louis.
3	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. For Las Vegas.
4	Occupant behavior driven building operations	MTG is seeking co-sponsorship from TC75 Lead: Bing Dong	Las Vegas; four speakers are already lined up.

3. Research

Research	Title	Lead	Newest updates
RTAR	Learning occupancy presence in residential buildings through electrical meter data	Bing Dong	Orlando---Rejected; Bing Dong will resubmit through MTG
RTAR	Updating reference guide for dynamic models of HVAC equipment	Heejin Cho	The revised RTAR is ready for committee to review and vote.
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. St. Louise update: Approved with minor edits needed.
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. St. Louise update: Turn it to smart-grid subcommittee

RTAR?	If you had “perfect information” on occupants comfort preferences and their location within a conditioned space then how would you optimize control and how much value would you be able to realized	Rich Hackner? Li Song?	St. Louise update: An RTAR is prepared by Li and will be discussed in the committee meeting for comments. Rich will lead on WS if the RTAR is accepted. Need inputs to improve the RTAR. Two volunteers: James Sweeney and Gary Shamshoian.
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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



Minutes

TC 7.5 Enabling Technologies Subcommittee

3:15-4:00 pm, Sunday, 26 January 2016

St. Louis

Prepared by Nick Gayeski

Objective for this Meeting: Generate ideas for research and program related to Enabling Technologies and assign owners.

Subcommittee 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.

- Research Summary: Two RTARs under active development (i, ii), One Retired (iii), One awaiting input from task owner (iv), and 3 parked ideas (v)
- i. RTAR 1783: Develop cost and performance indices to evaluate effectiveness of virtual sensors in HVAC applications
 1. Accepted with comments.
 2. Li to revise it and get research liaison input for WS
 3. Yuebin Yu offered support.
 - ii. An Information Model to Support FDD. Nick Gayeski to discuss with research liaison how to refine it for another RAC review.
 1. Negative feedback from RAC: 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, Jin Wen, David Yuill.
 3. Need Solicit the support of other committees, including BACnet DMG, TC1.5/BIM.
 4. Refer to RP on Utility/EMCS data representation from 1998
 - iii. Realized Value of Virtual Sensing Technology in the Operation of Packaged Air-Conditioning – Yuebin Yu. Will not move forward.
 - iv. Energy Audit using Smart Phones with Low Cost IR Cameras – Yuebin Yu with Siemens' researcher. Waiting on Siemens researcher to move forward.
 - v. Parked ideas:
 1. Embedded metadata/diagnostics: A Review of Metadata and Taxonomies to support Model-Predictive Control. To be drafted after similar FDD RTAR.
 2. Resolving the issues with wireless cybersecurity and reliability

3. The potential for low power wide area networks to support smart building systems. E.g. LoRA Alliance, www.lora-alliance.org. Purported 15km range, penetrates building materials. More extensively available in Europe.

Program

Summary: 6 potential ideas awaiting the right opportunity/conference track.

- i. Parked ideas waiting for the right conference track. Are any upcoming conference tracks right for these?
 - a. 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.
 - b. Nick Gayeski: “Smart Transducers with Embedded Diagnostics”. Speakers from Armstrong, Schneider Electric interested.
 - c. Carlos: Potential program was discussed on the role of cloud-based communication on smart meter technology. – Glenn Remington.
 - d. Bill Healey: “Sensing Technologies to Enable Smart Homes” for New York. PNNL and EPRI speakers. – already program
 - e. Joe Zhou: Open source platforms for HVAC. Srinivas Katipamula, Jin Wen. Not accepted for St. Louis. VOLTRON
 - f. Michael Munroe: Securing ad-hoc sensor networks. Autonomous swarms for robots, sensors, control, motion.

TC 7.5 Fault Detection and Diagnosis Subcommittee Meeting Agenda

2016 Annual Meeting, St. Louise, Missouri

Date: Sunday, June. 26, 2016

Time: 2:30 pm-3:15 pm

Location: Room 276, Level 2

Yuebin Yu called to order and started the meeting with a basic review of the meeting agenda.

