

**ASHRAE TC 6.9 – Thermal Storage  
General Meeting Minutes  
Monday, January 31st, 2022  
5:00 – 6:30 PM PST  
Hybrid – Caesars Palace, Capri(P) and Zoom Meeting**

**Attendees**

Attendees included:

Alexander Zhivov	G	
John Nix	VM	
Brent Kovash	CM	
Donald Williams	CM	
Jacob Miller	PCM	
Casey Troxler	G	
Richard Brooks	VM	Program Subcommittee Chair
Jin Jin Huang	G	
Farzin M. Rad	VM	Chair
Celeste Fieberg	G	
Daniel Pyewell	VM	Vice Chair/ Secretary/ Webmaster
Galen Gerig	G	
Ken Fulk	VM	
Guy Frankenfield	VM	joined later, not included in quorum
Garret Hedberg	G	
Chris Mincey	CM	
Blake Ellis	CM	Standards Subcommittee Chair
Philip Hayes	PCM	
Amy Van Asselt	VM	
Navin Kumar	CM	Handbook Subcommittee Chair
Zhenning Li	PCM	
Kashif Nawaz	G	
Kristina Lundeen	G	
Patrick MacCormac	PCM	
Sarp Hamamcioglu	CM	
Kyle Gluesenkamp	CM	
Steve Rudy	G	
Bruce Lindsay	CM	
Donald Williams	G	
Joseph Rendall	CM	
Jason Woods	CM	
Sandra Boetcher	CM	

**Preliminaries**

- Meeting called to order at 5:03 PM by Chairperson, Farzin Rad.
- 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 Farzin Rad.
- Voting Member Roll Call – 7/12 voting members were present: Farzin Rad, Richard Brooks, Guy Frankenfield (joined later), John Dunlap, Amy Van Asselt, Daniel Pyewell, John Nix, and Ken Fulk. The following voting members were not present: Mark MacCracken, Henry Becker, Scott Shaffer, and Charles Booten. Guy Frankenfield joined later on in the meeting and was not counted for quorum.
- Based on a total of 7/12 voting members present, a quorum was determined.
- All guests were given the opportunity to introduce themselves.

### **Approval of Minutes**

- Summer Virtual - Blake Ellis made a motion to approve the minutes, seconded by John Nix. 7 voting members approved, thus the minutes were approved unanimously.

### **Announcements by Chair – Farzin Rad**

Section 6 Breakfast (Daniel Pyewell reported)

- TAC is no longer mentioning TC mergers, so effort has died. Daniel Pyewell confirmed this per discussion with the TAC Vice Chair.
- Newly formed Committee/ Groups were mentioned by Daniel Pyewell, including the following
  - a. Resilience MTG
  - b. ISI (International Standards Initiative) Task Force
  - c. TFBD – Task Force for Building Decarbonization
  - d. GAC – Government Affair Committee

Daniel encouraged anyone interested in participating to reach out to the newly formed groups

- Balance of stakeholders was also mentioned that is now required out of the M.O.P.

### **Liaison Reports**

- Section 6 head Dawen Lu – did not attend.
- Professional Development Group – reported by John Nix. This is a standing committee focused on training and education. John attended the recent meeting to get an overview. In Summary, E-learning is up, and it seems like everybody is doing it. Just this year, there was a doubling in participation with e-learning. There are lots of packages available that customers are buying now.

At this conference, 4 courses were offered, but unfortunately, 3 were cancelled. 435 people participated in the courses, versus a typical winter where around 1200 usually attend. So there appears to be a strong increase in self-directed learning, and an emphasis on developing courses in decarbonization. The Group received about 50% of normal income in past year (from in-house classes), but 25% is now from E-learning.

If anyone has anything to offer for training, please contact John to pursue further.

- Work Group 90.1 – The working group’s last meeting cancelled. Chuck indicated it is starting to focus on batteries instead of thermal storage.

Daniel mentioned the use of % permissible heat loss over time approach in lieu of insulation R-value was included in the energy storage addendum for efficiency, that was submitted for Public Review.

