

**ASHRAE TC 6.9 – Thermal Storage
General Meeting Minutes
Monday, June 7th, 2021
3:30 – 5:00 PM EDT
Virtual Zoom Meeting**

Attendees

Attendees included:

John Andrepont	CM	
John Lau	VM	
Trent Hunt	VM	
Chuck Booten	CM	
Mike Kazmierczak	CM	
Steve Bourne	CM	
Richard Brooks	VM	Program Subcommittee Chair
Henry Becker	VM	
Farzin M. Rad	VM	Vice Chair
Jason Woods	CM	
Daniel Pyewell	VM	Secretary/ Webmaster
Bruce Lindsay	CM	
Ken Fulk	VM	joined later, not included in quorum
Guy Frankenfield	CM	
Scott Shaffer	VM	Handbook Subcommittee Chair
Richard Mullen	CM	
Chris Mincey	VM	Chair
Blake Ellis	CM	Standards Subcommittee Chair
Karl William Heine	CM	
Amy Van Asselt	CM	
Navin Kumar	CM	
Weihuan Zhao	CM	
Phil Trafton	CM	
Geoff Bares	VM	
Gustave Presser	CM	
Steve Rudy	CM	
Dragos Paraschiv	CM	
Ivan Thomas	CM	
Joseph Rendall	CM	
Keith Ponitz	CM	
Mohamed Alagraa	CM	
Som Shrestha	CM	
Gabriel Flechas	CM	
Sajith Wijesuriya	CM	

Preliminaries

- Meeting called to order at 3:33 PM by Chairperson, Chris Mincey.

- Housekeeping – keep mic on mute if not speaking. No need to provide email to Daniel on attendance.
- The TC 6.9 Purpose Statement and Code of Ethics Commitment was read by Chris Mincey.
- Voting Member Roll Call – 9/12 voting members were present: Farzin Rad, Richard Brooks, Chris Mincey, John Lau, Daniel Pyewell, Trent Hunt, Henry Becker, Scott Shaffer, and Geoff Bares. The following voting members were not present: John Nix, Ken Fulk (joined later), and Mark MacCracken.
- Based on a total of 9/12 voting members present, a quorum was determined.
- All guests were given the opportunity to introduce themselves.

Approval of Minutes

- Winter Virtual Meeting 2021. No comments were presented in the meeting. Geoff Bares made a motion to approve the minutes, seconded by Trent Hunt. 9 voting members approved, thus the minutes were approved unanimously.

Announcements by Chair – Chris Mincey

Section 6 Breakfast

- Not a whole lot to report. TAC so far approved (5) TC mergers, and a few more are in the works (this effort is on-going). Chris noted that no changes are planned to T.C. 6.9.
- Chris noted some subcommittee chair training coming up that may be worthwhile to attend.
- The strategic plan for ASHRAE is to extend for another year. The plan is to focus on building resilience and indoor air quality. Blake Ellis and Trent Hunt are on committee, and encourage everyone to reach out to them with any recommendations.
- Next meeting will be held in Las Vegas, and will be an in-person meeting. ASHRAE is planning for the Winter Conference meetings to be held from January 29th – Feb. 2nd, 2022.

Liaison Reports

- Section 6 head Dawen Lu – did not attend.
- Professional Development Group - John Nix – did not attend.
- Work Group 90.1 – The group is working on proposing a new energy credit for TES in an addendum. Daniel Pyewell advised that his recommendation on the use of % permissible heat loss instead of insulation R-value was dismissed. John Andrepont suggested that we write a letter to W.G. 90.1 indicating our T.C.s position and the recommendation on use of permissible heat leak.

Post meeting note: John Andrepont followed up with an email to Sean Smith (chair of W.G. 90.1) regarding the use of % permissible heat loss over time approach versus R-value, which was then acknowledged and supported by many TES experts

back to Sean. Sean submitted a change consistent with our recommendation for the Std. 90.1 addendum.

- 4.1 Load Calculations Data and Procedures – Guy Frankenfield continues to participate in this T.C., and indicates that the current focus is on weather data updates. Som Shrestha will find out an update from meeting that is planned for tomorrow (June 8th), and will send this update to Guy and copy Chris Mincey/Farzin Rad.