1. The first item is about the active research idea. There is currently one active rtar:
 - a) Methods to evaluate AFDD strategies for air handling units systems (150-125), Champion: Jin Wen. Currently it is an RTAR and work is needed to develop it as a work statement. Might seek for co-sponsorship from other committee, TC 7.3? voted for co-sponsorship.
2. The second item of business was a discussion of new research ideas.
 - a) RTAR: Development of AFDD for leakage of ground-source heat pumps. Champion: Zheng O'Neill and Christine? Currently working on the draft, trying to understand the frequency and magnitude of the issue on the fluid loop. Not the refrigerant side. They will try to circulate the RTAR among the members and seek for an email vote after the meeting.

There are also discussions about the potential research topics to be considered by this sub-committee on AFDD algorithms for simultaneous faults in building systems. They were encouraged to further shape the idea and bring up in future meetings.

3. The third item was about the program. Zheng O'Neil has proposed a seminar (Energy Assessment of Industrial Facility.) for Las Vegas meeting. This seminar will have 3 to 4 speakers, including Doe industry assembly center directors. The topic will be about energy assessment for medium and small manufacturing facilities, covering industrial process, HVAC, lighting, etc.
4. There is an active project RP-1615: Fault detection and diagnostic methods for supermarkets-Phase 1. They are currently seeking for volunteers who understand the refrigeration systems in supermarkets well to help a survey about the system types, control and operation, common faults, etc.
5. The meeting adjourned at 3:20pm.

ASHRAE TC 7.5 St. Louis, MO, Summer 2016

Smart Grid Subcommittee minutes

Joshua Rhodes, chair

-call to order-

We have 4 related program items from SG

Kristen Cetin talked about:

1. Net-zero buildings on grid
2. Residential smart devices

Rich Hackner:

1. Smart Grid in the Heartland

Joshua Rhodes:

1. Solar Decathlon lessons learned

Talk about what ASHRAE's purpose in SG is.

Glen – focus on education of society

Rich – bring programs to society as above

David – we have DER, IoT, Trans Energy – ASHRAE: how can buildings participate

Glen – a guideline?

David – how to make smart buildings smart grid ready, DOE wants, \$200M/3yr FOA now

Ralph – are we ready to use buildings for grid reg services?

Carlos – in Brazil, the free energy market lets anyone buy/sell anything

Frequency control?

What about ASHRAE in micro grids and DER?

Glen – ASHRAE can define the dynamic load

Glen: -- use BAS?

Ralph – but how dynamic are buildings really?

Jeff – 90.1 has no room for smart grid, no advantage, no mechanism to stimulate that

What is the benefit for buildings for smart grid systems? 90.1 is not ready for that

Should these be worked into models?

NIST has their Transitive Energy Challenge

Ellen: RMI has their new passive building that they want people to run these types of tests on

Ralph: we need a buildings focused model that can take these inputs/outputs?

Jen: sounds like 2 research projects

Ralph: gap between what we have a what we need, re: link between buildings models and grid models

Ellen: mix b/t MMV 2.0?

-out of time, end-

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
About 40+ participants | 5:15-5:20 |
| 2. Define Smart Building Systems | 5:20 – 5:35 |
| 3. Describe future opportunities in the smart building area | 5:35 – 6:00 |
| 4. Identify emerging technologies that could potentially reshape the smart building system concept | 6:00 – 6:20 |
| 5. Discuss the value of current TC 7.5 research development | 6:20 – 6:35 |
| 6. Summery and define focus area for future research | 6:35--6:45 |
| 7. Adjourn | 6:45 |

Notes are taken and will be summarized into a Roadmap report to be commented by participants by December 1st.

Breakfast Meeting Summary:

There is a new RAC liaison (Chris Wilkins); ASHRAE's new focus on sustainable refrigerant.

August 15th 2017 deadline for two WS

RAC Meeting:

March 1st for Spring meeting; May 15th for June meeting;

August 15th for Fall meeting; Dec 15th for Jan meeting.

