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._____TC7.5_____DATE 02/09/2020_____

TC/TG/MTG/TRG TITLE____Smart Building Systems_____

DATE OF MEETING 0/204/2020_____LOCATION Hilton Orlando, Orange F

Members Present	Appt	Ex-Officio Members and Additional Attendance
David Yuill, Vice Chair (V)	2017	See attached attendance list
Zheng O'Neill, Secretary (V)	2017	
Li Song, Research Subc (V)	2017	
Glenn T Remington (V)	2019	
Kristen Cetin, Subc (V)	2017	
Srinivas Katipamula V)	2019	
Eric Young, Subc (V)	2019	
Carol Lomonaco, Subc (CM)	2015	
Mike Brambley (CM)	2002	
Gregory S. Pavlak, Subc (CM)	2017	
Xiaohui Zhou, Subc (V)	2019	
David F Shipley (CM)	2017	
Chariti Young, (CM)	2002	
Guanjing Lin (CM)	2017	

 (V) = voting member
 (CM) = corresponding member
 (PCM) = provisional corresponding member

Note: The complete attendance list from TC 7.5 is enclosed.

DISTRIBUTION: *All Members of TC/TG/MTG/TRG plus the following:*	
Larry A Smith	SH7@ashrae.net
Rich M Heiden (Standard Liaison)	rheiden@train.com
David A Ballard (Chapter Technology Transfer Chair)	dballard@tcco.com
Bryan Becker (Handbook Liaison)	beckerb@umkc.edu
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

ASHRAE TC 7.5, Smart Building Systems
2020 Winter Meeting
Meeting Minutes
Orlando, FL

Location: Hilton Orlando, Orange F
Date: Tuesday, February 4th,
Time: 3:30 - 6:00 p.m.

1. **Welcome**
   3:30pm Vice Chair David Yuill called for meeting (on behalf of Chair Jin Wen)

2. **Roll Call and Introductions**

   Roll call: 8 voting members: Kristen Cetin; Zheng O'Neill; Li Song; David Yuill; Srinivas Katipamula; Glenn Remmington; Eric Yang (was later); Joe Zhou

3. **Scope**
   TC 7.5 is concerned with the performance and interactions of smart building systems, the impact of smart systems on the total building performance, methods for achieving more intelligent control and operation of building processes, interactions of smart buildings with utilities, and documentation of the benefits of smart buildings and smart building systems as they relate to energy consumption, cost of operation, maintenance, occupant comfort, building commissioning, operations, and impact of the SBS on utilities and natural resources.

   ASHRAE Code of Ethics Commitment – Chair
   In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, integrity and respect for others, and we shall avoid all real or perceived conflicts of interests. (See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)

4. **Discussion/Approval of Kansas City Minutes**
   Zheng motioned to move the approval, Kristen seconded 7-0-0 (CNV)

5. **Announcements**
   - ARPA-E SENSOR Project update
     a) Kristen and Zheng gave the updates on the ARPA-E SENSOR project in terms of simulation studies, lab testing preparation, etc.
     b) They have been talking with ASHRAE members to see whether it is feasible to incorporated outcomes from the SENSOR project into an ASHRAE standard
     c) They will have another workshop next year right after Chicago winter meeting.

6. **Liaison Reports: TC 1.4, TC 1.5, TC 1.6, TC 7.3, SPC 207P**
   - **TC 1.4 Chariti Young,**
     a) **GPC 13 Specifying Building Automation Systems:** Revisions to Guideline on track to complete and vote out to public review before 2020 Annual meeting in Austin. Major updates include a new section on networking and cybersecurity, including new network architectures being driven by IoT, and revised integration use cases, as well as an introduction to the guideline to help navigate the guideline. Revisions also include minor updates (mostly modernization of IT concepts) throughout Guideline, and an update to the companion word document that includes all of the guide specification language. In addition to general guidance regarding specifying Building Automation systems, G13 also includes specific guidance on specifying FDD, performance monitoring, and user interfaces. Requesting contributions and feedback before or during public review.
     b) **Controls certification program:** Committee decided to revise and resubmit controls certification program to pubs. Requesting contributors and reviewers.
     c) **New standard for controls description language:** TPS approved for new standard used for describing, documenting, specifying, and simulating control sequences. Goal is to make resulting controls description language an ISO standard. References: Obc.lbl.gov , paper by Michael Wetter
     Requesting committee membership – contact Steve Taylor staylor@taylor-engineering.com.
     d) **RP1711:** Advanced Control Sequences for HVAC systems – waterside. Will feed into Guideline 36. TC1.4 approved the final report.
     e) **RP1865:** Optimized control sequences for DOAS systems. PES selected from 10 bidders. TC1.4 approved selection.
     f) **RP1819:** TC1.4 co-sponsored research on control sequences for Multi-Zone VAV CO2 demand controlled ventilation received a no-cost extension through July 2020 to put together final report. Will feed into Guideline 36.
     g) **GPC36 :**Published 1.5 years ago, have already published 9 addendum. Expanding sequences to additional systems based on several research projects ongoing. Soliciting input for other sequences, can submit via CMP. Copyright language adjusted so sequences can be used and provided as a word document. Work in process.

   Discussions:
   a) David asked a question about how GPC 36 and GPC 13 handle the FDD and suggested including training in GPC 13.

   - **Craig Section 7 lead:**
     a) 7.3 and 7.8 will merge. No action for TC 7. 5
     b) 7.1 and 7.2 are considering merge
     c) Roster changes due tonight

- **TC 1.5 Mike Galler:**
  a) TC 1.5 is forming MTG: cybersecurity and will vote tomorrow.

- **TC1.6: working on a searchable database.**

- **TC 7.3 Mike Brambley:**
  a) Standard (SPC 221P) a testing scoring for unitary unit on the field (for practitioners)
  b) System metrics: e.g. ,EER for the entire system; fault: leakage in the duct work.
  c) Voted by SPC for the publication, but it may take some time

- **SPC207P: FDD system for air-side economizer**
  a) David. S: the standard is out for a public review: received 1 typo. 3 comments.
  b) RTAR to test SPC 207P is drafted
  c) Earliest publication date: October, 2002

7. **Fault Detection and Diagnosis Subcommittee (Li Song for Liping Wang)**
   - See subcommittee summary

8. **Enabling Technologies Subcommittee (David Yuill for Carol Lomonaco)**
   - See subcommittee summary
   a) Subcommittee renaming discussions
   b) Research ideas
      o Standardized taxonomy and meta data (RTAR was written 5 years ago), Nick will take a lead
      o Austin Roger: suggest connecting with the CDL team for taxonomy
      o Chariti/Devan: SPC223 (from Bacnet)
      o Brick website offers a lot of good information and examples.

