

**ASHRAE TC 6.9 – Thermal Storage
General Meeting Minutes
Monday, July 13th, 2020
3:30 – 5:00 PM EDT
Virtual Zoom Meeting**

Attendees

Attendees included:

Kyle Gluesenkamp	CM	
Craig Wray	CM	
Charles Dorgan	CM	
John Andrepont	CM	
John Lau	VM	
Karl Heine	CM	
Keith Ponitz	CM	
Mike Kazmierczak	CM	
Ryan Lime	CM	
Sandra Boetcher	CM	
Spencer Dutton	CM	
Richard Brooks	VM	Program Subcommittee Chair
Henry Becker	VM	
Farzin M. Rad	VM	Vice Chair
John H. Nix	VM	
Daniel Pyewell	CM	Secretary/ Webmaster
Bruce Lindsay	CM	
Ken Fulk	CM	Outgoing Standards Subcommittee Chair
Guy Frankenfield	VM	
Scott Shaffer	CM	Handbook Subcommittee Chair
John Dunlap	VM	
Sandra Boetcher	CM	
Rafael Rodriguez	CM	
Chris Mincey	VM	Chair
Blake Ellis	CM	Incoming Standards Subcommittee Chair
Paulo Tabares	VM	Research Subcommittee Chair
Amy Van Asselt	CM	
Navin Kumar	CM	

Preliminaries

- Meeting called to order at 3:30 PM by Chairperson, Chris Mincey.
- Housekeeping – keep mic on mute if not speaking.
- The TC 6.9 Purpose Statement and Code of Ethics Commitment was read by Chris Mincey.

- Voting Member Roll Call – 9 voting members were present: Farzin Rad, John Dunlap, Paulo Tabares, Guy Frankenfield, Richard Brooks, Chris Mincey, John Lau, John Nix, and Henry Becker. The following voting members were not present: Trenton Hunt, Geoff Bares, John Nix, and Mark McCracken.
- Based on a total of 9 voting members, a quorum was determined.
- All guests were given the opportunity to introduce themselves.
- Modifications to the agenda – 1 correction – Ken Fulk will be taking standards through this meeting, and then Blake Ellis will pick up afterwards.

Approval of Minutes

Orlando – Winter Meeting 2020. No comments were presented in meeting. Chris makes a motion to approve, seconded by Guy. 9 voting members approved, thus the minutes were approved.

Announcements by Chair – Chris Mincey

Section 6 Breakfast

- Not a lot of new information disseminated. 4 T.C. mergers have been completed to-date. There's still some discussion about T.C. restructuring, but not much more consideration.
- COVID-19 has affected ASHRAE, and may affect RTARs and research funding.
- Incomplete program submissions were the biggest reason for seminar rejections.

Liaison Reports

- Section 6 head Dawen Lu – did not attend.
- John Nix – did not attend.
- Guy Frankenfield will continue to follow up with T.C. chair for 4.1 Load Calculations Data and Procedures.
- For Work Group 90.1, John Dunlap reported that 90.1 is working to try to get proposal in front of main committee to promote usage of thermal storage. PNNL to work with DOE to model typical office building for thermal storage. Dan Pyewell indicated that he has been providing some support for CHW TES modelling to the PNNL work group.

Standards – Ken Fulk

- Standards Section 6 Liaison Report- Mr. Craig Way. Nothing to report. Craig will send Ken the form for submitting any changes needed to standards.
- Current T.C. 6.9 Standards to be discussed:
 - a. Standard 94.2-2010 (RA 2006); Revision Committee Approved 2013, Method of Testing Thermal Storage Devices with Electrical Input and Thermal Output Based on Thermal Performance. Standard has been officially withdrawn. T.C. no longer responsible for.

- b. ANSI/ASHRAE Standard 150-2000 (RA 2019) – Method of Testing the Performance of Cool Storage Systems-Published in Orlando. Next steps:
 - i. Consider submitting a request to the Standards Committee to revise Standard 150.
 - ii. Need to assemble a new SPC. A SPC Chair and a minimum of four (4) members are required.
 - iii. Need volunteers to be members.
 - iv. Balance of Membership is required.
 - v. Critical Need: SPC Chair.

Charles Dorgan indicated that he will volunteer as chair of the committee. Blake is also willing to participate in the team.

- Other Standards (of Interest to T.C. 6.9):
 - a. ANSI/AHRI 900 (I-P)-2014, Performance Rating of Thermal Storage Equipment Used for Cooling – ANSI Approved in 2015; Updates planned:
 - i. Shwetha Prabhu with AHRI is our liaison on this document.
 - ii. E-mail: sprabhu@ahrinet.org
 - iii. Address: 311 Wilson Blvd., Suite 400; Arlington, VA 22201
 - iv. Phone: 703-600-0357

John Lau indicated that the committee has re-affirmed the standard, so no changes/ updates will be made.