ASHRAE TC 7.5: Smart Building Systems Research Plan

Active Project: 1; Active WS: 2; Active RTAR:5; Co-sponsor WS: 2;

Subc	Project	Contributors/PI	Status
FDD	1615 RP FDD Methods for Supermarkets	PI: Yuebin Yu and David Yuill PMS Chair: John House	CHI—J. House reports on results of PES. ATL- 1 st 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. STL – update at the end of the file
FDD	RTAR 1781: – 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 STL – WS in preparation; 7.3 will co-sponsor. Might seek co-sponsorship with 9.1
ET	RTAR-1783: 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 STL – WS in preparation
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. ORL – Heejin will give a revised version tonight. STL: The revised RTAR is ready for committee to review and vote
AFDD	Draft RTAR – AFDD for GSHP	Zheng O'Neill Kristen Cetin	STL: RTAR discussed in sub-committee. Will be voted in mid-July
BOD	Draft RTAR: If you had “perfect information” on occupants comfort preferences and their location within a conditioned space then how would you optimize control and how much value would you be able to realized	Rich Hackner Li Song	STL: An RTAR is prepared by Li and will be discussed in the committee meeting for comments. Rich will lead on WS if the RTAR is accepted. Need inputs to improve the RTAR. Two volunteers: James Sweeney and Gary Shamshoian.

Subc	Project	Contributors/PI	Status
FDD	Draft RTAR-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 STL – Zhen will not work on it, Yuebin needs to take the lead
ET/FDD	RTAR Metadata and Taxonomy to Support FDD in Smart Buildings	Nick Gayeski Charity Young	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 ORL – Nick is continuously updating it STL – Nick is continuously updating it
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 and 1.4 WS is returned with comments. Wangda will provide updated WS for TC review during Orlando. STL: the TC voted Yes and submitted to RAC. RAC conditional approved.
Co-Sponsor	TC 2.4: WS evaluation of low-cost particulate sensors for building	Brent Stephens	ORL: – need co-authorship too – against lab-grade equipment to review their performances... STL: the TC voted YES and submitted to RAC. No feedback yet.
Co-Sponsor	TC 1.4 RTAR Current title: "Night setback effectiveness" possible change to "Night preconditioning effectiveness"	Peter Armstrong	ORL: Seek co-authorship. 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		

Subc	Project	Contributors/PI	Status
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?)		
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 Hayes	ATL – active WS
ET	RTAR -1782: “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 rejected. “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.
FDD	RTAR-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 STL - dropped

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.

June 2016 update:

1615-RP: Fault Detection and Diagnostics (FDD) Methods for Supermarkets – Phase I

Contractor: University of Nebraska

PI & Co-PI: Yuebin Yu and David Yuill

Summary of Meeting and Project Status:

The PMS held a web meeting with the contractor June 20, 2016. The primary objective of the project is to identify existing automated FDD (AFDD) methods from the literature and assess their applicability to supermarkets. Three of the five project tasks are considered complete, including the literature review and the assessment of existing AFDD methods. During the past six months the contractors have evaluated knowledge-based AFDD methods from the literature using data from supermarket refrigeration systems and laboratory data for a walk-in cooler. The complexity of supermarket systems, and the lack of data (measurements used in the AFDD methods are not routinely available in supermarkets) limited the applicability of these methods.

Ongoing work includes an online survey aimed at identifying the important characteristics of supermarket equipment and systems, and a review of service records corresponding to four supermarkets for which operational data have been collected. By reviewing the service records, it may be possible to create labeled data sets for certain faults.

A no-cost extension was previously granted to the contractor. The project is scheduled to end July 1, 2017.

Summary of Accomplishments for 1615-RP:

1. Identified main candidate AFDD algorithms through a comprehensive review.
2. Conducted a preliminary evaluation of the AFDD algorithms against ten criteria and tabulated the results.
3. Acquired laboratory data for a walk-in freezer and a walk-in cooler, and field data for four supermarkets for which commissioning and calibration had been performed.
4. Conducted an online survey that covers the equipment, control characteristics, and typical faults in supermarkets. Conducted an analysis of 120,000 service calls from a manufacturer of supermarket refrigeration systems.
5. Evaluated one data driven algorithm against data from real supermarkets. Evaluated the applicability of knowledge-based AFDD methods using data for a walk-in freezer and data from supermarkets.