9. **Smart Grid Subcommittee (Kristen Cetin)**
   - See subcommittee summary
   a) Seminars for GEB for Austin conference: 10 ideas. If any questions please check with Kristen

10. **Buildings Operations Dynamics Subcommittee (Zheng O'Neill with Donghun Kim)**
    - See subcommittee summary
    a) Donghun talked with TC 6.9 about the seminar idea. TC 6.9 will lead the seminar of thermal storage vs. battery

11. **Research (Li Song)**
    - Invite ASHRAE 90.1 to the TC 7.5 to give the TC some introductions on how 90.1 handling the FDD and controls.
    a) Possible an internal seminar in Austin

b) First focus on the commercial buildings and residential buildings.
- Srinivas: IECC has some requirements for the FDD, suggested talking to Wayne Stoppelmoor (Standard chair)
- Carol is willing to help to organize

12. Program (Eric Yang)
- For the Orlando meeting: 75 out of 123 seminar submissions were accepted. 1 out 5 forum submissions were accepted; 2 out of 2 debates were accepted
- TC 7.5: 6/9 seminars selected; 2 co-sponsored seminars
- Mike B: proposed a seminar: relationship between the grid service and energy efficiency. He is collecting Title, speaker information, a short abstract
- Carol will have a couple of seminars that TC 1.4 needs to sponsor
- Resilience: TC 2.10: Li Song will chair/speak, Glenn will be a speaker
- Chariti is proposing a debate: MPC vs. rule based control. Donghun Kim is interested to help

13. Handbook (Joe Zhou)
- Two subgroups of 6-7 people for Chapter 43 and Chapter 60.
- Looking at the existing version.
- Bi-monthly meeting

14. Standards (David Yuill)
- TC 7.5 is responsible for two standards now.
  a) Standard 201- Facility Smart Grid Information Model
  b) Standard 207P- Laboratory Method of Test of Fault Detection and Diagnostics for Air-side Economizers

15. Web Page (Mike Galler)
- Use base camp II
- Carol: need to have a better organization
- Mike G: subcommittee to organize the content better
- Carol: set up an award subcommittee folder, remove the roster from the camp, upload all agendas to the camp
- Anyone can invite anyone to join the camp
- The TC will ask ASHRAE: how to manage the camp within TC

16. Award (Carol Lomonaco)
- nominate people
- promote the nomination
- nominate John House for Fellow

17. Old Business

- Working group re-organization
- YEA (25 attendees)
- Track Suggestions
  a) Carol: Cybersecurity track for Chicago
- Old Publications (FDD and Dynamic Building Models)
- An IEEE Webinar was held in December given by Mark Siira (SCC 21 Committee Chair (Standards Coordinating Committee on Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage)
  a) Suggest Jin posting it on the base camp

18. New Business
- Organizations (how to allocate research and program in subcommittee meeting)
  a) Use the maturity levels for allocation/management of program and research subcommittees
     o Li Song will work on the maturity levels for research
     o Eric will work on the maturity levels for program
  b) New track discussion should be in program
  c) Suggest switching BOD with program subcommittee time

- Acknowledge efforts from TC 7.5 members for the new published smart grid guideline book
  a) Joe Zhou
  b) Glenn Remmington

19. Adjournment
David Yuill made a motion to end the meeting, Glenn Remmington seconded

TC 7.5 Fault Detection and Diagnostics
3:00-3:45 pm, Sunday, February 2, 2020

Substituted by Li Song

Subcommittee Scope: explore and develop technologies to detect and diagnose common faults in both commercial and residential buildings. 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.

Agenda:

0:00	**Call to Order**	
	Circulate Sign-in sheet, self-introduction, announce the subcommittee scope.	
10 min	**Sessions at current ASHARE conference**	
	Paper Session 1: Presentation 3: A Change Point Detection Algorithm with Application to Smart Thermostat Data (OR-20-001) Sunday, February 2 8:40 AM - 9:00 AM Presented by Austin Rogers, PNNL Location: Hilton Orlando, LL, Orange A	
	Paper Session 16: Presentation 4: Home Envelope Performance Evaluation Using a Data Driven Method (OR-20-013) Tuesday, February 4 9:00 AM – 9:20 AM Presented by Junke Wang, University of Oklahoma (co-author: Li Song) Location: Hilton Orlando, LL, Orange B	
	Seminar 61: Outliers Detection Techniques and their Benefits in Data-Driven Modeling Wednesday, February 5 Sponsored by TC 4.7 8:00 AM–9:30 AM Presentation 1: Overview of Outlier Detection Techniques with Applications to HVAC&R Presentation 2: A Case Study on the Outliers Detection and Rejection in Data-Driven Baseline Modeling of Building Energy Performance Presentation 3: Whole Building Energy Data Quality Assurance through an Energy Balance Loads Approach Presentation 4: Machine Learning for Anomaly Detection in Subjective Thermal Comfort Votes Location: Hilton Orlando, LL, Orange B	
10 min	**Annual ASHRAE conference seminar ideas** • Fundamental and Applications	

8

	- HVAC&R Systems and Equipment - Research Summit (Chair: Kristen Cetin) - Professional Development - Grid-Interactive Efficient Built Environment - Multifamily and Residential Buildings - Resilient Buildings and Communities - Zero Energy Buildings and Communities: Opportunities and Challenges - Building Myths proposals due: February 10, 2020	
	Potential Seminar Ideas for Austin, TX	
	Possible seminar idea: Automated Alarm Management: DDC alarms used for FDD? Segment the alarm information into useful pieces. The building operator has to go through all the alarms. Orlando: An indiaition of the poor performance. The question is to get more information from field. For large BAS building systems.	Carol Lomonaco, Kim She is preparing for Austin conference. Orlando: Make presentation to collect information to make a RTAR is a goal. TC1.4: program would be the co-host.
	FDD in Guideline (GPC) 36 Orlando: (1711. PMS meeting will be in the Tuesday morning) Report draft is completed.	TC 1.4, co-sponsor 7.5 FDD Orlando: Guanjing Lin (LBNL) volunteered to chair.
	Fault prevalence types and impacts by building types and system types.	Piljae Im (Chicago) Orlando: no upadate.
	Facility User of FDDs (90 FDD owners, savings, best practice) Orlando: FDD for Roof Top Unit	Guanjing Lin, Orlando Durak Orlando: (Submitted, but rejected) will try for Austin TX.
	Residential FDD (multip family residential buildings) revew of FDD on residentials. Orlando: Potnetially David's student can present.	David Yuill Orlando: (one similar topic by a PNNL is accepted for conference paper). David will chair.
	Big Data analysis for AFDD	Jin wen
	Orlando: New idea: User's experiences with FDD? How do users respond to the alarms, correct or false?	Orlando: Initiated and will be chaired by Austin Rodgers, PNNL Laura Towsley, Rycom, (laura.towsley@rycom.com) may provide case studies from her clients.
	New ideas?	
15 min	**Update/Discussion of Active project/RTARs/Work Statement**	
	Development of AFDD for leakage of ground-source heat pumps (work statement revision)	Zheng O'Neill and Kristen Cetin

