

ASHRAE TC 6.9 – Thermal Storage
Main Committee Meeting Minutes
Monday, June 24, 2024
4:00 PM – 6:00 PM EDT
Indianapolis IN

Attendees

Attendees in person and online:

1. Aaron Farha
2. Achutha Tamraparni
3. Aggrey Mwesigye
4. Amy Van Asselt
5. Andrew Fix
6. Anna Bell
7. Arun Cherian
8. Brent Kovash
9. Bruce Lindsay
10. Casey Troxler
11. Cheng Wee Leong
12. Chuck Booten
13. Chuck Dorgan
14. Daniel Pyewell
15. Doug Ames
16. Dragos Paraschiv
17. Dre Helmns
18. Elizabeth Gell
19. Eric Kozubal
20. Eric Newberg
21. Farzin Rad
22. Geoff Bares
23. Getu Hailu
24. Henry Becker
25. Ian LaHiff
26. Ivan Serrano
27. Ivan Thomas
28. James Larson
29. Jared Williams
30. Jason Woods
31. Jeff Seewald
32. Joe Rendall
33. John Andrepont
34. John Dunlap
35. John Steinbergs
36. Jonathan Alo
37. Jonathan Woolley
38. Josh Eckert
39. Ken Fulk
40. Kyle Gluesenkamp

41. Lei Gao
42. Larry Markel
43. Mark MacCracken
44. Mark Schaefer
45. Michael Huylo
46. Mike Filler
47. Min Che
48. Navin Kumar
49. Nehemiah Emaikwu
50. Payam Delgoshaei
51. Peter J. Oleske
52. Petros Dalavouras
53. Pinjala Sai Sudhir
54. Rick Clemenzi
55. Richard Brooks
56. Sandra Boetcher
57. Sarath Kannan
58. Sean Smith
59. Scott Delo
60. Som Shrestha
61. Spencer Marmac
62. Stan Nabozny
63. Thomas Yeh
64. Tod Green
65. Troy Cummings
66. Vaughn Engler
67. William Davies
68. Xiaoli Liu
69. Yeonjin Bae
70. Yiyuan Qiao
71. Zhenglai Shen

Preliminaries

- i. Meeting called to order at 4:02PM by Chair Daniel Pyewell
- ii. Reading of TPS and Ethics statement
- iii. Introductions around the room

Establishment of Quorum

Voting members present:

- Daniel
- Amy
- Chuck
- Kyle
- Mike
- Ken

We have a quorum with 6 out of 8 VM. Note: Emishaw later joined virtually.

Approval of prior Chicago minutes.

- Need to vote in Orlando when the prior minutes are finalized

Daniel updates from TAC

- Online rostering updates
- New committee, Center of Excellence on Building Decarbonization
 - o Special Projects reported that they are looking to establish design guides (practical tools)
- RTARs and WSs will transition to fully online this fall

Training and education Liaison report (John Nix)

No update.

90.1 Liaison report (Amy)

90.1 is working on adding more on TES to 90.1 in 2025. The energy credit section is being reconfigured, reconsidering the 60% limit for TES. Forum was held yesterday with about 25 people to get feedback on how to implement TES in 90.1.

Bruce Lindsay notes that Sean was at the 90.1 discussion, notes that 90.1 has been focused on energy efficiency and not shifting load. Load shifting is being recognized more, including federally. 90.1 needs to consider how to incorporate life cycle costing and load shifting.

Mark MacCracken notes that 90.1 could treat TES like a battery, rather than like an air conditioner. Suggests to acknowledge the criticality of storage.

Suggestion was made to engage with mechanical subcommittee of 90.1 and get on their agenda.

Update on IDEA – International District Energy Agency – John Andrepont

- Upcoming IDEA conferences:

Upcoming IDEA conferences include:

- 38th Annual Campus Energy Conference, Workshops & Trade Show
February 3-6, 2025 – Boston, Massachusetts
- 116th Annual Conference, Workshops & Trade Show
June 2-5, 2025 – Minneapolis, Minnesota
- 39th Annual Campus Energy Conference, Workshops & Trade Show
February, 2026 – near Washington, DC
- 117th Annual Conference, Workshops & Trade Show
June, 2026 – Ottawa, Canada

LEED v5 – Ian LaHiff

- Some new credits – a decarb credit includes “Reduce Peak Thermal Load” credit

DECARBONIZATION

Ultra-Low Carbon Operations	Embodied Carbon	Existing Buildings
 IP Prerequisite: Carbon Assessment	 MR Prerequisite: Assess Embodied Carbon / Credit: Reduce Embodied Carbon	 IP Prerequisite: Operations Assessment: Climate Action
 EA Prerequisite: Operational Carbon Projection and Decarbonization Plan	 MR Credit: Building and Materials Reuse	 EA Credit: Decarbonization and Efficiency Plans
 EA Credits: Electrification, Reduce Peak Thermal Loads, Enhanced Energy Efficiency, Renewable Energy	 MR Credit: Optimized Building Products	 EA Credit: GHG Emissions Reductions
	 MR Credit: Construction & Demolition Waste Diversion	 EA Credit: Energy Performance and Commissioning