Standards – Blake Ellis

- ASHRAE Std. 150-2000 (RA 2019) – Method of Testing the Performance of Cool Storage Systems
 - a. Published in Orlando (Winter 2020).
 - b. A periodic maintenance recommendation form has been submitted. A new SPC will form once this is approved by SRS.
- AHRI 900-2014 (RA 2020) – Performance Rating of Thermal Storage Equipment Used for Cooling. Reaffirmed in 2020 with no changes. Standard is holding status quo. If any questions on the standard, please contact Sarp Hamamcioglu (Blake has his contact information).
- Proposed ASME TES-2-200X, Safety Standard for Thermal Energy Storage (TES) System Requirements for Solid State and other TES Systems. This is a safety-focused standard for thermal storage, particularly for high temperature phase change material TES systems. Nicole Gomez is the main contact for the standard (Blake has her contact information, if needed). Blake indicated that they will host a panel session on August 4th, 2021, if anyone is interested. Blake reiterated that this standard does not seem related to building TES systems.
- New standard on Test Standard for Phase Change Materials has been proposed by Navin Kumar. A form for the new standard proposal has been completed by Navin, and Blake has distributed this to the TC Voting members for review. Navin will be chair of the committee, and is looking for four volunteers to serve on the committee (two generals, and two producers). Chuck Dorgan indicated that he is willing to be on committee. Dre Helmns, Chuck Booten, and Katherine Avignon expressed interested in the previous T.C. meeting. Blake wants voting members to read the proposal, and then will request a vote via ballot (email).
- Standards Section 6 Liaison Report – Craig Wray did not attend

Programs – Richard Brooks

- **PAST PROGRAMS – Virtual/ Chicago IL – Winter 2021 (Seminar Virtual due to Covid-19)**
 - a. We submitted on 4 Seminars:
 1. Seminar-30899 - Smart Controls and Optimization for Thermal Storage Systems and Connected Communities
 - a. Chair-Paulo Tabares Velasco

2. Seminar-30929 - Thermal Storage for Grid-Friendly Refrigeration
 - a. Chair-Scott Hackel
3. Seminar-30939 - Techno-Economic Comparison of Energy Storage Technologies
 - a. Co-Sponsored by TC-7.5 Smart Building Systems
 - b. Chair -Kyle Gluesenkamp
4. Seminar-30975 - Integrating Renewable Energy into Residential and Commercial Air Conditioning with Thermal Energy Storage to Resolve Grid and Off-Grid Issues
 - a. Chair -Bruce Lindsay

b. The CEC committee chose **all** of our Seminar Topics:

1. Techno-Economic Comparison of Energy Storage Technologies
 - a. Seminar #11
 - b. Live from 6:00 – 7:50 PM (Tuesday, Feb 9th 2021)
2. Thermal Storage for Grid-Friendly Refrigeration
 - a. Seminar #12
 - b. Live from 7:00 – 8:50 AM (Wednesday, Feb 10th 2021)
3. Integrating Renewable Energy into Residential and Commercial Air Conditioning with Thermal Energy Storage to Resolve Grid and Off-Grid Issues
 - a. Seminar #64
4. Smart Controls and Optimization for Thermal Storage Systems and Connected Communities
 - a. Seminar #76

• **CURRENT PROGRAMS – Virtual/ Phoenix AZ 2021 (Seminar Virtual due to Covid-19)**

- a. We sponsored Seminar #76:
 1. What is Hot in Energy Storage? Integration and Effective Utilization of Thermal Energy Storage into the Built Environment
 - a. Chair is Spencer Dutton

- **FUTURE PROGRAMS – Las Vegas – Jan. 29th thru Feb 2nd, 2022 (Venue – Caesars Palace)**

a. In past meetings, it was suggested to consider the following seminar topics:

1. TES for refrigeration (case study with specific vendors)
2. TES with solar and renewables (look to cosponsor with TC-6.7)
3. Thermal vs. Battery Storage
4. Long term versus Short Term Storage
5. 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”.
6. ASHRAE 150: What is it and how to apply it

b. 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

c. Deadlines for the Winter Las Vegas NV 2022 Conference:

1. Monday, April 12, 2021: Conference Paper Abstracts, Technical Papers Due
2. Friday, April 30, 2021: Conference Paper Abstract Accept/Reject Notifications
3. Friday, June 18, 2021: Website Opens for Program Proposals
4. Monday, July 12, 2021: Conference Papers Due
5. Monday August 2, 2021: Debate, Panel, Seminar, Forum, Workshop, and Debate Proposals Due
6. Friday, August 6, 2021: Revised Conference Papers/ Final Technical Papers Due
7. Monday, August 23, 2021: Conference Paper Accept/ Revise/Reject Notifications