		Orlando: No udpates (still working on it)
	Evaluation of ASHRAE Standard 207P	David Shipley Orland: Kim TC1.4 Research chair will lead. Ahmed Abdel-Salam (ahmed.abdel-salam@rycom.com) volunteered to help.
	New Research Ideas	
	RTAR idea: collect, clean, and label existing data for FDD research.	Xiwang Li, Liping Wang, Kristen Cetin. Shawn Shi Orlalndo: No update
	RTAR idea: collect, clean, and label existing data for FDD research.	Xiwang Li, Liping Wang, Kristen Cetin. Shawn Shi
	Automated Alarm Management: DDC alarms used for FDD? (automated analytics to correct alarms or utilize alarms) – return the threshold to reduce false alarms in an automated process.	Carol Lomonaco; Reinhard Seidl, Li Song, Te Qi, John Wallace
	Whatresearch should TC 7.5 provide to use the FDD results to support the energy-saving requirement for Standard 90.1 and 189.1? what is the minimum requirement for the 90.1?	Continuous discussion in Orlando. Orlando: Guanjing Lin volunteered to lead. Kim suggested an internal TC75 meeting to discuss about it.
	Orlando: User experience and organization adoption of FDD	Orlando: Proposed by Devan Tracy, (devan.tracey@lmco.com) Lockheed.
10 min	**New ideas and discussions**	
Adjourn		

Meeting Minutes

TC 7.5 Enabling Technology
3:15-4:00 pm, Sunday, February 2, 2020

Prepared by David Yuill

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.

Agenda:

5 min	**Call to Order**
	Introductions; Agenda Overview
15 min	**Program**
	Current meeting status and new ideas
	proposals due: February 10, 2020
15 min	**Research**
10 min	**Committee future steps**

Program Discussions from Orlando:

Monitoring and Instrumentation
Kristin agreed to chair a seminar on this topic. Glenn Remington, Nick Gayeski, and a third person volunteered to give presentation.

New Sensing Technology
The chair for this idea was listed as Carol Lomonaco, who wasn't present so the idea was tabled.

Impact of IoT on building control & monitoring
Carol was also listed as champion for this topic, with Glenn Remington as helper. Glenn discussed ideas related to the topic.

Low Cost Sensors
Jin Wen was listed as champion, to be proposed for Austin. Mahabir Bhandari from ORNL offered to present.

Research Discussion from Orlando:

Nick Gayeski discussed the idea of development of standard taxonomies and metadata for building systems. A potential use case is FDD vendors who could drastically reduce the difficulty of providing diagnostics with a standardized way of identifying equipment. However, there is a wide array of potential use cases beyond diagnostics. Project Haystack is starting to be treated as a proxy for a standard taxonomy, but it has some shortcomings with respect to potential use cases. Nick developed an RTAR about five year ago that was submitted and rejected. He believes that for us to get traction with moving forward a research project to address this need, we would need support of the BACnet committee. Nick, Devan Tracy, and Parastoo Delgoshaei volunteered to revisit the RTAR to potentially update it for resubmission.

Meeting Minutes

TC 7.5 Smart Grid Subcommittee
4:30-5:15 pm, Sunday, February 2, 2020
Prepared by Kristen S. Cetin

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

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

Agenda:

0:00	**Call to Order**	
	Circulate Sign In sheet, self-introduction, announce the subcommittee scope.	
2 min	**Relevant sessions at current ASHRAE conference**	
	Paper Session 1: Smart Thermostat Sensing and Control (Sunday, 8-9:00 am)	Fangzhou Guo; Bryan Rasmussen
	Seminar 13: Current Practices of Grid Interactive Building Applications; The Importance of IoT for the Smart Grid (Sunday 11-12:30 pm)	Christie Kjellman; Michel Kohanim
	Debate 1: Does Building Energy Efficiency Matter in a 100% Renewable Grid? (Sunday 9:45-10:45 pm)	Jim Edelson
	Seminar 60: Control for Grid Interactive Buildings: A Look Toward the Future (Wed 8-9:30 am)	Michael Brambley
3 min	**Update on ASHRAE Guide/Guideline**	Joe Zhou, Christie Kjellman
1 min	**Smart Building Systems – Green Guide**	Kristen Cetin
35 min	**Summer ASHRAE conference seminar ideas**	
Adjourn		

Detailed Meeting Minutes

Call to Order
- Sign in Sheet
- New members – name – affiliation, new member
- Read scope

Sessions at current ASHARE conference
- Paper Session 1: Smart Thermostat Sensing and Control (Sunday, 8-9:00 am)
- Seminar 13: Current Practices of Grid Interactive Building Applications; The Importance of IoT for the Smart Grid (Sunday 11-12:30 pm)
- Debate 1: Does Building Energy Efficiency Matter in a 100% Renewable Grid? (Sunday 9:45-10:45 pm)
- Seminar 60: Control for Grid Interactive Buildings: A Look Toward the Future (Wed 8-9:30 am)
  - Please attend this seminar on Wednesday

Update - "Grid interactive Smart Building Guideline" – Christie /Joe
- **ASHRAE guide on smart grid for smart buildings** - Joe provided an update on the guide; importance of this subcommittee to recognize this and connecting of buildings; purpose of guide is for awareness

Update – Green Guide chapter – looking for volunteers – Please contact Kristen Cetin if interested

ASHRAE conference ideas

Summer 2020 – Orlando, FL, Feb 1-5, 2020
VERY SHORT TURN AROUND TIME – Feb 10 (next Monday) – Kristen Cetin will help anyone interested in helping to get these submitted.
- Tracks (potentially relevant tracks)
  1. (3) Research Summit
  2. **(5) Grid-Interactive Efficient Built Environment** → we (this TC/Subcommittee) fit best in this and have been asked by the conference chair to submit items to this
  3. (6) Multifamily and residential buildings
  4. (7) Resilient Buildings and Communities
  5. (8) Zero Energy Buildings and Communities
- Ideas / Discussions
  - From previous discussions @ last TC meeting:
    - Transitive Control/Building-Grid integration (Thanks Christie/Mike)**:** (1) control, (2) modeling, (3) applications (4) designing buildings to enable smart grid control, (5) focus on testbeds seminar discussion places where building-grid interactions can be tested
  - (1) Smart Grid guide intro/information on the published guide (*has 3 speakers*) **- *Joe, Christine, Glenn***
  - (2) Grid Communication Protocol – OpenADR, Voltron, BACNet (*has 4 speakers*) - **Joe**
  - (3) Grid-Interactive Buildings: efficiency vs. flexibility (*has 3 speakers*) - **Zheng O'Neill/PNNL/ Southern**
  - (4) Estimating the Grid-Interactive Approach *(has 4 speakers)* **Jared Benjamin**
  - (5) Future Smart Building Operations *(has 4 speakers)* - **Bing Dong**
  - (6) Grid-Interactive building Test beds @ National Labs or other locations *(in development)*-   - **Donghun Kim – lead, Austin Rogers - interested**
    - Need for education in ASHRAE – what are capabilities, what can be done?
    - Research designs/logistics of how to do smart grid testing
  - (7) Control of Grid-Interactive Buildings *(in development)* – **Mike**