### **Standards – Blake Ellis**

- ASHRAE Std. 150-2000 (RA 2019) – Method of Testing the Performance of Cool Storage Systems
  - a. New SPC has been formed
  - b. Meeting scheduled for 1/29/2022 from 1pm – 3pm PST in Las Vegas. Meeting is likely to be held physically and virtually. Blake will be there to set it up.
    - i. Chuck is chair
    - ii. Blake indicated that they met on Saturday. He said there was a good percentage of voting members present, and felt the meeting went well.
- ASHRAE Std. SP 233P – Testing, Evaluating, and Reporting on Phase Change Materials Performance.
  - a. Purpose:
    - i. To provide a test method to evaluate the performance of Phase Change Materials (PCMs). This standard also provides a method of reporting the performance of different phase change materials in a standardized way based on laboratory testing.
  - b. Scope:
    - i. This standard covers the testing and evaluation of Phase Change Materials (PCM) thermal and life-cycle performance.
      - 1. Per Navin, 10°C to 100°C range, so solely building scale.
    - ii. This standard includes:
      - 1. Uniform method of testing
      - 2. Identification of testing equipment for performing such testing.
      - 3. Identification of data required and calculations to be used.
      - 4. Identification of reporting method to be used.
      - 5. Criteria for determining the life cycle performance.
      - 6. Definitions and Terminology

- iii. This standard does not cover thermal energy storage system-level evaluation.
  - c. Timeline:
    - i. Approved by the TC in August 2021
    - ii. Sent to PPIS in August 2021
    - iii. Proposed Standard authorized November 2021
  - d. Contact:
    - i. Navin Kumar, Chair  
[nkumar@gti.energy](mailto:nkumar@gti.energy)
- AHRI 900-2014 (RA 2020) – Performance Rating of Thermal Storage Equipment Used for Cooling.
  - a. ANSI approved in 2015. Reaffirmed in 2020.
  - b. No change since it was reaffirmed in 2020 with no changes.
  - c. Contact:
    - i. Sarp Hamamcioglu  
507 E. Craighill Channel Dr.  
Perryville, MD 21903  
Tel 667-228-9626  
[shamamcioglu@ahrinet.org](mailto:shamamcioglu@ahrinet.org)
- Proposed ASME TES-2-200X, Safety Standard for Thermal Energy Storage (TES) System Requirements for Solid State and other TES Systems.
  - a. Tentative Scope: Safety requirements for high temperature TES systems
  - b. Status: In development (according to Nicole)
  - c. Contact:
    - i. Nicole Gomez  
S&C Project Engineer, Safety Codes & Standards  
ASME  
2 Park Avenue, 6<sup>th</sup> Floor  
New York, NY 10016-5990  
Tel 1-202-591-870  
Fax 1-212-591-8501  
[gomezn@asme.org](mailto:gomezn@asme.org)

#### **Programs – Richard Brooks**

- **PAST PROGRAMS – Virtual/ Phoenix, AZ – Summer 2021 (Seminar Virtual due to Covid-19)**

- a. None of our proposed seminar topics were chosen by the selection committee (CEC). This is to be expected since we had such a successful program at the last Winter meeting in 2021 (4 were chosen).
- **CURRENT PROGRAMS – Las Vegas, NV 2022 – Jan. 29<sup>th</sup> thru Feb. 2<sup>nd</sup>, 2022, venue = Caesar’s Palace**
    - a. T.C. 6.9 has one seminar that was to be presented at this meeting.
      - i. Seminar 8 – The Solar Panel: Enabling Renewable’s Integration with Thermal Energy Storage Systems. 9:45 a.m. – 10:45 a.m. PST, Caesar’s Palace, (P), Neopolitan III/IV
      - ii. Unfortunately, flights were cancelled due to weather in the Northeast U.S. and the seminar was cancelled. It will be added to a future conference (see below).
        - 1. Chaired and presented by Amy Van Asselt, along with Celeste Fieberg (her student) also presenting
        - 2. about Residential PCM and control of water heaters
  - **FUTURE PROGRAMS – Toronto – June 25<sup>th</sup> thru June 29<sup>th</sup>, or Atlanta, Feb. 4<sup>th</sup> through Feb. 8<sup>th</sup>, 2023**
    - a. Five suggestions were discussed for Toronto:
      - i. Dr. Simone Mancin, from University of Padova-Italy, is available to give a seminar presentation on the topic “Optimization of Latent Thermal Energy Storage for Air Conditioning and Refrigeration.”
        - 1. This will be co-sponsored by T.C. 1.3 Heat Transfer and Fluid Flow
          - a. Program Chair for T.C. 1.3 is Pratik Deokar
        - 2. Motion to approve the seminar was made by John Nix, which was seconded by Blake Ellis. All voting members approved, with none against. Thus, the seminar is approved.
      - ii. Sandra Boetcher PhD from Embry-Riddle Aeronautical University in Daytona FL & Rag Manglik from University of Cincinnati would like to put together a panel of program managers from Department of Energy related to buildings and Thermal Energy Storage.
        - a. Sandra will chair
        - b. Embry-Riddle has several Ice Storage TES systems on campus.
    - 2. Motion to approve the panel was made by Richard Brooks, and seconded by Blake Ellis. All voting members approved, with none against. Thus, the seminar is approved.