- b. Proposed ASME (American Society of Mechanical Engineers) TES-2-200X, Safety Standard for Thermal Energy Storage (TES) System Requirements for Solid State and Other TES Systems is being monitored-Status-Exchanged e-mails.

Standard already written and put together. Should be sent out for review soon.

- Possible Method of Test Standard for Phase Change Materials was being proposed by Navin Kumar with the Oak Ridge National Laboratory. His contact information is as follows:
 - a. E-mail: kumarn1@ornl.gov
 - b. One Bethel Valley Road, Bldg. 3147, MS-6070; Oak Ridge, TN 37830-6070
 - c. Phone: 865-341-0085 (Office; 386-898-2292 (Cell)

Ken exchanged some emails with Navin. We do have this moving through the system, but unsure if it is ready to submit to committee for review (probably in the next month or so).

- Ken is rolling off as chair at the end of this meeting. Ken reconfirms that Blake Ellis has stepped forward to take his place. Blake encourages anyone interested in the committee to get in touch with him.

Programs – Richard Brooks

Subcommittee- Richard let the guests introduce themselves

- **PAST PROGRAMS – Orlando FL – Feb 1st thru Feb 5th, 2020**
Hilton Orlando and Orange County Convention Center (postponed)

1. Two Programs were proposed by TC-6.9 for this Winter Conference.

A. Using Thermal Energy Storage to Increase the Resiliency and Flexibility of Florida HVAC & Power Generation Facilities.

B. Advances in Energy Storage for Smart Buildings: New Modeling Capabilities and Technologies

Track: Cutting Edge Approaches

Chair: Paulo Cesar Tabares Velasco

2. None of our proposed seminar topics were approved/ chosen by the selection committee (CEC).

3. The “History of TES” was recently published so special thanks go out to Mr. Andrepont, Mr. Dorgan, Mr. Lindsay, Mr. Markel, Mr. MacCracken, & Mr. Williams

- **CURRENT PROGRAMS – Virtual Meeting Summer 2020**

JW Marriott and Austin Convention Center (Changed to a Virtual Meeting)

TC-6.9 has no seminars scheduled for this Summer Conference due to the Virtual Presenting of the Material. The committee approved three seminars for the Austin/Summer meeting. Later, all the seminar chairs opted to postpone these seminars to future meetings.

The three seminars postponed include:

1. Embry Riddle – TES in Small Scale Storage Applications.
2. Integrating PCM (hot and cold HX) storage in different configurations of HVAC systems (residential and commercial with LiO battery). Possible co-sponsor with T.C. 7.5. Smart Building systems
3. Techno-economic comparisons of TES systems

- **FUTURE PROGRAMS – Chicago IL – Jan 23rd thru Jan 27th, 2021**

Venue=Palmer House Hilton

The three possible seminars that were postponed include:

1. Embry Riddle Aeronautical University in Daytona Beach FL– TES in Small Scale Storage Applications.

Possible Chair-(Bruce Lindsay??)

ASHRAE Student Branch (participation ??)

Speakers:

a) Dave Snyder at Centerpoint Energy (Houston) -Problems with wind and solar production and having to pay customers to take the excess power.

b) Marc Compere, Assoc Professor, pending a student volunteer to show off his/her student design project.

c) John Constantinide – The economics (pending a nomination of a CARICOM member as substitute, for an island economic aspect).

Chris made a motion to approve the submittal, seconded by John Dunlap. All 9 voting members approved.

2. Integrating PCM (hot and cold HX) storage in different configurations of HVAC systems (residential and commercial with LiO battery). Possible co-sponsor with T.C. 7.5. Smart Building systems. Chris Mincey offered to help as chair for the seminar. Mike Kazmierczak, Kyle Gluesenkamp, and Amy Van Asselt are interested in presenting. John Andrepont mentioned that someone needs to reach out to T.C. 7.5 for co-sponsorship. Kyle Gluesenkamp will follow up and reach out to the T.C. for this.

Chris made a motion to approve the submittal, seconded by Farzin. All 9 voting members approved.

3. Techno-economic comparisons of TES systems. Paulo Tabares to chair.

John Nix made a motion to approve the submittal, seconded by Chris. All 9 voting members approved.

4. TES for refrigeration (case study with specific vendors). Greg or Scott will determine who to chair.

Chris made a motion to approved, seconded by Guy. All 9 voting members approved.