- o (8) Building on debate related to grid-interactive buildings, what's impact on efficiency – *(in development)* **Mike** /**Eric**/ **Glenn**
- o (9) Cybersecurity & Smart Grid *(in development)*- **Carol Lomonaco – lead, Glenn Remington - interested**
  - ▪ potential collaboration with TC 1.5
  - ▪ plan to submit for Austin (more appropriate track)
  - ▪ integrate with IoT discussion from Enabling Technology subcommittee
- o (10) Load Forecasting Model - data driven approach –*(in development looking for speakers)* **Jin/Kristen/others interested?**
- o Other topics for the future
  - ▪ Renewables and the smart grid – (**Kim**)
    - • How do we handle this
  - ▪ Smart products for residential and commercial buildings
    - • talk with residential TC – net zero building committee
  - ▪ Panel discussion on grid interactive buildings
  - ▪ Smart grid and building envelope interaction (from 4.4) - as an energy storage feature –
    - • How building envelope can impact or interplay with smart grid contributions from buildings
    - • Dynamic facades
    - • Suggestion to follow up with NBI
  - ▪ Utility Grid Battery Control Strategies and Impacts on O&M & LCA (From Atlanta 2019)
    - • Large scale batteries

Discussion of RTARs/Work Statement ideas (for next time – not discussed this time)
- *Guidance on smart building equipment / IoT – (something that came up from forum discussion)*
  - o *what are you getting, functionality, products*
  - o *what program functions are necessary to work in different environments*
- *Development of models for better peak load predictions*
  - o *City-scale model validation for predicting demand response - some models exist*
  - o *Need an evaluation of the state of the art, perhaps useful for new city planning*
  - o *Need some more research on demand response capacity prediction*
  - o *Existing software – GridLabD – developed to designing rate cases*
- *Instantaneous voltage and current load from buildings*
- *Energy demand prediction of multiple building scale*
- *Linking building modeling to grid modeling*
  - o *Some existing efforts*
  - o *End user of this work would be policy recommendations for ISOs*
  - o *How to validate models?*

Meeting Minutes

TC 7.5 Building Operations Dynamics
4:30-5:15 pm, Monday, February 3, 2020

Prepared by Zheng O'Neill

Subcommittee Scope: • The Building Operations Dynamics Subcommittee of TC 7.5 is concerned with the dynamic characteristics and interactions of comfort conditions, the active components of HVAC systems, the passive components of HVAC systems, control systems and operation strategies and the building. The committee is concerned with the methods of building system operation which minimize energy used through the consideration of dynamics and interactions. It is also concerned with methods which consider dynamic and interactive characteristics in the design or comfort conditioning systems.

Miniues:

5 min	**Call to Order**	
	Circulate Sign-in sheet, self-introduction, announce the subcommittee scope and other announcements.	Zheng O'Neill chaired this subcommiteee. Zheng called for the meeting at 4:30pm
15 min	**Program**	
	Current meeting status and new ideas proposals due: February 10, 2020	Discusssions are provided below
15 min	**Update/Discussion of Active project/RTARs/Work Statement**	Discusssions are provided below
10 min	**New ideas and discussions**	Discusssions are provided below
Adjourn		

Program Discusssion:

Program	Title	Lead	Newest update – 02/03/2020
1	What to do with optimal control?	Peter Armstrong	Orlando: Peter is not in the meeting.No discussions.
2	Model accuracy impact study on model predictive control	Andreas Athienitis	KC: Complete, conference paper, Plan to organize seminar. Orlando: Donghun Kim and Dave Blum from LBNL are willing to participate in this seminar. Zheng O'Neill will connect them with Andreas.
3	Smart products for residential and commercial	Josh and Kristen	KC: On going Orlando: this program was discussed in enabling technologies subcommittee. Drop from this subcommitee
4	Training plan for facilities	Zhou Joe	Bach to follow up Orlando: No discussions. Park this idea.
5	Building Operations for Grow Applications?	Glen/Bach Tsan	Develop discussion topics/Review Chicago Seminar Orlando: No discussions. Park this idea.

6	Load shifting - assessing economics and emissions impacts of measures the primarily shift load	Scott Hackell (Splitream) - Chair	Orlando: Will propose to Austin (TC 2.8, 6.9, 7.5, others?)
7	Refrigeration Thermal Storage - locating thermal storage specifically in refrigeration systems (TC 6.9, 7.5, refrigeration, others?)	Scott Hackell (Splitream) - chair	Orlando: Will propose to 2021. (TC 6.9, 7.5, refrigeration, others?) Zheng suggested to talke with 10.7
8	Thermal storage (PCM, ice thermal storage, chilled water thermal storage) vs. battery ecoominic	Donghu Kim (Chair)	Orlando: will sumbit to Austin GEB track. Speaker: • LBNL • ORNL • NREL • Jie cai (OU)

Research Proposals Discussions:

Research	Title	Lead	Newest updates
RP-1661	RP- 1661: Development and Validation of Dynamic Models for the Evaluation of Chilled-Water System Control Strategies in the ASHRAE Handbook	TBD	Li Song and Wangda Zuo provided update to the research project, developed 9 different control sequence models and have run 18,000 simulations. Simulations are on-going. Current progress is running debugging of the simulations. Project expected to end April 2019- request PMS / TC 4.7 to extend 1 year. Discuss if extension could be granted. Orlando: Li (PMS): need to tune the model, scopes need to be changed. May need another extension. Wangda (contractor): provides udpates. Submit 60 pages of documentation to move forward for modeling. Finish implementation, debug controlers. Try to finish the debugging within 1-2 months. Asked for another one year NCE to April 2021.
WS	WS- 1809: Updating reference guide for dynamic models of HVAC equipment	Heejin Cho	Send out to RAC before the RTAR rules changed PTAR (Publication TAR). Co-Sponsored by 1.4 Has been reviewed by all voting members. 1/15/2019 – Approved by all. RAC provided comments back to the author Orlando: no updates from Heejin Cho. Zheng will follow up with Heejin