ASHRAE 2016 Annual Conference at St. Louis

TC 7.5 Smart Building Systems

Minutes of Program Subcommittee Meeting

Sunday (6/26) 5:30 pm - 6:00 pm 276 (2)

Programs presented at St. Louis

Sponsoring Committee	Program ID	Session Title	Co-Sponsoring Committee	Session Chair
07.05 Smart Building Systems	Seminar 52	Residential Building Smart Devices & Data: Improving Energy Use Insights & Performance Evaluation		Kristen Cetin
07.05 Smart Building Systems	Seminar 11	Smart Grid in the Heartland --- See What Happens Next		Richard Hackner
07.05 Smart Building Systems	Seminar 37	The Impact of Zero Net Energy Buildings on the Electric Grid		Kristen Cetin
07.05 Smart Building Systems	Seminar 46	Regulatory Process Overview for Smart Grid, Smart Building and Demand Response Programs as Applicable to Building Owners and Utility Tariffs.		Glenn Remington
07.05 Smart Building Systems	Seminar 59	Solar Decathlon 2015, Lessons Learned From The Largest Student-lead Solar Powered Housing Competition		Joshua Rhodes
07.05 Smart Building Systems	Technical Paper 5	Advances in VFD Control and Building Operations and Maintenance		Li Song
01.04 Control Theory and Application	Workshop 4	DDC for Smart Buildings and Smart Grid	07.05 Smart Building Systems	Cynthia Moreno

ASHRAE 2017 Winter Conference at Las Vegas

The conference seeks programs on new tracks that address the changes in technology:

- The relationship between water usage and energy systems becomes more prominent as the demands of development and over use as well as climate change continue to drain resources. The **Water-Energy Nexus** track highlights research in this area. It also explores technologies and designs intended to reduce the gap between energy and water efficiency.

- The **Advances in Mission Critical Design and Operation** track highlights developments in mission critical facilities and the challenges of meeting increasing load demands while minimizing the impact on energy and water usage.
- Climate change will have an increasing effect on the design and operation of the built environment. The **Climate Change and Its Effects on HVAC&R Design and Technologies** track focuses on methods to increase building resiliency and facilitate climate adaptation.
- **Energy Efficient Industrial Buildings and Life Safety** spotlights energy efficiency in industrial buildings and how it can be achieved without compromising life safety considerations.
- In addition, the conference seeks programs on **Fundamentals and Applications, HVAC&R Systems and Equipment, Commercial and Industrial IAQ and Building Operation and Performance: Meeting the Modeling Expectations.**

- *Track 1: Fundamentals and Applications*

Track Chair: Chuck Curlin

Email: 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

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

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

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

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

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

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

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@ashrae.org)

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

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

ASHRAE Annual Conference at| Long Beach, CA

- *Track 1: Fundamentals and Applications*

Track Chair: [Frank Schambach](#)

Email: frankschambach@mindspring.com

It’s back to the basics! This track provides the foundation for design and construction of HVAC&R components and their application. This track seeks papers and programs of varying levels to provide discussion on theories, models, designs and shared experiences. Topics may range from fan laws and psychometrics to room air distribution and heat transfer and much more.

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

Track Chair: [Jennifer E. Leach](#)

Email: pennst8jen@yahoo.com

What system and equipment are best for my building? Selection of equipment and design of systems is critical for effective HVAC&R operation and usually has more than one right answer. This track will provide engineers, designers, contractors, owners and building operators the tools to properly design, select and

operate traditional, non-traditional and hybrid equipment and systems. The papers and programs within this track may range from basic concept to the technical analysis of system performance.

- *Track 3: Refrigeration*

Track Chair: Vikrant Aute

Email: vikrant@umd.edu

The refrigeration cycle is a key component to our daily needs, as it is used for thermal comfort, food storage, creating ice and medicinal needs. There have been numerous improvements and changes to refrigeration systems and refrigerants to accommodate the increased system efficiency and reduce environmental impact. This track seeks papers and programs that address the wide range of developments and applications of refrigerants, including alternative lower-GWP refrigerants, variable refrigerant flow applications, refrigerant management and food storage.

- *Track 4: Building Life Safety Systems*

Track Chair: Robert Alan Neely

Email: alan_neely@pghcorning.com

Building life safety systems are critical in commercial facilities to protect building occupants from fires and power outages. This track focuses on building egress, fire protection systems, fire alarms, emergency lighting, fire and smoke barriers, and special hazard protection and describes key factors to consider when designing these life safety systems. Papers and programs are sought to evaluate design strategies for the life safety systems noted above along with building specific life safety systems, such as gas detection systems, kitchen ventilation and smoke evacuation systems, etc.