- iii. Mark McCracken – seminar based on article, July 2020 ASHRAE Journal, grid interaction with heat pumps and thermal storage – applied for heating and cooling. “Electrification, Heat Pumps, and Thermal Energy Storage”
  - a. For dense urban environment buildings (electrification)
    - i. Can easily store the energy with heat pumps when there is not enough waste heat
    - ii. Co-sponsored by 8.1 and 8.2
  - 2. Motion to approve the seminar was made by Blake Ellis, and seconded by John Nix. All voting members approved, with none against. The Seminar was thus approved.
- iv. Paulo suggested a seminar for battery storage along with thermal energy storage
  - a. Jason Wood, Mark McCracken, and Chuck Booten will be presenters.
    - i. Paulo Tabares will chair the presentation
  - 2. Motion was made by Blake Ellis to approve the seminar, which was seconded by Ken Fulk. All voting members approved the seminar, with none against. The seminar was thus approved.
- v. Redo of Amy’s seminar that was cancelled: Seminar 8 - The Solar Panel: Enabling Renewable’s Integration with Thermal Energy Storage Systems
  - 1. Motion to approve the seminar was made by Blake Ellis, which was seconded by Daniel Pyewell. All voting members approved, with none against. The seminar was thus approved.

**b. Deadlines for the Annual Toronto 2022 Conference:**

- 1. Thursday, February 17, 2022: Extended Abstract Paper Due
- 2. Thursday, February 17, 2022: Program (Seminar, Forum, Workshop, Debate, and Panel) Proposals Due
- 3. Friday, February 18, 2022: Conference and Technical Paper Final Accept/ Reject Notifications
- 4. Friday, March 18, 2022: Extended Abstracts Accept/ Reject Notifications
- 5. Friday, April 1, 2022: Debate, Panel, Seminar, Forum, Workshop Accept/ Reject Notifications

## **Handbook – Navin Kumar**

- Navin Kumar offered to become handbook chair in our subcommittee meeting. A motion was made by John Nix to approve Navin as the new chair, seconded by Daniel Pyewell. The motion was unanimously approved.
- Farzin will give updates to Navin to get him up to speed so he can properly report during the Summer Meeting.

## **Research –Paulo Cesar Tabares Velasco (did not attend) - Daniel Pyewell reported from Subcommittee Mtg. notes**

- No current projects and work statements
- RTARs
  - a. Identifying synergies between behind-the-meter battery and thermal energy storage
    - i. Led by Jason Wood, with support by Paulo Tabares.
  - b. Phase-change Material Thermal Energy Storage for Light Commercial and Residential HVAC Applications.
    - i. Still trying to figure out the right scope
    - ii. To be led by Sandra Boetcher, with support by Spencer Dutton, Kyle Gluesenkamp, and Paulo Tabares.
    - iii. This is still in process (no RTAR developed yet).
    - iv. Sandra indicated in the main meeting that this initiative has stalled.
  - c. Hot Water Storage. Why not adapted more?
    - i. Still need to define scope.
    - ii. To be lead by Joe Rendall. Looking for collaborators.
      - Why not more wide spread usage?
      - Amy working on something similar, and suggests being a partner. Armada power – aggregate and control hot water heaters.
    - iii. Spencer Dutton indicated that he is currently soliciting participants.
    - iv. This is still in process (no RTAR yet).