- **ACTION ITEMS for TC-6.9 Summer 2021 Virtual Meeting**

a. Proposed Seminars & Programs for Winter 2022 in Las Vegas

1. What are the topics?

2. Do we have any Co-sponsors?
3. Is TC-6.9 Co-Sponsoring any Seminars?
4. See Richard's Handout for Las Vegas Tracks
5. Trent Hunt asked if anyone has been involved in guideline 36 – group to develop best in-class control sequences. The intent of the guideline is to get standardized sequences. Chris doesn't believe we have any technical expertise to promote. To note, Steven Taylor is chair of guideline 36.
6. A new topic for future seminar Track #5 (best fit) was proposed with the Title of "Smart Controls and Resilient Optimization for Thermal Storage Systems and Connected Communities"
 - a. Amy has research students that are working on projects that would fit into Track 5. One project focuses on Controls and PCM system design (small scale system design integrated to water to air system).
 - b. Jason Woods – has been doing work on hybrid battery and thermal. The work covers how you can use TES systems, combining them with PV, electrical vehicle charging and batteries. This is more of a high-level commercial building net zero analysis.
 - c. Amy could present, as well as Jason (as students are graduating). Jason Woods volunteered to be chair for this. Aim to have at least 3 presenters. Jason's email address is as follows: Jason.wood@nrel.gov
 - d. Trent Hunt made a motion to approve this proposed seminar, which was seconded by Farzin Rad. Approved 8-0-0.
7. A new topic recommended by Guy Frankenfield was "All the advantages of TES". He elaborated that the topic could list all the various reasons why owners and engineers specify thermal energy storage. The general positives of TES:
 - a. Cost avoidance of not having to add refrigeration
 - b. Fixing imbalance in heating/ cooling
 - c. Utilizing waste heat
 - d. Increasing the capacity of a turbine generators
 - e. John Andrepont indicated it would replace item #5 (TES 101).
8. From chair breakfast, Chris mentioned ASHRAE's focus on building resilience (resilience of buildings) and indoor air quality.

Handbook – Scott Shaffer

- We are in the first of the 4 year cycle to revise Thermal Storage Ch. 50. The 2020 version was just issued, and the next edition will be published in 2024.
- Scott got access to the ASHRAE authoring portal, using Microsoft Edge.
- Scott attended a virtual handbook chair meeting on Friday, June 4th. Heather Kennedy indicated that 2020 handbook has not been converted yet. Therefore, Scott does not have an editable copy of the 2020 edition.
- Guy asks what volunteers there are for review of new topics/ revisions. The T.C. was unsure of any certain requirements on reviewers, so Scott followed up with Heather. She indicated that if adding to an existing section, it is up to the T.C.s discretion for determining the number of reviewers. Farzin indicated that previously, ASHRAE requested to have one lead author, and three reviewers, which John Andrepont thinks is logical to proceed with. Scott is soliciting reviewers for each of these 6 new topics. Chris Mincey, Farzin Rad, and Navin Kumar offered to volunteer as reviewers.
- Scott indicated that he is not aware of anything being written up on the 6 new topics, and suggested that the authors begin work, and submit their drafts to Scott and Chris Mincey once finished, so it may be passed around accordingly.
- John Andrepont suggested that Katherine D’Avign and John Molnar get in contact with each other and discuss topics #1 and #6, as they may be similar or one of the same.
- Summary of reviewers assigned, per topic, are as follows: For #1 passive thermal storage, Navin Kumar volunteered to review. Chris Mincey volunteered to review for #2 Heat Storage (Seasonal). Navin Kumar volunteered to also review #4 – PCM expansion.
- As noted in the last meeting, John Andrepont reminded to check all bibliography and references in the Chapter to ensure they are up to date.

Research –Paulo Cesar Tabares Velasco

- Paulo did not attend the meeting, so Chris reported in his absence.
- RTARs
 - a. Optimal Design and Control of Distributed Cool Thermal Energy Storage for the Interactive Grid.
 - i. Amy does not have any updates. The RTAR is not complete, and has not been submitted yet. This is probably further along than the other potential RTARs (6 months or so from submittal).
 - b. Phase-change Material Thermal Energy Storage for Light Commercial and Residential HVAC Applications.
 - i. To be led by Sandra Boetcher.
 - ii. This is still in process (no RTAR developed yet).

- c. Hot Water Heaters for Thermal Storage.
 - i. To be lead by Joe Rendall
 - ii. Spencer Dutton indicated that he is currently soliciting participants.
 - iii. This is still in process (no RTAR yet).
- New idea was proposed by Som Shrestha, for the need to develop a standard for developing metrics for calculating energy savings (source and site) from TES. This will focus on energy savings, and will not be cost related. This can look at primary energy savings and peak energy savings. A recommendation was made for going through Blake Ellis and John Dunlap to pursue. Som indicated that we would need an RP for someone to look at this in detail and develop.