RTAR?	If you had "perfect information" on occupant's comfort preferences and their location within a conditioned space then how would you optimize control and how much value would you be able to realize	Rich Hackner? Li Song?	RTAR completed but did not submit. Internal TC review, and started to award, but search for co-sponsorship. Should check with occupant behavior group. Coordinate with TC 1.4? Circulate the document again via e-mail and repost by Li Song. Wen to communicate with Rich Hackner Voting Members to review on this RTAR and posted on BaseCamp. Organize electronic voting. Voted in KC Orlando: Not submitted yet. Will submitted by Li
RTAR?	How IoT impacts operators	Carol Liping Wang Scott Hackel	Carol working on outline. How to quantify impact – Li Song Dovetailing with enabling technologies. Update the title Orlando: Carol: No updates Li: should include Residentia application. We will need to have another idea/RTAR and Zheng will help Li Carol: does the new idea include homes or multi-family homes. Need to conside privacy, multi-stories,etc.
RTAR?	Link the productivity with occupancy based control; Occupant in the loop controls	Ivo Martinac	Ivo Martinac – professor developing idea. The idea but need to develop the team. Park this idea at this time Orlando: No updates. Park this idea, Zheng will follow up with Ivo.
RTAR?	Smart management of moisture and energy consumption in residential houses, smart ventilation, optimal location for dryer, heat pump water heater, etc.	Andrew Windham; Kristen Cetin	Update from Kristen Cetin Orlando: Drop this idea.
RTAR?	Design guideline to consider unmeasured disturbance for an implementable MPC	Donghun Kim, David Blum	Completed RTAR but has not been voted. Donghun seek assistance to upload. Wen Jin's records show and updated draft between Donghun and David. Wen to forward to Li and process. Orlando: Donghun: Drop idea Adptive control can distorte robustness. Well delveoped research area.
New	Opensource tool for integrating building and grid	Donghun Kim, Jie Cai, Qun Zhou	Orlando: Frist we will need to define the scope. Qun Zhou from University of Central

			Floirda talked about her perspertive from grid side.

ASHRAE TC 7.5: Smart Building Systems Research Subcommittee Meeting
Monday, February 3, 5:15pm to 6:00pm, Hilton Orlando, L, Lake Mizell B

Meeting Minutes
Prepared by Li Song

1.	Roll Call and Introduction	5:15 - 5:20
2.	Announcements/recap of the research subcommittee chair meeting	5:20 – 5:35

3. Status of current Research Projects
    3.1 Two ongoing research projects that are co-sponsored by TC75.
        a. RP 1661: the PI requested the 2nd 12-month no-cost extension.
        b. RP 1756: no update since peter and Liping did not show up.
     3.2 Four active work statements.
        a. WS 1781: Jin suggested to park it.
        b. WS 1783: Zheng is working on it.
        c. WS 1809: Heejin is still working on it.
        d. WS 1812: Li is working on it.
     3.3 Four active RTAR (one of them is co-sponsor)
            - RTAR-SP207P evaluation (added)
     3.4 New research candidates
     3.5 RTARs/WS underdevelopment

4.	TC 7.5 research new ideas and topics	5:50 – 5:55
5.	New Business	5:55 – 6:00
6.	Adjourn	6:00

ASHRAE TC 7.5: Smart Building Systems Research Plan

Active Project: 0;

Co-sponsor Project: 2;

Active WS: 3;

Active RTAR:3;

Co-sponsor WS/RTAR: 2

Subc	Project	Contributors /PI	Status
Co-Sponsor	(TC 4.7) RP 1661- Development and validation of dynamic models for the evaluation of chilled water system control strategies in the ASHRAE handbook	PMS Liaison: Li Song	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. Las Vegas – Selected a bidder. Miami is the winner Long Beach – contract is being signed. Project starts on August 1st. Wangda is the PI (will be at Boulder) Chicago: The project has begun, and the PMS met with the contractor. Task 1 is complete. Conference call is complete. Houston: The PI gave a report on the progress. Atlanta Update by Wangda: PMS meeting was on Sunday. Identified 9 sequences rather than 3 sequences. Large scale simulation and debugging is ongoing. 12-month extension is requested. Orlando: the 2nd 12-month extension is proposed by the PI and main sponsoring TC.
Co-Sponsor	TC 2.4: RP-1756 evaluation of low-cost particulate sensors for building	Brent Stephens (2.4) 7.5 PMS: Glenn Remington and Liping Wang	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. Las Vegas – resubmit a WS. Need 1-2 PES volunteers Long Beach – PES met and is selecting winner. Chicago: Project was awarded to Jordan Clark at Ohio State University, and has commenced. There are some initial adjustments to scope requested. Houston: The PMS had their second meeting. Update: Li will follow up with Remington or Li Ping Wang for an update before the main TC meeting. Kansas City update: The PIs made decent progress on the project. They have submitted an STBE paper currently under revision. Orlando: need update from Peter/Liping.
WS			

Subc	Project	Contributors /PI	Status
BOD	WS-1809 – 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. Committee voted approval. RAC approved. Need to develop WS. Las Vegas: WS in development. Long Beach: WS in development. Aim at Chicago meeting Chicago: a draft WS has been developed and sent to Zheng. It still needs some significant development. Attendees at the meeting were supportive of continuing this topic. Houston: Heejin expects to get a draft to us by mid-July. The Atlanta update by Zeng: WS was voted and submitted. Kansas City update: Carol mentioned the big-data based modeling approach. Jin will take the lead to communicate with Carol. Will be a new RTAR in BOD. Orlando: Zeng will follow up with the Author.
FDD	WS-1812 – Detection and Diagnosis of the Circulating Fluid Leakage for Hydronic Systems	Zheng O'Neill Kristen Cetin	STL: RTART discussed in sub-committee. Will be voted in mid-July. Committee voted approval. RAC approved. Need to develop WS. Las Vegas: WS in development. Long Beach: WS is ready to be voted. Aim at August deadline. Chicago: TC 6.8 was approached as co-sponsor. They were initially uncertain, but after a visit, they requested a change in title. TC 6.8 voted 9-1-1-1 CNV. Houston: WS was returned with comments. They aim to revise for August 15th deadline. Update by Zheng: First draft was submitted after Chicago meeting. Received comments in May 2018. TC 6.8 research committee has approved revised version. The WS is revised and is ready for vote. Kansas City update: revised WS is returned with comments. Orlando: Zheng will continue working on it.
ET	WS-1875: 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 Las Vegas – no update Long Beach – no update Chicago: there is still an interest in submitting a WS. Houston: Li will submit WS to RAC by August 15. Update in Kansas City: 1783 Orlando: Li Still working on it.
RTAR			