- *Track 5: Controls*

Track Chair: Melanie Derby

Email: derbym@ksu.edu

This track will explore smart building systems and how they can be incorporated into commercial facilities to help reduce energy consumption and improve occupant comfort. As owners and designers incorporate more controls systems with web and cloud access into buildings, there is a concern that this allows more opportunities for hackers to gain access into sensitive and confidential databases. The track will include programs about effective building controls, integration of multiple building systems (ie HVAC, lighting, security, water consumption, etc), along with measures to keep this information safe, while maintaining the flexibility of remote control/access of building systems.

- *Track 6: Commissioning: Optimizing New and Existing Buildings and their Operation*

Track Chair: Dennis Alejandro

Email: denzjac@yahoo.com

High efficiency building systems come at a cost, and after the owner's initial investment it is important to verify that the system components are operating as the designer intended. Secondly, the systems need to be operated properly to reach and maintain the system efficiency levels. This track seeks papers and programs providing lessons learned and recommendations for successful commissioning projects. This track also seeks case studies of existing buildings with a retro-commissioning plan to reduce energy consumption and evaluate the payback of these modifications.

- *Track 7: Net Zero Energy Buildings: The International Race to 2030*

Track Chair: Jason DeGraw

Email: jason.degraw@nrel.gov

Title 24 and Architecture 2030 have ambitious goals for all commercial buildings in California to be Net Zero Energy (NZE) by the year 2030. This track will assist the design team and owners to evaluate various systems (including HVAC, building envelope, lighting, domestic water and renewable energy system), design strategies, construction measures and building operation to achieve NZE. The programs within the track will also explore the advancing code and regulations that countries around the world are implementing to reduce building energy consumption.

- *Track 8: Residential Buildings: Standards Guidelines and Codes*

Track Chair: Kimberly Pierson

Email: kdpwildcat@gmail.com

ASHRAE is known for its standards and design guidelines and their evolution to improving the built environment and its systems. This track will inform designers, contractors and owners of the current requirements and upcoming changes to ASHRAE's low-rise residential guidelines: Standard 90.2, Standard 62.2 and Guideline 24. This track also seeks papers and programs for cutting-edge residential systems and the incorporation of ASHRAE standards in the design.

- *Track 9: Research Summit*

Track Chair: Ann Peratt

Email: ann.peratt@gmail.com

The fifth annual Research Summit brings together distinguished researchers to present the latest research results. Papers are requested on the following topics: 1) building science research that address the performance of buildings systems and occupant usage and 2) renewable energy research and its impact as we move towards net zero energy buildings.

Conference Program Chair: Ann Peratt

Email: ann.peratt@gmail.com

Staff Support

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Tiffany D. Cox

Assistant Manager of Conference Programs

Email: tcox@ashrae.org

Technical Support

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

August 29, 2016	Conference Paper Abstracts and Technical Papers Due
September 9, 2016	Conference Paper Abstract Notifications Due
December 9, 2016	Final Conference Papers Submitted for Review (Includes Bio, Learning Objectives and Methods of Assessment)
January 2, 2017	Website Opens for Seminar, Forum and Workshop Proposals
January 16, 2017	Conference Paper Accept/Revise/Reject Notifications Due
February 6, 2017	Seminar, Forum and Workshop Proposals Due

February 10, 2017	Revised Conference Papers/Final Technical Papers Due
February 20, 2017	Conference and Technical Paper Final Accept/Reject Notifications

Program ideas for Las Vegas and the future

Type	Session Chair / Speakers	Proposed Title	Status
Seminar	Zheng O'Neill	Energy Assessment of Industrial Facility	For Las Vegas
Seminar	Xin Hu	Data Driven Energy Auditing, Measurement and Verification	For Las Vegas Co-sponsor: TC 7.6
Seminar	Andreas Athienitis	Model accuracy impact study on model predictive control	For Las Vegas?
Seminar	Peter Armstrong	What to Do with Demand Response Optimal Control?	For Las Vegas
Seminar	Bing Dong (MTG Occupant Behavior for Buildings)	Occupant Behavior for Building Operation	Co-sponsor for Las Vegas Sponsored by MTG OBB
Seminar	David Yuill	Fault Effects on Equipment Performance	Co-sponsor for Las Vegas Sponsored by TC 8.11
Seminar	Carlos Haiad & Glenn Remington	The role of cloud-based communication on smart meter technology.	For Long Beach
Seminar	Chris Kinney/Michael Munroe/Glenn Remington	FDD and Clouds?	For Long Beach
Seminar	Carol Lomonaco	Cyber Security on Building Systems	For Long Beach
Seminar	Srinivas Katipamula	Improving Energy Efficiency of Commercial Buildings thru Data Analytics	For future
Seminar	Nick Gayeski	Edge computing, Cloud Analytics, and On-Premise Systems – Architectures for Smart Building Systems	For future
Seminar	Nick Gayeski / Speakers from Armstrong	Smart Transducers with Embedded Diagnostics	For future
Seminar, co-sponsor TC 7.9	Song Li & Carol Lomonaco	How BAS can Enhance Existing Building Commissioning	For future
Seminar	Kristin Heinemeier / Kristin & Jon Douglas, someone from TC 7.9?	Fault Detection and Retro-commissioning: Where is the Line and Does it Matter?	For future