Providing some prescriptive options for smaller teams that do not have capability for modeling-based approach

NEW LEED v5 BD+C and ID+C EA Credits

Electrification (5 plus 3)

- Designed for no onsite combustion > 20 F
 - Credits system-by-system
- Additional credit for no combustion
- 3 regional credits for cold climates

Reduce Peak Thermal Loads (5)

- Enhanced envelope and ventilation
 - Tighter envelopes
 - Ventilation heat recovery
 - Reduced thermal bridging
 - Reduced thermal peaks

LEED v5 currently open for public comment

Standards – John Dunlap

- 4:37 John Dunlap
- SPC 150-2000
 - a. Effort to add latent storage to 150
 - b. Is currently out for public review.
- SPC 233P
 - a. To evaluate phase change material
 - b. Just set monthly interim meetings
- ASME TES-2
 - a. Second edition of TES-1 was published in Dec 2023.
 - b. Committee meets quarterly.
- AHRI 900-2014 – no change since reaffirmed 2020. AHRI looking for members.
 - a. No update.
- Proposed new standards:
 - a. Measuring non-binary TES – 94.2 – Paul Steffes made request to reinstate 94.1, 2, and 3.
 - b. This standard has become important in light of 2045.x tax credits.
 - c. Brent Kovash notes they are still waiting to hear back from Treasury if the verbiage of 94.2 might be used in the tax incentive.
 - d. Current status is the standard was withdrawn
 - e. To start a new committee, would need chair and at least 5 members.
 - f. Reinstatement of the standard would require formation of a committee, and sending standard for public review
 - g. Brent Kovash volunteered to become chair of the effort

Programs – Bruce Lindsay

- 4:48
- Very successful record of programs from last few meetings:
 - a. Atlanta
 - i. 7 sessions on TES
 - ii. Had the three most-attended sessions in Atlanta
 - b. Tampa
 - i. 3 sessions on TES
 - ii. Session attendance was not ranked in Tampa
 - c. Chicago
 - i. 3 sessions on TES
 - ii. Had the most attended session in Chicago
 - iii. Tour of Centrio plant
 - d. Indianapolis
 - i. 1 Forum
 - ii. 2 Seminars

Programs for ASHRAE Indianapolis

Bruce Lindsay, Trane Technologies

Forum 1, Sunday, June 23, 11:00-12:30

Integrating Thermal Storage and 40% Tax Credits into ASHRAE Standard 90.1

- Amy Van Asselt, Lafayette College, Chair

Seminar, Tuesday, June 25, 8:00-9:30

DOE Student Competition for Jump into STEM Challenge: Three Winning Projects for Thermal Storage

- Bruce Lindsay, Trane Technologies, Chair (replace with Yeonjin Bao, ORNL, and Kim Trenbath, NREL)
- Rebehak Shields, Worcester Polytechnic Institute, “Kiln Thermal Energy Storage”
- Andreas Josef Hoess, Purdue University, “Reducing Barriers to Achieve an Energy Efficient Lifestyle for Low Income Families in the US”

Seminar 41, Tuesday, June 25, 3:15-4:45

Changing World for Electric and Thermal Batteries

- Mike Filler, Trane Technologies, Chair
- Jason Woods, NREL, “Hybrid Batteries for Buildings: Electric and Thermal” I
- Stan Nabonzy, Michaels Energy, “Revolutionizing the Cold Chain, Leveraging PCM for Electrification in Chilled Trucking and Refrigerated Warehouses”
- Bruce Lindsay, Trane Technologies, “Survey of Utility Incentives and Promotional Rates for Thermal Batteries”

- Report out on Program Subcommittee meeting held virtually recently:

Program Subcommittee
2025 ASHRAE Orlando Programs

- Student Session
 - History of Thermal Storage at Embry Riddle Aeronautical University—Ice, Ice, Water. Student Project—Jacob/Valerie
 - History of Thermal Storage at Brevard County, Florida--Schools, County, Port, and City, Student Project—Alex
 - UCF Chilled Water Storage, Student Project I
- Thermal Storage Updates
 - LEED v5.0 and Thermal Storage—Ian LaHill, USGBC (agreed to present)
 - Resiliency of Energy Storage Systems—Alex Zhivov
 - Utility Perspective of Thermal Storage since 1990—Chi Lui, FPL
 - Analysis Tools for Ice Storage Systems for Both Cooling and Heating—Scott Delo, Trane
- Local TES projects—Applying for Section 48 Tax Credits
 - Ice Storage in Police HQ—Lock'em Up in the Cooler!—Chase, TLC
 - Chilled Water Storage System for Orange County Convention Center—OUC (student tour)
- Special Session--ALL:
 - Inflation Reduction Act—Overview, Tax Credits in Section 48, Tax Deductions for Energy Efficiency Design Team in Section 179D, and Accelerated Depreciation, MARS. Jacob Goldman and Mike Filler. (cosponsor with TC6.7, TC6.8, TC7.3, and TC9.7)
- First-pass economic tool for ice storage, now working to expand to heating mode
- Some placeholders in place for Phoenix. Send an email to Bruce if interest to contribute to Program in Phoenix.
- Geoff Bares notes that TC 6.2 is working on a Program submission related, could co-sponsor this with 6.9

- Motion was made and seconded, to co-sponsor the session with 6.2, **approved 8-0-0-0 CV**
- Motion was made and seconded, to submit the proposed program sessions for Orlando, **approved 6-0-0-0 CV**

2025 ASHRAE Phoenix Programs

- Update on SSHP in LaCrosse—delay until 2026, need winter operations data
- Conversion of Ice Storage Tanks for Heating Operation in New York City—JBB
- Update on TES Research Outside US—Canada, Germany, NRC Canada
- Arizona State TES System
- US Electric Utility Demonstration Projects on BTM Energy Storage—DTE, NYSERDA,
- Thermal Storage for Data Centers
- Update to Canada Tax Credits and Rebate Programs
- US Update on Rebates and DR

2026 Las Vegas Programs

- Real Time Pricing and Dispatchable TES Using Artificial Intelligence
- John Andrepont notes that IDEA was held in Orlando recently, gave technical tours etc.

Handbook – Navin

- 5:05 PM
- Latest handbook edition was reaffirmed without any changes made.
- Next update will be in next cycle. More updates coming in Winter Orlando.
- Daniel notes we will need to recruit reviewers, and Betsy from TC 6.2 can help support effort
- Navin will check with Handbook committee on whether tax information can be included
- Betsy notes there are some actual financial numbers in Chapter 12 (District Energy) in 2024 Handbook
- John Andrepont and John Nix note that general qualitative information has been included in past in handbook
- Bruce notes that federal tax credits with 10 year horizon will be more stable than specific utility rates and rebates
- Chuck suggests an approach could be “if an incentive were structured as xyz, here’s guidance on how it could be analyzed.”

Liaison – training and climate change – John Nix

- Updates expected in Orlando

Research – Paulo (covered today by Jason Woods)

- 5:14 PM
- Subcommittee meeting discussed previous RTARs. Scrapped them for now.
- Some newer ideas discussed:
 - a. Mike Filler, quantifying carbon savings from TES, how to simplify the analysis so practicing engineers have a method to follow.
 - i. Mike Filler agreed to chair effort, with John Dunlap and Ken Fulk offering to support
- Open call for other new ideas from the committee
 - a. PTAR is another possibility for Alexander's paper on Applicability of Large Thermal Energy Storage Guidelines
 - i. Post meeting note: Chair Pyewell to take vote with TC voting members on approval to support development of PTAR for this report
- Casey notes that TC 8.11 subcommittee expressed a desire for a standard on how TES could be integrated with heat pumps

Long Range Planning / Website

- Stan Nabozny has volunteered to become Webmaster. Chair Pyewell will get him set up and engaged prior to Winter Meeting in Orlando.
- We've added 22 new PCMs since the last meeting
- Ken Fulk will roll off, Geoff Bares will roll on as VMs, keeping us at 8 voting members

Honors and Awards – Blake Ellis

- Several awards
 - o Standards achievement, Bill Bahnfleth
 - o STBE best paper award, Parveen Dhillon
 - o Katherine D'Avignon, poster presentation
 - o Dennis Alejandro, DSA
 - o Doug Reindl, ESA
- Updated ASHRAE bio is essential
- Hightower award – given for last 4 years of TC activity, due by Sept 1. Form is submitted by TC chair.
- Most other awards are due one of the two dates:
 - o **May 1** due date for some awards, including DSA and ESA
 - o **Dec 1** due date for some awards, including Fellow nominations

Old business

- Will follow up with Alexander on how to publish his report after meeting
- Brief status update about Stor4Build energy storage consortium

New business

- New MTG on decarbonization – hasn't been submitted yet – Bruce volunteered to help coordinate with them
- John Andrepont notes that coupling district energy with ground heat exchange, and hot and cold thermal storage. Princeton notes they reduced from 3100 to 2100 the number of required boreholes by coupling with storage, saving 25 million dollars.
- Bruce notes that thermal storage investment tax credits in Canada have been enacted. 30% tax credit for technologies including thermal storage, ground source HPs, solar, wind.

Meeting adjourned at 5:30 PM