Subc	Project	Contributors /PI	Status
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. Las Vegas: In development Long Beach: In development Chicago: No update. Houston: Li plans to submit to RAC by August 15. The chair of MTG.OBB has agreed to cosponsor. We hope to vote at the main meeting to submit the RTAR. Atlanta update by Song: Li will upload the RTAR on basecamp and circulate among the TC. Kansas City update: Li will add the cosponsorship to the RTAR and send it Jin for voting on Tuesday. Orlando: The RTAT is submitted to Bill Murphy.
ET/FDD	Draft 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. Las Vegas – Nick is continuously updating it. Long Beach – no update Chicago: No update. Houston: Dennis Krieger will pick this up to see if there's potential to move forward. He's unfamiliar with ASHRAE processes. Update from John Wallace: Will follow up with Dennis Krieger. Jin clarified it included two components: Taxonomy and point mapping. It might be good to organize a program before moving forward with RTAR - John. Orlando: Nick gave up on the RTAR but will move to a program. (David Yuill) Li will follow up with Nick to clarify it will be for a program or an RTAR. He is revisiting with BecNet to see if he can resubmit.

Subc	Project	Contributors/PI	Status
BOD	Draft RTAR - Design guideline to consider unmeasured disturbance for an implementable MPC	Donghun Kim, David Blum	New at Long Beach Chicago: Still in progress Houston: Still in progress. Update by Zeng: The RTAR draft was prepared by Donghun Kim. David Blum sent the comments back to Donghun Kim January 2019 and no updates since then. Li will follow up. Kansas City update: Donghun Kim will finalize the draft RTAR. Targeted for August 15, 2019 deadline. Orlando: Drop
SG	RTAR - Development of models for better peak load predictions for building clusters/neighborhood/city	Michael Bobker Kristen Cetin	Long Beach – initiated the idea Houston: No update The Atlanta update by Kristen: still interested in working on. Helps are welcome. Helia Zandi with Oak Ridge will help Kristen work on it. TC4.1 is interested in co-sponsorship. Kansas City update: Kristen is still interested in working on it. Positive to develop a RTAR. Bing Dong and Zhe Wang volunteered to help. Orlando: still interested. Chicago.
SG	RTAR - - Linking building modeling to grid modeling	Donghun Kim	Long Beach – initiated the idea Chicago: was discussed, there's still interest. Chicago: Not discussed. Update by Kristen: Kristen will follow up with Donghun Kim. Jie Cai volunteer to participate. Ellen Franconi with PNNL will facilitate the project leaning toward to providing simulation capacity for enhancing code. Kansas City update: Kim is still interested in working on it. Li will follow up with Jie Cai to connect with Kim. Bing Dong volunteered to help. Orlando: Donghum, Jie Cai.
BOD	RTAR - How IoT impacts operators	Carol Lomonaco Liping Wang Scott ??	New at Long Beach Houston: There was discussion about the topic, and there's still interest in it. A written RTAR is not planned before Atlanta. Update by Carol in Atlanta: Carol still interested in working on this RTAR. Joe and Li are interested to help. No RTAR is developed yet. Kansas City update: Carol will provide an update after the subcommittee meeting. Orlando: After Chicago added Scott Hackel (SHackel@slipstreaminc.org) as a coauthor (Joe Zhou is the contact).
BOD	RTAR - Link the productivity with occupant-in-loop control	Ivo Martinac	New at Long Beach Houston: Topic was discussed. Ivo was not present, but there is general interest among those present. Update by Zeng: update before Houston meeting "no time to get the work done". Carol added that it was meant for a mini system for local air condition control, personal comfort. Kansas City update: Jin will update the TC after contacting POC. Orlando: Park
BOD	RTAR - Smart management of moisture and energy consumption in residential houses, smart ventilation, optimal location for dyer, heat pump water heater, etc.	Andrew Windham; Kristen Cetin	New at Long Beach Houston: Not discussed Update by Kristen: still interested in working on it. Update in Kansas City: Kristen mentioned one discussion with Andrew a year ago. Kristen will clarify the intention with Andrew and update the team. Orlando: drop

Subc	Project	Contributors /PI	Status
BOD	TC 1.4 RTAR Current title: "Night setback effectiveness" possible change to "Night preconditioning effectiveness" Orlando: Recommended to change the title to unoccupied-period Preconditioning effectiveness	Peter Armstrong	ORL: Seek co-authorship. Objective: show how to credibly model energy and comfort impacts of night preconditioning. (effectiveness of simple through MPC controls?) Las Vegas – continue development Long Beach: no update Houston: No update Kansas City update: it is dropped by TC1.4. Peter will lead it. Orlando: Helen (University of Toronto). Li will coordinate with peter and will lead.
BOD	RTAR: Big data-based approach for HVAC equipment modeling	Carol and Jin	Carol initiated the big data-based modeling approach in Kansas City. Jin will take the lead to communicate with Carol. Will be a new RTAR in BOD. Orlando: A new volunteer, Mr. Shengbo Zhang (U. of Toronto) wass introduced to Jin and Carol.
BOD	How smart/connected thermostat impact energy performance?	Li, Jin, Kristen, Glenn, David Shipley, Bing Dong, Han Li (hanli@lbl.gov), Brent Huchuk (Univ. of Toronto), 3 more from 90.2	Volunteers from 90.2: Mike Lubliner, Washington State University, lublinerm@energy.wsu.edu, 360-956-2082, Richard Watson, SSHC, Inc.,rwatson@sshcinc.com,860-399-5434, Matt Vargo, Carrier Corp, Matt.vargo@carrier.utc.com. Kansas City update: Li will explore the study done by EPA and start the draft of the RTAR Orlando: Mike Brambely provided inputs about the presentation on Sunday.
FDD	Method of evaluation of the FDD standard of air-side economizer on RTU	David Shipley	Kansas City update: David Shipley initiated the topic and will send the draft of the RTAT to Li for improvement in the TC. Orlando: Kim will lead this RTAR and Mike Brambley and Ahmed (ahmed.abdel-salam@rycom.com) will assist.
FDD	New in Orlando: User experience about FDD. Operator, building managers. System to be conservative or aggressive.	Austin Rodger	Austin proposed the idea. Not only for energy efficiency also O&M issues. Li will send the RTAT template to Austin to help him started. Li will connect Austin with Laura Towsley (laura.towsley@rycom.com).
Co-Sponsor	Draft: Low-cost indoor pollutant sensor metrics for data-driven control of ventilation in smart buildings	Jordan Clark, Brent Stephens, Kristen Cetin	Houston: In progress. TC4.3 is the main TC. Update by Kristen: RTAR is ready by Jordan. It is built off their existing project. Comments are welcome after TC review. Jin comments TC needs more time to review and vote. Zheng asked for difference between this project and prior project. Li will forward the questions to Jordan and request Jordan to present and answer the questions. Liping is the PMS of the prior project and should be consulted. Kansas City update: It is designed as the follow up project. Orlando: Kristen explained that Jordan Clark is being approved by the TC for submission.
Parking Lot			
FDD	RTAR: Self-fixing faults once it is diagnosed	Andrew Windham windhamaw@appstate.edu; Jin Wen will help)	New at Long Beach Houston: no update Kansas City update: an ongoing project is funded by DOE. Orlando. park

