Meeting Minutes

TC 7.6 Building Energy Performance
Research Subcommittee – Hybrid

Sunday June 22, 2025, 1:00 PM–2:00 PM (MST)
Location/Room: Hyatt Regency Phoenix, Sundance (Level 1)
Virtual Meeting Link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_YWViODVlMmUtZDAzZC00MmM0LWJhNGEtYzQyMzFhNDIyZWU3%40thread.v2/0?context=%7b%22Tid%22%3a%22f5222e6c-5fc6-48eb-8f03-73db18203b63%22%2c%22Oid%22%3a%22295c4c24-9ba7-4aa3-a639-ca8640cc6084%22%7d

TC 7.6 is concerned with the estimation, measurement, analysis, benchmarking, and management of whole building and building systems energy and water performance.

1. Sign-in / Introduction: Link
   - ASHRAE Research Process: Flowchart
   - 15 Attendees

	First Name	Last Name	Affiliation	Email	TC 7.6 Membership
1	Hyojin	Kim	NJIT	hyojin.kim@njit.edu	Voting Member (VM)
2	Nicholas	Long	NREL	nicholas.long@nrel.gov	Corresponding Member (CM)
3	Chris	Balbach	PSD	cbalbach89@gmail.com	Guest
4	Amanda	Webb	University of Cincinnati	amanda.webb@uc.edu	Voting Member (VM)
5	Steven	Carlson	XRG Analysis	carlson@xrganalytics.com	Voting Member (VM)
6	Adam	Hinge	Sustainable Energy Partnerships	hingea@aol.com	Corresponding Member (CM)
7	Jeff haberl	haberl	Texas a&m	jhaberl@tamu.edu	Guest
8	ANTON	Szilasi	Performance systems development	ajszilasi@gmail.com	Guest
9	Yunyang	Ye	Colorado School of Mines	yunyangye922@gmail.com	Corresponding Member (CM)
10	Marshall	Duer-Balkind	IMT	marshall@imt.org	Provisional Corresponding Member (PCM)
11	Ali	SalimShirazi	ATI Group	ali.salim.sh@gmail.com	Corresponding Member (CM)
12	James	Frey	2050 Partners	jamesfrey@2050partners.com	Guest
13	Craig	Simmons	NREL	craig.simmons@nrel.gov	Guest
14	Kajen	Ethirveerasingham	Enerlife Consulting	kajen777@gmail.com	Corresponding Member (CM)
15	Gaurav	Soni	RWE Clean Energy	gauravsonish@gmail.com	Provisional Corresponding Member (PCM)

2. Recently-Completed Projects: The abstracts of the Final Reports are available at the end of the minutes.
   - 1836-RP Developing a Standardized Categorization System for Energy Efficiency Measures (Final report published on February 2022; Revised on February 2023)
   - 1814-RP Actual Energy Performance of Secondary Schools Designed to Comply with ASHRAE Standard 90.1-2010 (Final report published on January 2023)
   - 1815-RP Integrating Occupant Behavior Data with Building Information Modeling for Performance Simulation (Final report published on October 2024)

3. Status of Current Research Projects

No	Project	Contributors	Status
1	1988-SP Whole-Life Carbon Gap Analysis	Samir Traboulsi (RC) CEBD (Co-Sponsor) TC 2.8; TC 4.4; TC 4.7; TC 6.7; and TC 7.6	(2025 Annual) Proposal due July 18.

4. WS and RTAR In-Progress

No	Project	Contributors	Status
1	1861-WS Thermal Comfort in U.S. and Canadian Residences: Indoor Conditions, Occupant Behavior	Hyojin Kim (RC) TC 2.1 (Co-Sponsor) TC 7.6	(2020 Winter) WS submitted to the subcommittee basecamp. Ready for review. Due by Feb. 16. (2021 Winter) The team received feedback from RAC. There were concerns with data collection and a large scope proposed. Feedback from TC 2.1 includes to remove the field work and consider a meta-