John Andrepont also suggested comparing the round trip efficiency of TES to Battery storage. It was also mentioned to consider CO2 benefits when it is linked up with renewables.

Som indicated that he can help with this RTAR, but he does not have time to lead. The T.C. is thus currently looking for someone to lead this effort.

- Gustave Presser also recommended looking at energy storage from high temperature pressurized hot water, for purposes as storing for mechanical electrical generation.
- For an update on the CTIC Design Guide (primary author Dharam Punwani), John Andrepont indicated that he doesn't believe it has been published yet. He recalled a long delay in the guide approval, as they had to get original author releases on some of the graphs included in the guide.

Long Range Planning/Website – Chris Mincey/Daniel Pyewell

- Guy Frankenfield is continuing to sit in on meetings for ESIC (modeling software). The Der-vet software (Distributed Energy Resource Valuation Estimation Tool) has been released, which allows user to calculate cost and benefit of energy storage system, but it is just currently built around batteries. As the software progress, developers will add other storage technologies, which will include thermal energy storage. TC members interested in the software can find out more information on www.der-vet.com. Additionally, more information can be found at the following:

https://www.der-vet.com/files/EPRI_DER-VET_Overview.pdf
- Chris brought up the suggestion of modifying our current T.C. purpose statement, as it is somewhat outdated. Chris read the updated purpose statement that was agreed upon during the subcommittee discussion.
 - a. Keith Ponitz recommended that cooling come before heating. The statement was updated accordingly.
 - b. John Lau made a motion to approved, seconded by Geoff Bare. Unanimously approved, 9-0-0 (Ken Fulk, joining late, also approved).
- Chris indicated that TAC continues to merge TCs, but none of the mergers will affect T.C. 6.9.
- ASHRAE is finally planning a face-to-face meeting for Las Vegas in January 2022

- Farzin Rad will take over as chair after this meeting, and Daniel Pyewell will be taking over as vice chair. The T.C. is still looking for volunteers for webmaster and secretary.
- Voting members rolling off are Trent Hunt, Chris Mincey, Geoff Bares, and John Lau. Guy Frankenfield, Amy Van Asselt, Chuck Booten, and John Dunlap will be rolling on as voting members as of July 1st, 2021.

Honors and Awards – Blake Ellis

- Blake did not attend the meeting, so Chris reported in his absence.
- **Fellow ASHRAE**
 - a. Fellow ASHRAE is a membership grade that recognizes members who have attained distinction and made substantial contributions in HVAC&R and the built environment such as education, research, engineering design and consultation, publications, presentations, and mentoring. The Society elevated the following T.C. 6.9 members to the grade of Fellow:
 - i. Blake E. Ellis, P.E. (CM)
- **John F. James International Award**
 - a. Peter, Simmonds, Ph.D (CM), received the John F. James International Award. The award recognizes a member who has done the most to enhance the Society’s international presence. Simmonds works for Building and Systems Analytics, Los Angeles, CA and Hong Kong, China.
- **Distinguished Service Award**
 - a. 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 T.C. 6.9 members were recognized:
 - i. John S. Andrepont, Life Member ASHRAE, (CM)
 - ii. Trenton S Hunt (VM)
- **Crosby Field Award**
 - a. Peter Simmonds, Ph.D., Fellow Life Member ASHRAE (CM), is a recipient 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.
- **Other Awards Application Dates**
 - a. December 1 Due Dates
 - i. 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.

- ii. 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.
- iii. 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.
- iv. 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.
- v. 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.
- vi. 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.

b. May 1 Due Dates:

- i. Louise and Bill Holladay Distinguished Fellow Award: This award honors Fellows of the Society for continuing preeminence in engineering or research work.
- ii. 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.
- iii. 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.

- iv. *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.
- v. *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).

- Chris encouraged everyone to update their bio for award eligibility.
- Chris also requested that TC members think about anyone that they may nominate for the hightower award for service in technical activities, and get with Blake and Chris for nomination submittal.

Old Business

- None

New Business

- Amy Van Asselt announced that a book has been recently published, titled “Thermal Mechanical and Hybrid Chemical Energy Storage Systems”, which is sort of an ASME type utility-scale book. Amy and Doug Reindl developed a small section in the book on thermal energy storage.

Adjourn

- Motion to adjourn the meeting was made by Trent Hunt, seconded by Farzin Rad. All voting members approved the motion.
- Chris adjourned the meeting at 4:50 p.m.