- **Deadlines for the Winter Conference in Chicago IL:**

Monday, July 7, 2020: Conference Paper Abstract Accept/Reject Notifications

Monday, August 3, 2020: Website Closes for Seminar, Workshop, Forum, Debate, and Panel Proposals

Monday, August 17, 2020: Final Conference Papers Due - Submitted for Review (Includes Bio, Learning Objectives and Methods of Assessment); Request for Conference Paper Sessions Due

Monday, August 31, 2020: Conference Paper Accept/Revise/Reject Notifications

Monday, September 14, 2020: Revised Conference Papers/Final Technical Papers Due

Monday, September 21, 2020: Conference and Technical Paper Final Accept/Reject
Notifications

Monday, October 5, 2020: Seminar, Workshop, Forum, Debate, and Panel Accept/Reject
Notifications

- **POTENTIAL FUTURE SEMINAR TOPICS**

1. Thermal vs. Battery Storage
2. Long term versus Short Term Storage
3. TES 101 – may be too general and needs to include some new buzzwords. Possibly, “All the things you wanted to know about TES but were too afraid to ask.”
4. John Andrepont’s Conference Paper seminar regarding his previously published paper regarding TES & Turbine Inlet Chilling
5. ASHRAE 150: What is it and how to apply it
6. Economics of Thermal Energy Storage
7. Predictive Controls to Utilize TES to Address Renewables – Amy

- **POTENTIAL FUTURE SEMINAR TITLES**

1. Simple, Elegant, and “Virtually” the Best Battery Ever – Thermal Storage
2. How Many Times Can a TES System Pay for Itself?
3. The Nitty “Griddy” about TES Systems – Why Electric Grids and Microgrids need TES

- **POTENTIAL FUTURE TOUR SITE RECOMMENDATIONS:**

1. Chicago, IL - Jan 23–27, 2021 a. It was mentioned to possibly use Enwave Chicago, (Geoff Bares as a contact), on the next Conference in Chicago.

John Andrepont suggested to tour the Large Stratified CHW tank with LTF at McCormick Place.

2. Phoenix, AZ - Jun 26–30, 2021

John Andrepont mentioned Enwave has large Ice-on-coil application systems in downtown Phoenix.

In main meeting, John indicated that these future tours may not be fruitful due to the COVID situation, in which only essential personnel may only be permitted to these locations.

- **ACTION ITEMS for TC-6.9 Summer 2020 Virtual Meeting**

1. Proposed Seminars & Programs for Winter 2021 in Chicago, IL a. What are the topics?
2. Is TC-6.9 Co-Sponsoring any Seminars?

- **Tracks for Chicago include:**

1. **HVAC&R Fundamentals and Applications:** Fundamentals are the foundation for understanding applications in engineering. Key components of ASHRAE fundamentals include thermodynamics, psychrometrics, 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.

Robert Cox Email: bob.cox@jacobs.com

2. **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.

Dr. Marianna Vallejo Email: marianna.vallejo@jacobs.com

3. **Refrigeration and Refrigerants:** Refrigeration is a critical element of modern life, from preserving food and medicine to maintaining comfort. With significant changes on the horizon for refrigerant regulations, along with new applications for refrigeration systems being frequently applied, there is more need than ever to understand both the fundamental and advanced concepts and issues related to refrigeration. Papers and programs in this track will focus on refrigerants, refrigerant regulation, refrigeration cycles and refrigeration applications.

Gary Debes Email: gary.debes@comcast.net

4. **Environmental Health Through IEQ:** HVAC&R systems play a significant role in maintaining indoor environmental conditions. As people spend increasingly more time in the built environment, health concerns are becoming paramount to design. This track will seek papers and programs on developing, evaluating and predicting optimal indoor environmental conditions, especially as they pertain to environmental health.

Stephen Idem Email: sidem@tntech.edu

5. **Building Performance and Commissioning for Operation and Management:** Modern HVAC&R systems are complicated and designed for high efficiencies. In order to optimize their use and provide proper operation, commissioning is recommended. This track provides an opportunity to provide papers and presentations surrounding building operation and commissioning practices as well as case studies in performance and commissioning.

Lee Ribbeck Email: lee.riback@gmail.com Programs TC-6.9 Page 5

6. **Energy Conservation:** Whether it is new construction, renovation, routine maintenance or energy audits there is a major concern over the use of energy in the built environment. Designs are using more techniques to reduce energy with the use of energy wheels and pipes, solar energy, photo voltaic, and more efficient equipment and new concepts that are pushing to be standard design practice. In addition, modeling is being used to generate more life cycle cost decisions for the design and value-engineering decisions beyond standard HVAC practice. This track will highlight case studies and research that expand on the simple to the complex energy savings measures being implemented in today's and tomorrow's designs.