	and Energy Consumption		analysis instead. The team agreed to work on the revision in summer 2021. (**2021 Annual**) The team plans to work on the revision this summer. (**2022 Winter**) The team still works on the revision of this WS. (**2022 Annual, after meeting**) The team met and agreed to re-scope this WS and aim to complete it by the end of August. (**2023 Winter**) Still working on WS revision. (**2023 Annual/2024 Winter/2024 Annual/2025 Winter/**2025 Annual) On hold until the release of G45P in 2024. G45P is under APR.
2	1972-WS Data Center Direct-to-Chip Liquid Cooling Resiliency - Failure Modes and IT Throttling Impacts; Liquid Cooling Energy Use Metrics and Modeling	Eric Yang (RC) TC 9.9 (Co-Sponsor) TC 7.6	(2024 Annual) RTAR approved. (**2025 Winter**) WS submitted on 8/15/2024; revised/resubmitted on 12/15/2024. **(2025 Annual)** WS is fully approved; RFP expected to be issued soon.
3	1822-RTAR Supplemental Normalization Parameters for Alternate/Enhanced Expression of Energy Performance	Dennis Landsberg, Jeff Haberl (RC) TC 7.6 (Co-Sponsor) SSPC 100	(**2020 Annual**) WS in progress; to be completed before the next conference. (**2021 Winter, from Basecamp**) WS draft is ready but needs polishing; to be completed after the winter conference. (**2021 Annual, by email**) Dennis is still working on the WS draft. (**2022 Winter**) Dennis plans to complete this WS after G14 is done. (**2022 Annual**) G14 is near completion, and Dennis plans to complete this WS soon. Scott West is interested in this topic and volunteers to help out to address RAC comments. (**2023 Winter**) Jeff Haberl said that this idea by Dennis came from work by the NAS/TRB on airport terminal buildings where EUIs don't describe the buildings. Jeff will help this effort. (**2023 Annual**) No progress. Jeff to collaborate with Soolyeon Cho and Juan-Carlos Baltazar on this WS. (**2024 Winter**) Dennis plans to complete WS after the ASHRAE meeting. Will ask SSPC 100 for a couple of reviewers and aim for the RAC meeting in April. (**2024 Annual**) Dennis plans to circulate his WS draft once it is done. He needs 2 more potential bidders. (**2025 Winter**) Dennis plans to reactivate/complete WS. He looks for 2 more potential bidders. **(2025 Annual)** No progress to report. Dennis still plans to complete WS.
4	New Idea Do buildings designed to 90.1 / 189.1 comply with Standard 100?	Scott West, Joseph Firrantello, Dennis Landsberg	(**2020 Annual**) Scott West to obtain the input from ASHRAE 189.1 and Joe F. to obtain the input from ASHRAE 100. (**2021 Winter**) No updates. (**2021 Annual, from Basecamp**) SSPC 189.1 is still interested in this. They are looking at an outcome-based energy performance option. However, it is not clear how 189.1 energy performance compares to Standard 100 performance levels. (**2022 Winter**) Still interested in this idea. Not many buildings complying with 189.1. Scott will check RP-1771. (**2022 Annual**) Scott said it is hard to find good empirical data collected from buildings complying with 189.1. Amanda suggested to

			redirect this study to compare modeled vs. measured energy use of buildings complying with different versions of 90.1. Dennis volunteered to help this effort. (**2023 Winter**) Amanda said benchmarking data might be one way to move forward for this RTAR. A lot of information needs to be collected at the time a building is built. Scott will check the final report of 1814-RP. Hyojin said how to find good data can be a part of this project. (**2023 Annual**) Scott presented first draft RTAR (Background and Research Need), pending completion of Objectives and Expected Approach. Will focus on 90.1. Amanda and Nicholas will review the completed RTAR. (**2024 Winter**) Scott has narrowed down the scope to 90.1 (excluding 189.1) and intends to complete the RTAR draft by the 2024 Annual Conference. Amanda will connect Scott with a researcher at PNNL. (**2024 Annual**) Amanda agreed to follow up with Scott to schedule a working session. (**2025 Winter**) No progress, but the topic remains relevant. He will continue working on the RTAR draft. **(2025 Annual)** Hyojin will connect the team with Marshall, who has shared relevant work in this area. Scott will continue working on the RTAR draft, aiming for the August deadline.
5	New Idea follow-up project of 1836-RP	Amanda Webb	(**2022 Annual**) Amanda Webb agreed to work on a new RTAR as a follow up project of 1836-RP to create a large database/dataset using the developed EEM classification system. (**2023 Winter**) Nicholas Long said there is an effort that is happening in Washington DC about standard ECMs. He agreed to help with the follow-on RTAR. (**2023 Annual**) Some ideas, but no substantial progress. Still plan to pursue. Amanda to discuss 1836 outcomes with Std 211/100. (**2024 Winter**) Amanda has no time to pursue this. Nicholas agreed to host a meeting after the conference to brainstorm ideas. (**2024 Annual**) Amanda agreed to follow up with Nicholas to schedule a working session. (**2025 Winter**) Amanda/Nicholas will draft a RTAR. **(2025 Annual)** No progress to report.
6	New Idea Building trending data schema/management	Gregory Cmar, Eric Yang	(**2023 Winter**) A rough draft was posted on Basecamp. Idea is to use bar codes to help define the global database, including site keys, equipment keys, point keys, etc. Eric said this RTAR is geared toward a process using bar code and then map the point automatically. TC 7.3 is in favor of cosponsoring this. There's a presentation on this topic – Seminar 44 at Atlanta. The committee agreed that this is an issue, but RTAR still needs some work to define this project (e.g., who owns the data, identify vendors). Jeff suggested one way to proceed would be to have an RTAR that defines the different methods available in the industry and puts them into a common framework for evaluating how to proceed: e.g., an Annotated Bibliography. (**2023 Annual**) Plan to have the first draft at the 2024 Chicago meeting. (**2024 Winter**) The team decided to not to proceed with it. This item will be delisted.