Subc	Project	Contributors /PI	Status
FDD	RTAR: collect, clean, and label existing data for FDD research	Xiwang Li, Liping Wang, Kristen. Shawn Shi (Carleton)	Las Vegas: new idea Long Beach: no update Houston: No update Kansas City update: Park. Orlando: park
FDD	WS 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 Las Vegas – WS in development. Will seek a vote in between meetings. Long Beach - WS is ready to be voted. Aim at submitting it by August deadline Chicago: WS was submitted after vote in LB. RAC returned with comments. Jin, Michael, and David met with Chris Wilkins, RAC liaison, and discussed revisions and resubmitting. Houston: No update. It times out within the next year, but we're still interested in pursuing this. Update by Jin in Atlanta: WS was inspired by the difficulties of the evaluation of RTU FDD algorithms. The WS was submitted once and comments were collected. Jin will get it done before the February 2019. Kansas City update: drop from the list and park
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?)		
ET	Ideas -- Connectivity in the home?	Nick Gayeski	CHI – Much discussion no resolution
SG	Development of models for better peak load predictions	Kristine; Mike, Srinivas will review	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
Co-Sponsor	Idea -	TC 7.3	ATL - Mike Brambly mentioned an idea about building maintenance and FDD

Subc	Project	Contributors /PI	Status
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.
SG	Guideline on smart building equipment		Chicago: New idea Houston: Not discussed.

1. **Web meeting info:**

    - **Join Microsoft Teams Meeting**
    - **+1 312-667-7145** United States, Chicago (Toll)
    - Conference ID: **256 155 156#**

2. **Call to order / Intro** (2 min)

3. **Report from TC 7.5 handbook Co-Chair (Joe Zhou)** (4 min)

    3.1. Progress since last ASHRAE meeting

    3.2. Schedule for the next version

    3.3. Recruit new reviewers/editors for the next version

4. **Discussion on Chapter 42 Supervisory Control Strategies and Optimization (Zheng O'Neill)** (10 min)

    4.1. Status

    4.2. Discussion

5. **Discussion on Chapter 63 Smart Building Systems (Greg Pavlak)** (10 min)

    5.1. Status

    5.2. Discussion

6. **New business** (3 min)

7. **Next handbook subcommittee meeting** (1 min)

    7.1. In-person meeting: 5:15 PM~5:45 PM, Sunday, June 27, 2020, ASHRAE Annual Meeting in Austin, TX.

8. Adjourn

TC 7.5 Program Subcommittee
5:45 - 6:15 pm, Sunday, 2 February 2020
Orlando Hilton
Orlando, FL

Subcommittee Chair Eric Yang was absent but Carol Lomonaco called the meeting to order at about 5.50 pm.

Current Program Reviewed:
The current program for the ASHRAE Orlando WTR 2020 meeting was reviewed. The programs listed below were either sponsored or co-sponsored by TC 7.5:
-Seminar 1
Seminar xx
Seminar 37
Seminar 60
Seminar 70
Seminar 74

Program for ASHRAE Austin TX Summer Meeting:
The program tracks were reviewed. There were a few questions about which track to use if the area of program was not listed. Note: it was suggested that the person check with the overall program track chair early on at ASHRAE.

Program Ideas for Austin TX and the future:
The parking lot of program ideas were briefly reviewed and all those interested were asked to consider the ideas for ASHARE Chicago's WTR meeting in January 2021 and after.

Programs presented at Orlando (sequence by time)

Sponsoring Committee	Program Time	Session Chair	Session Title	Co-Sponsoring Committee
6.7 Solar Energy Utilization	Seminar 1 Sunday, 8:00 AM -9:00 PM	Eric Yang	Building-Integrated Photovoltaic Systems: Enabling Energy-Resilient High-Performance Buildings	7.5 Smart Building Systems; TC 4.4
1.4 Control Theory and Application	Seminar 37 Monday, 9:45 AM -10:45 AM	Taraneh Shoorideh	Show Me the Money! Cost-Based Control of Supply Air Temperature	7.5 Smart Building Systems
1.4 Control Theory and Application	Seminar 45 Tuesday, 9:45 AM -10:45 AM	Carol Lomonaco	BACnet Secure Connect: What You Need to Know!	7.5 Smart Building Systems, SSPC135
7.5 Smart Building Systems	Seminar 60 Wednesday, 8:00 AM - 09:30 AM	Michael Brambley	Control for Grid Interactive Buildings: A Look Toward the Future	1.4 Control Theory and Application;
4.10 Indoor Environmental Modeling	Seminar 70 Wednesday, 11:00 AM - 12:30 AM	Duncan Phyfe	Leveraging Computational Models to Make Smart Controls	7.5 Smart Building Systems,
1.4 Control Theory and Application	Seminar 74 Wednesday, 11:00 AM - 12:30 AM	Chariti Young	Smart Is as Smart Does: Case Studies from Intelligent Florida Buildings, Campuses and Cities	7.5 Smart Building Systems; TC7.3; TC7.9

Program tracks and timelines for Austin, Tx

1	**Fundamentals and Applications:** Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychometrics, fluid and mass flow. This track provides opportunities for papers and presentations of varying levels across a large topic base. Concepts, design elements and shared experiences for theoretical and applied concepts of HVAC&R design are included.
2	**HVAC&R Systems and Equipment:** HVAC&R Systems and Equipment are constantly evolving to address the changing requirements of the built environment. Papers and