Nivedita Jadhav Email: nivi2307@gmail.com

7. **International Design:** Design for various environmental elements, geography and culture demand that new and innovative strategies be developed. As an international organization, ASHRAE strives to meet the needs of a global membership. HVAC&R systems vary globally and this track provides an opportunity to share innovative and necessary design elements that can be shared internationally.

Farhan Mehboob Email: farhan.mehboob@smehboob.com

8. **Standards, Guidelines and Codes:** ASHRAE is known for its standards and design guidelines – and they are constantly evolving with the intent on improving the built environment and its systems. Designers, Contractors, Architects and Owners must be able to keep up with the continuing changes in the current cycle but to also be prepared for the future changes. In addition, there is a large interaction of ASHRAE with the code authorities and government to incorporate these standards and guidelines. The series of sessions in this track highlight the changes to the standards and guidelines, their projected path and optimum design techniques to meet or exceed the standards.

Kyle Inge Email: kinge@burns-group.com

9 (Mini-Track)

Mini-track based on Chuck Gulledge's Presidential Theme (to be announced and not accepting papers).

Handbook – Scott Shaffer

- Error in Table of Contents. Thermal Storage is now Ch. 50, and not Ch. 51. Chapters appear to be flip-flopped. Additionally, John Lau indicated that the contributors were not updated in the .pdf version of the handbook. Guy suggested to contact Heather Kennedy to resolve the error.
- Scott reviewed changes to 2020 edition, with contributions by John Lau, Guy Frankenfield, and Daniel Pyewell.
- Two new topics for the guide: Passive TES (John Molnar) and Heat Seasonal Storage (Section 50.16?). Farzin to provide proposal at next meeting.
- Room to improve refrigeration of PCMs as well in the chapter.

- The T.C. is soliciting for authors for the new additions to the handbook. Please contact Scott Shaffer if interested.
- Scott ask for suggestions for including in the next revision of the handbook. To further address in main meeting and in Chicago, and see whom wants to author each section.

Research –Paulo Cesar Tabares Velasco

- Current Projects:

RP-1762 Design Guide for CTIC Systems TC 4.4 Co-sponsoring. Finished and authorized to be published. Dharam Punwani gave an online presentation on this guide.

- WS: currently none

- RTAR:

Optimal Design and Control of Distributed Cool Thermal Energy Storage for the Interactive Grid

- Combined from:
 - Model Predictive Control for Chilled Water Storage (Amy Van Asselt)
 - Optimal Design and Control of Distributed Ice Thermal Energy Storage for the Interactive Grid (Karl Heine, Paulo Tabares)
 - Got feedback from Dough Reindl and Ken Fulk, working on updated version
- New Ideas:
 1. TES and EV??
 2. Potential cost savings maps for cool storage (Paulo Tabares, Mikael Salonvaara)
 3. Potential for value TES for vegetable/fruits preservation.
 4. Hot water storage (Joseph Rendall)
 5. Renewable energy generation + energy storage (heating purposes)
 - Additional Ideas:
 6. Convective heat transfer role in PCMs effectiveness
 7. TES control to maximize mix of renewable energy generation
 8. Control strategies with a stochastic (not deterministic) data
 9. Renewable energy generation for heating purposes or for mix storage sources
 10. PCM Plenum Storage
 11. Methods to Address High Flow Requirements When Using TES for Emergency Cooling
 12. Secondary Coolants, Refrigerants Efficiency Improvements to TES
 13. Small plate diffusers. Characterization. Design vs figure of merit. Varies way to design diffusers.

Long Range Planning/Website – Chris Mincey/Daniel Pyewell

- 4 T.C.s have merged, to-date.
- COVID has affected funding on research, and may affect our future T.C. research.
- Paolo recommends possibly updating/ changing the mission statement and scope of the T.C. Chris suggested adding this to the Chicago meeting agenda.
- Chris proposes to eliminate the meeting information on the website, and simply have the agenda and main meeting information on the page.

- Guy is sitting in on meetings for ESIC (modelling software), but they are currently focusing on batteries for now. Guy is sitting in to see how it's progressing, and to ensure TES is included in this software.
- Daniel has been keeping our website up-to-date. Dan mentioned that the redundant meeting information will be removed from the website.

Honors and Awards – Blake Ellis

- **TC 6.9 Members Elected to the Board of Directors**

- Directors-at-Large (DALs):

- **Kenneth Fulk (CM)**, principal, Reed Wells Benson & Company, Allen, Texas.