			(**2024 Annual**) Potential co-sponsorship from TC 1.4/Standard 223P, Semantic Data Model for Analytics and Automation Applications in Buildings). Eric/Greg/Jeff plan to revise/present RTAR. (**2025 Winter/2025 Annual**) No report.
7	New Idea from Monitoring and Energy Performance Subcommittee "Building Energy or GHG Performance Trends in Jurisdictions with Building Performance Standards in Place."	Adam Hinge, Amanda Webb	(**2024 Annual**) Meta-study using a large building performance/benchmarking database (e.g., NY city annual report by Urban Green Council): changes over the past 10 years, machine learning efforts, how-to-do analysis, and setting targets. Adam and Amanda will continuously brainstorm this idea. (**2025 Winter**) Adam/Amanda will continue with this topic. More discussions in the Monitoring and Energy Performance SC. **(2025 Annual)** Draft Adam plans to organize a program around this topic in Las Vegas.

5. PTAR In-Progress
   - None

6. New Ideas / Topics / Business
   - Long-term M&V for multi-year retrofit projects, focusing on cost-effective methodologies.
   - Development of an annotated bibliography covering M&V methods and their evolution over the past 40 years.
   - Research on instrumentation, addressing calibration, costs, and accuracy requirements.

7. Adjourn 1:53 PM MST

Appendix A: Final Report Abstracts of Recently-Completed Projects

- 1836-RP Developing a Standardized Categorization System for Energy Efficiency Measures (Final report published on February 2022; Revised on February 2023)
    - This report describes the development of a standardized system for categorizing and characterizing energy efficiency measures (EEMs). EEMs are the fundamental mechanism for improving energy performance in buildings. As a result, they play a central role in building energy modeling, energy auditing, and energy data collection and exchange. An EEM is defined as "an action taken in the operation or equipment in a building that reduces energy use of the building while maintaining or enhancing the building's safety, comfort, and functionality" [1]. This broad definition underscores the foundational nature of EEMs and highlights the wide-ranging set of possible actions that may be considered an EEM.
- 1814-RP Actual Energy Performance of Secondary Schools Designed to Comply with ASHRAE Standard 90.1-2010 (Final report published on January 2023)
    - The objectives of the ASHRAE 1814 research project are: 1) compare national averages of the actual annual Energy Cost Indices (ECI) from the analysis of utility bills for secondary schools designed and built to comply with Standard 90.1-2004 and 2010 (or equivalent); 2) determine the factors common to relatively well-performing buildings, as well as the factors common to relatively poorly-performing buildings, based on building surveys and site visits to a sample of school buildings comply with Standard 90.1-2010 (or equivalent); 3) provide recommendations for making future versions of Standard 90.1 more effective in achieving energy savings. In this project, the 2012 International Energy Conservation Code (IECC) is assumed equivalent to ASHRAE Standard 90.1-2010, unless "weakening amendments" have been included in the former (Makela, Willamson, & Makela, 2011). It is worth mentioning that originally the project scope also included medium office buildings. However, through initial outreach to potential building owners and very few responded or were interested in participation and providing building information including monthly energy use data needed for our research. Later this portion of the scope was dropped.
- 1815-RP Integrating Occupant Behavior Data with Building Information Modeling for Performance Simulation (Final report published on October 2024)
    - The ASHRAE RP-1815 project centers on advancing the state of occupant behavior modeling as part of building information modeling (BIM) and energy modeling and simulation (BEM) workflows. Enhancements to the industry data standards ifc and gbXML for BIM and BEM to support occupant behavior modeling data were a specific area of focus and project deliverable. The research draws heavily on Lawrence Berkeley's obXML occupant behavior modeling schema as an influence and point of departure for this work. As part of this research, 16 stakeholder interviews were conducted to assess the state of the art and needs for improvements. A dozen existing research programs, software products and relevant data standards were evaluated to determine requirements for OBM supported BIM and BEM workflows and data standardization support. The report provides a comprehensive survey and review of existing technologies and standards' support of occupant behavior modeling. It emphasizes the crucial role of OBM in enhancing energy modeling accuracy and building performance analysis, identifying the need for more effective integration to capture the impact of occupant behavior on building energy use. Revisions to the gbXML schema have been developed and are now incorporated in the current gbXML consensus standard specification. IFC targeted enhancements have led to the development of a private online data dictionary hosted on building smart's BSDD service. This work specifically anticipates use of gbXML and IFC in energy modeling workflows using the DOE's EnergyPlus energy modeler including the system's Functional Mockup (FMU) co-simulation capabilities, and the Open Studio application and APIs for model import, editing and export. Beyond these requirements, the research identified key enhancements in two other data formats: the obXML schema itself, where XML compliancy and other enhancements are proposed based on learning from the gbXML – obXML integration effort, and the DOE's new epJSON input format as an alternative to today's IDF for EnergyPlus model import. Numerous appendices, supplementary files, and online resources are provided as deliverables to the project. The full project repots and supporting content is hosted on a private GitHub, currently located at: https://github.com/jwouellette/ASHRAE_RP-1815.