	programs in this track will focus on the development of new systems and equipment, improvements to existing systems and equipment and the proper application and operation of systems and equipment.
3	**Research Summit:** Active research, and the exchange of those research findings, are critical to the development of our HVAC&R industry and built environment. The 8th annual research summit invites researchers to share those results, including ASHRAE-sponsored research and research of interest to the ASHRAE community. Researchers are invited to present papers, extended abstracts, seminars, forums or participate in panel discussions. The Research Summit includes a partnership with ASHRAE's archival journal, Science and Technology for the Built Environment.
4	**Professional Development:** As members of a professional organization, we not only participate for the great value of technical exchange, but also the interpersonal exchange. We recognize that the single greatest strength of our organization is its membership. This track is designed to allow those professionals an opportunity to develop in the areas of presentation skills, leadership, team-building, understanding various business operations, interpersonal skills, etc. In short, the Professional Development Track will cover all aspects of business outside of engineering/technical applications and lends itself to interactive session types such as workshops and forums.
5	**Grid-Interactive Efficient Built Environment:** This new track focuses on the effects of industry trends (grid-enabled buildings, demand response, decarbonization, etc.) on system, building and community design practices. Topics include smart building, grid-enabled equipment and appliance, and HVAC design and operation for load flexibility. Topic can also include energy storage (thermal, battery, building mass, etc.), energy recovery (from condenser water or air), time-of-day practices, utility programs, etc.
6	**Multifamily and Residential Buildings:** Multifamily is one of the fast growth building sectors but has been underserved. Multifamily buildings present challenges and opportunities on energy codes requirements, energy efficiency opportunities, ventilation and air tightness balance, and equality to address low-income multifamily buildings. This track covers programs and papers on best practices, utility and above-code incentive programs, field studies, and codes and standards requirements. This track also welcomes programs and papers for single family housing and other residential buildings.
7	**Resilient Buildings and Communities:** The cycle of building development, design and construction is moving more rapidly than ever. Key stakeholders in the design and construction process face new challenges of responding to a range of environmental, market and consumer-driven pressures. Increasingly, it is being recognized that "smart" buildings and integrated systems are central to successfully addressing challenges posed by climate change, natural disasters, accidents, disease, and terrorism. Papers and program in this track focus on innovation and exploration related to these challenges and best practices that enable adaptability, resilience and recovery of buildings and communities.
8	**Zero Energy Buildings and Communities: Opportunities and Challenges.** To address the climate change challenges and carbon reduction needs, zero energy buildings and communities have proven concept in many cases. However these case studies remain a very minor portion of the building stock. This track provides an opportunity to address the challenges and demonstrate opportunities in a wide range of perspectives. Topics in this track includes integrated design approach, tools and resources to make it easier on zero energy design and operation, innovative and state-of-art technologies and strategies; balance between energy efficiency measures and on-site renewable generation,

	aggregated scale to achieve zero energy communities and campuses. This track will also cover the topics on policies and regulations, codes and standards and utility programs for adoption and scale up of zero energy buildings and communities.
9 Mini-Track	**Building Myths:** It is often difficult to present or publish "negative" results where there was no successful outcome of an experiment or study. This often leads to people conducting similar experiments to discover what others knew but never published. This min-track is designated to share the lessons learned from these precious experiences. This mini-track will also identify and test unquestioned assumptions related to the built environment and its efficient operation.

Deadlines:
Friday, Feb. 10, 2020: Seminar, Workshop, Forum, Debate, and Panel Proposals Due
Friday, March 16, 2020: Seminar, Workshop, Forum, Debate, and Panel Accept/Reject Notifications

Program ideas for Austin, Tx and the future

Type	Session Chair / Speakers	Proposed Title	Status	Updates
Seminar	Guanjing Lin, New Heaven University for FDD for Rooftop Unit	Users' experiences for FDDs in commercial buildings		
Seminar	David Yuill	Faults for Condenser Fouling		
Seminar	Jin wen	Big Data Analysis for AFDD		
Seminar	Michael Brambly	Control – Look toward to the future -Smart Grid three series: 1. Control (Led by Michael) 2. Modeling (led by Jin Wen- Austin) 3. Application (led by Kristen Cetin)	Control and Application for Orlando; Modeling for Austin	
Seminar	Joe Zhou, Glenn Remington, Scott Hackel	Smart Grid Guide / Guideline (seminar)	For Austin	
Seminar	Glenn Remington	Cybersecurity & Smart Grid		
Seminar	David Blum	Fundamentals of smart building integration		
Seminar	Kristen Cetin/Zheng O'Neill	Smart products for residential and commercial buildings		
Seminar	Donghun Kim	Smart Grid – Building Envelope Interaction/Dynamic Facades		

Seminar	Eric Yang	Utility Grid Battery (large scale) Control Strategies and impact on O&M, LCA		
Seminar/Debate	Carol Lomonaco	LoT Security		
Seminar	Carol Lomonaco	BMS integration with IoT		
Seminar		California Requirement of FDD		
Seminar	Edward Tsui	Best practice of monitoring and instrumentation		Glenn Remington; TC 7.6 and 1.2 will sponsor
	Jin Wen	Low cost sensors	For Austin, Tx	
	Joe Zhou	What the smart valve can do		
Seminar	Jin Wen	Transactive Control – speakers from NREL, PNNL		
Seminar	Eric Yang	Battery Control Strategies and its impact to life cycle cost	Christie Kjellman, Glenn Remington, Srinivas Katipamula	
Seminar	Peter Armstrong	What to do with optimal control?		
Seminar	Andreas Athienitis	Model accuracy impact study on model predictive control		Complete, conference paper, Plan to organize seminar.
Seminar	Josh and Kristen	Smart products for residential and commercial		On going
Seminar	Zhou Joe	Training plan for facilities		Bach to follow up
Seminar	Glen/Bach Tsan	*Building Operations for Grow Applications?*		Develop discussion topics/Review Chicago Seminar
		Secure BacNet	For Austin	TC7.5 cosponsor
Seminar	Carlos/David	Fundamentals of smart building integration		
Seminar	Smart products for residential and commercial buildings	Josh Rhodes, Kristen Cetin, Zheng O'Neill		
Seminar	Smart Grid – Building Envelope Interaction/Dynamic Facades	Jie Cai, Donghun Kim, Paulo Tabares		

Seminar	Carol Lomonaco / Sherry Hu	The role of cloud-based communication on smart meter technology.		What the procedure to get the data and what people can do with the data. Sherry Hu can be a speaker. To find more speakers.
Seminar		IOT sensor/calibration		
TBD	Carol Lomonaco	Strong password for BAS		
TBD	TBD	What data the lawyer would like to know –needs to define scope	In future	
Seminar	Peter Armstrong& Li Song	Building optimal / predictive control	For Future	
Seminar,co-sponsor TC 7.9	Li Song& Carol Lomonaco	How BAS can Enhance Existing Building Commissioning	For Future	
Seminar	Srinivas Katipamula	Improving Energy Efficiency of Commercial Buildings thru Data Analytics	For future	
Seminar	Armstrong	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	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 2007 really work?	For future	
Seminar	Glenn Remington	Case Studies: Using FDD for smarter facility operations / Lessons Learned from FDD implementation	For future	The project has been done for a while
Seminar	Chris Kinney/Michael Munroe/Glenn Remington	FDD and Clouds?	For future	
Seminar	Jin Wen / Zheng O'Neil	Occupancy-based control sensor	For Future	To invite speakers

Seminar	Xiaohui Zhou/Srinivas Katipamula/Jin Wen	Open source platforms for HVAC,VOLTRON	For future	