- **TC 6.9 Members Receiving Awards at this Meeting:**

- Crosby Field Award

Charles S. Barnaby, Fellow Life Member ASHRAE and **Peter Simmonds (CM)**, Ph.D., Fellow Life Member ASHRAE, are recipients of the Crosby Field Award for "Development of a Unified Tool for Analysis of Room Loads and Conditions," which was judged to be the best paper presented before the Society. The Crosby Field Award is named for a former Presidential Member.

- Distinguished Service Award

The Distinguished Service Award salutes members of any grade who have served the Society faithfully and with distinction and who have given freely of their time and talent in chapter, regional and Society activities. The following 43 members were recognized:

- **John S. Andrepont (CM)**, Life Member ASHRAE, President, The Cool Solutions Company, Lisle, Illinois.
 - **Trenton S. Hunt (VM)**, Vice President, Mechanical Products NSW, Salt Lake City, Utah.

- **Update ASHRAE Bio**

- Blake indicated that an updated ASHRAE bio is important as it is reviewed with any award submission and Blake encouraged people to keep their bios updated.

- **Hightower Award**

- Given to people about service the last four years on technical activities.
 - TC chair and members of TAC & Tech Council are not eligible.
 - TC chair submits the form to the TC section head by September 1.

- **Other Awards Application Dates**

- December 1 Due Dates

- ASHRAE Hall of Fame: This award honors deceased members who have made milestone contributions to the growth of ASHRAE-related technology. Individuals inducted into the Hall of Fame must have been an ASHRAE member (any grade) or a member of a predecessor Society and must have shown evidence of distinction in the Society, either technically or academically.
 - ASHRAE Pioneers of the Industry Award: This award honors deceased individuals who have made milestone contributions to the growth of air

conditioning, heating, refrigeration and ventilation. Individuals inducted into the Pioneers of the Industry must have shown evidence of distinction, either technically or academically.

- *F. Paul Anderson Award:* This award, named in honor of F. Paul Anderson, 1927-28 President of the American Society of Heating and Ventilating Engineers, is the Society's highest award. This award honors members for notable achievement, outstanding work or service in any field of the Society. Accomplishments should include exceptional leadership in the HVAC&R industry, ASHRAE, and society. Broad-based activities of outstanding value in consulting, contracting, engineering, design, and related activity within ASHRAE are desired. Previous recipients of this award include Willis Carrier, Sam Lewis, Carl Ashley and Donald Kroecker.
- *Fellow Nominations:* ASHRAE members who have attained distinction in the fields of heating, refrigeration, air conditioning, ventilation or the allied arts and sciences through invention, research, teaching, design, original work, or as an engineering executive on projects of unusual or important scope. The individual must have made substantial contributions and have been a full grade member in good standing for at least ten years prior to the date of their election.
- *ASHRAE Award for Distinguished Public Service:* This award recognizes ASHRAE members who have performed outstanding public service in their community, and in doing so, have helped to improve the public image of the engineer.
- *Honorary Member:* Honorary Member status is granted to individuals in recognition of preeminent professional distinction without regard to whether the individual is or has been a member of the Society. Previous recipients include Milton Eisenhower and President Herbert Hoover.

May 1 Due Dates:

- *Louise and Bill Holladay Distinguished Fellow Award:* This award honors Fellows of the Society for continuing preeminence in engineering or research work.
- *Andrew T. Boggs Service Award:* This award, named after Andrew T. Boggs, former ASHRAE Executive Vice President, recognizes past recipients of the Exceptional Service Award for continuing, unselfish, dedicated and distinguished service to the Society.
- *Distinguished Fifty-Year Member Award:* This award recognizes individuals who have been ASHRAE members for a minimum of fifty years, and were a past Society President, a Fellow, recipient of the Distinguished Service Award, or otherwise performed outstanding service for the Society.
- *Exceptional Service Award:* This award recognizes members who have served the Society faithfully and with exemplary effort, far in excess (45 service points) of that required for the Distinguished Service Award (15 service points). The individual must have been a full grade Member for a minimum of ten years and be a past recipient of the Distinguished Service Award.
- *Distinguished Service Award:* This award recognizes members of ASHRAE who have served the Society faithfully and with distinction on committees or otherwise given freely of their time and talent on behalf of the Society (15 service points are required).

Old Business

- none

New Business

- Guy is rolling off as a voting member, but is interested in rolling back on in a year from now.

- Chris suggested for members to check the website to see if they are provisional members or corresponding members, and follow up with Chris. His email is the following: cmincey@CromCorp.com

Adjourn

- Chris adjourned the meeting at 4:43 p.m.