## **Long Range Planning/Website – Farzin Rad/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](http://www.der-vet.com). Additionally, more information can be found at the following:

[https://www.der-vet.com/files/EPRI\\_DER-VET\\_Overview.pdf](https://www.der-vet.com/files/EPRI_DER-VET_Overview.pdf)

Guy mentioned that they are working on including emissions, and promise to include thermal energy. Guy continues to sit in on meetings to ensure that this happens.

- Guy mentioned the Build-Back-Better legislation which has stalled in Congress. Originally, this included a climate component with renewable energy generation and energy storage. Guy indicated that something happened during the re-writing of the bill and prevented thermal energy storage from being included.
  - a. Guy indicated that an ad-hoc group has gotten together and hired lobbyists to help correct legislation in the Build-Back-Better Bill to include thermal storage. He said that they were making headway, just as the bill fell apart.
  - b. Guy believes that the climate component of the bill is something that both sides of aisle (both Democrats and Republicans) want to have happen, and know it's going to be part of the effort in the next couple months. He indicated that it will be very important over the next 3-4 months to be engaged with Congress to ensure thermal storage will be included. Guy would like to solicit others (to make a coordinated TES coalition to hire lobbyists). If interested, please reach out to Guy. The more that are involved, the more economical to financially support for all parties.
  - c. John Nix mentioned for Guy to reach out to Global Climate Change Committee (2.5) for support on this.
  - d. Daniel Pyewell also mentioned to reach out to the newly formed Government Affair Committee that was mentioned by T.A.C. Blake will provide Guy with a contact for this.
- Alexander with the Corps. of Engineers for Research and Development (and chair of 7.6 Building Energy Performance) mentioned that he has been busy establishing a program for energy master planning with resiliency. He indicated that they developed 60 architectures for heating and cooling systems, which include thermal storage. He said the Army has been tasked to look at long term thermal storage.

He is currently partnering with NREL for this work, and collecting data for long term and mid term storage, and is asking T.C. 6.9 about our opinion on cost that is included in the data. Generally, he is trying to adjust European pricing to U.S. pricing. He would like an opinion on the accuracy of modeling, and for application of thermal storage (combination with CHP, solar water heating, and waste heat from chillers), and would like to hear about any other significant components where it could be used. They will provide load profile, and need someone in our T.C. to do a peer review. He is offering a partnership, as well as a project that can be presented within ASHRAE.

- a. Daniel Pyewell, John Nix, Philip Hayes, Brent Kovash, volunteered to form a subcommittee for support. Alexander left his card, and wants us to reach out with our interest. The timeline for this work is this calendar year, and Alexander is happy to send out his current write-up.

- b. Post meeting note: Daniel Pyewell reached out to Alexander on 2/2/22 with copying John, Philip, and Brent, to pursue further correspondence on this.

### **Honors and Awards – Blake Ellis**

- No awards given this meeting to any T.C. members
- Blake reminded everyone that an updated ASHRAE bio is important as it is reviewed with any award submission. Blake encouraged everyone to keep their bios updated.
- **Hightower Award**
  - a. Given to people about their service for the last four years on technical activities.
  - b. TC chair and members of TAC & Tech Council are not eligible
  - c. TC chair submits the form to the TC section head by September 1
- **Other Awards Application Dates**
  - a. 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). Can self-nominate.
  - b. 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.

### **Old Business**

- None

### **New Business**

- Daniel spoke about balance of T.C. stakeholders in the TC breakfast meeting. Farzin to review and reach out to voting members if he has any questions per his assessment.

- Next meeting will be in Toronto. Farzin indicated that he will be physically attending that meeting.
- John Nix wants the T.C. to think about the emphasis on e-learning. John suggested that maybe we can take our course and put it into some self-directed learning course. It could also be helpful to look at including with renewables and decarbonization efforts. John will talk with training and education to see if they are interested in our T.C. putting something together.

### **Adjourn**

- Farzin adjourned the meeting at 6:28 p.m.