Workshop	Kristin Heinemeier	Lab Methods for verifying that FDD tools for RTUs really work: Will Standard 207 really work?	For future
Seminar	Glenn Remington	Case Studies: Using FDD for smarter facility operations / Lessons Learned from FDD implementation	For future

Note: Xin (Sherry) Hu has proposed a seminar idea but won't be at the St. Louis meeting. The abstract is as follow.

Topic: Using Analytics Platforms to Continuously Evaluate Buildings and Drive Persistent Savings

Presenter: Ryan Hoest, President and Co-Founder of EcoVox Energy Analytics

Abstract:

There's no shortage of available software applications and tools that can be leveraged to identify savings opportunities in buildings. The challenge is identifying which tool types are appropriate and what data is useful for the variety of needed building assessments that range from simple benchmarking to fault detection/auditing or advanced statistical analysis. This presentation provides an overview of a software environment developed to leverage the relative strengths of some energy analytics, workflow management, and visualization tools to identify savings opportunities, quantify savings impacts, and support an ongoing commissioning process in actual facilities.

Topic: Using advanced Energy Management System (EMS) for Automatic Energy Audit in China

Presenter: Hui Li, Ph.D, P.E, President, Shenzhen Institute of Building Environment and Energy Research, China CEO, Shenzhen Secom Tech. Ltd, China

Abstract:

Due to the requirements of national energy policy, more than 10,000 large public and commercial buildings in China installed sub-meters in the last eight years. Energy audit and retro-commissioning were also performed on these buildings. EMS platform that can track and perform analysis on data collected from sub-meters and BAS is becoming essential for analyzing system operation, identifying system issues and faults , and uncovering energy cost-saving opportunities.

This presentation introduces an advanced EMS platform used for automatically data collection and archiving, data calibration, energy benchmarking, equipment and system operation performance analysis, energy and operation fault alerting, and measurement & verification. Case studies of two buildings will be covered including analytics process, optimization measures uncovered, energy and cost savings, and lessons learned.

Session Objective

1. Review the development of building sub-meter system, energy audit and EMS in China;
2. Present the EMS software structure and conceptual diagnostic methodologies;
3. Case studies of two buildings, including analytics process, operational opportunities uncovered, actual annual savings, and lessons learned.

Topic: A Smart Data Center Energy Expert System for Automatic Measurement, Energy Audit and Energy Efficiency Improvement

Presenter: Wenli Yu & Xin Hu, PhD, PE

Contact: Wenli Yu, CEO of Archimedes Controls Corp,

The Smart Data Center Energy Expert System is a continuous monitoring, control and analytics platform developed by the needs of modern data centers for down time prevention powered by latest IoT and cloud technologies. The expert-system approach enables fast and accurate identification of environmental trend along with comprehensive and cost effective energy efficiency recommendations, boosts adoption of energy saving measures and automatic CRAC controls. The all-in-one system significantly simplifies and standardizes savings estimation and verification, and effectively sustains and improves the savings over time for medium to large data centers.

Our solution consists a comprehensive data center energy efficiency package controlled by its management element including advanced monitoring, control and analytics tools. It employs latest wireless sensing and network technology, periodic data center energy auditing and reporting, fine space temperature and humidity set points tune, cooling equipment self-adaptive controls and cloud-based server database for best energy efficiency results. In addition, the platform enables and assists implementation of airflow management, HVAC and IT optimization, local and remote management, 3D thermal and CFD imaging, power consumption and major performance metrics as well as fault and alarm notification and achieving. All these tools help form a policy-based platform for energy and customer satisfaction conscious data center management.