Monday, September 11

9:10 AM - 10:10 AM
Debate (Basic)

ASHRAE’s Corner Debate
Room: Hill Country C-D
Chair: Aaron Patrick Boranian, Senior Energy Engineer, Associate, Big Ladder Software, Denver, CO
The evolution of building performance simulation tools started with slide rules for many engineering calculations, progressing to the first “generation” of simulation engines with hourly resolution in the 1970’s, and eventually leading to the plethora of tool options and features available today. And yet, firms and individuals with enough resources and motivation are continually developing their own unique tools in-house. In this debate, we’ll hear experts in the field debate if practitioners currently have all the building performance simulation tools necessary to holistically analyze the operational energy, embodied carbon, and comfort of their building designs.

9:10 AM - 10:10 AM
Seminar 1 (Intermediate)

Occupant Behavior-Centric Building Design and Operation and Its Effects on Building Energy Usage
Room: Texas 1-3
Sponsor: MTG.OBB Occupant Behavior in Buildings, 1.5 Computer Applications
Chair: Stephen B Roth, PE, Full Member, Carmel Software Corp, San Rafael, CA
Occupant behavior (OB) has a significant impact on building energy usage. Building design and operation strategies that take into account occupants’ behavior can significantly reduce energy consumption. This seminar presents an overview of occupant behavior-centric building design and operation and its effects on building energy usage. The first speaker will give a high-level overview of various studies being done on building occupant behavior including ASHRAE RP-1815. The second speaker will describe in more detail RP-1815 and how it will improve the occupant behavior workflow between BIM and analysis. The final speaker will discuss occupant-centric metrics for building design and simulation.

1. An Overview of How Occupant Behavior Affects Building Energy Usage
   Stephen B Roth, PE, Full Member, Carmel Software Corp, San Rafael, CA
2. More Findings from RP-1815
Intelligent Building Operations: Efficiencies and Load Management I

9:10 AM - 10:10 AM

Room: Texas 5-6

Chair: Susan Collins, Associate, Whole Building Systems, Mt Pleasant, SC

Faults, controls, and metadata oh my! This session begins with imposing three fault scenarios in a test building to analyze the effects on the cooling system of the rooftop unit and building interior conditions. It continues with a study that combines Artificial Neural Networks (ANN) models that use indoor and outdoor conditions to predict room air temperature and A/C electricity consumption for real-time Model Predictive Control to optimize control variables to reduce cooling energy and deviation from setpoint. This session concludes with the advantages of semantic graphs for visualizing data connections across diverse sources (sensor data, control information, etc.).

1. Impact of Faults on Cooling System of Commercial Building Based on Fault Scenario Testing
   Sungkyun Jung, Ph.D., Yeobeom Yoon, Associate and Piljae Im, Ph.D., Full Member, Oak Ridge National Laboratory, Oak Ridge, TN

2. Real-Time Implementation of Federated Control for Package Air Conditioners in Residential Buildings
   Seongkwon Cho, Jin-Hong Kim and Cheol-Soo Park, PhD, Member, Seoul National University, Suwon City 441-744, South Korea

3. Semantic Metadata: Enabling Analytics Applications with Intelligent Data Management
   Parastoo Delgoshaei, Associate1 and Mohammad Heidarinejad, Ph.D., P.E., S-B-a Member2, (1)NIST, Gaithersburg, MD, (2)Illinois institute of Technology, Chicago, IL

Monday, September 11, 10:30 AM - 12:00 PM

Seminar 4 (Intermediate)

Recent and Planned Additions to ASHRAE Standard 140, Method of Test For Evaluating Building Performance Simulation Software

Room: Texas 1-3

Sponsor: SSPC 140

Chair: Joel Neymark, P.E., Full Member, J. Neymark & Associates, Golden, CO

ASHRAE Standard 140 has some exciting recent additions and developments in progress. In this seminar, presenters will discuss the recently published addendum that provides acceptance criteria (i.e. a pass-fail criteria); the Whole Building Modeling test suite in development; and a roadmap for other planned new additions including reorganization of current Standard 140 content to facilitate usability and integrating new material, a users manual, reporting automation, and more test suites.
1. ASHRAE Standard 140 Acceptance Criteria
Jason John Glazer, P.E., BEMP, Full Member, GARD Analytics, Lino Lakes, MN
2. Statistical Basis of ASHRAE Standard 140 Acceptance Criteria
Ralph T Muehleisen, Ph.D., P.E., Full Member, Argonne National Laboratory, Lemont, IL
3. Whole Building Modeling Suite for ASHRAE Standard 140
Yan Chen, Ph.D., Member, Pacific Northwest National Laboratory, Portland, OR
4. ASHRAE Standard 140 Roadmap
Timothy P McDowell, Member, Thermal Energy Systems Specialists, Madison, WI

10:30 AM - 12:00 PM
Seminar 5 (Intermediate)
Modeling Advances: Tools and Workflows I
Room: Texas 5-6
Chair: Ranojoy Dutta, BEMP, Associate, View Inc, SAN JOSE, CA
This session covers tool and workflow advances related to holistic analysis for lighting and daylight to energy model prototypes and standards. The first presentation focuses on a workflow for linking energy and non-energy metrics to model lighting control. The session then moves to a review of energy prototypes and best practices in developing a good prototype. Then, a deep dive into ASHRAE Standard 205-2023 Representation of Performance Data For HVAC&R and Other Facility Equipment covers additions and changes to the standard this year. Finally, the session concludes with a session on a parametric multi-objective performance analysis for facade optimization.
1. A Workflow for Modeling Integrated Lighting Control Based on Energy and Non-Energy Performance Metrics
Tammie Yu¹ and Taoning Wang², (1)Lawrence Berkeley National Laboratory, (2)Lawrence Berkeley National Lab, Berkeley, CA
2. Pro Tips on Prototypes
Neal J Kruis, Associate and Peter Ellis, Member, Big Ladder Software, Denver, CO
3. An Update on ASHRAE Standard 205-2023
Charles S Barnaby, Fellow Life Member¹ and Neal J Kruis, Associate², (1)CSB Consulting, Moultonborough, NH, (2)Big Ladder Software, Denver, CO
4. Multi-Objective Performance Analytics: Daylight and Energy to Inform the Ultimate Enclosure
Jake Chevrier and Reinhardt Swart, LC, SmithGroup, San Francisco, CA

10:30 AM - 12:00 PM
Seminar 6 (Intermediate)
Lighting
Room: Hill Country A-B
Chair: Nicole Peterson, Associate, Thornton Tomasetti, Portland, ME
This session addresses modeling of building lighting systems. The first presentation describes design and configuration of a grid-responsive lighting system. The second deals with use of photometry and physics-based rendering to generate realistic lighting scenes under a range of realistic sky conditions. The third presents developments in daylight modeling tools and workflows, with a focus on complex fenestration systems, visual and non-visual radiation, and the packaging of these into tool libraries. The fourth presents a method for extracting similarity features from luminance maps and using this information to infer occupant visual preferences in daylit spaces using deep learning-based classification models.
1. Commissioning and Demonstration of a Residential Lighting System That Can Respond to OpenADR Signals
Shat Pratoomratana and Michael E Poplawski, Associate, Pacific Northwest National Laboratory, Portland, OR
2. Indoor Photometry and Scene Reconstruction
Guanzhou Ji, Carnegie Mellon University, Pittsburgh, PA
3. Input Data and Tools for Daylight and Control Modeling
Taoning Wang, Lawrence Berkeley National Lab, Berkeley, CA
4. Inferring Personal Lighting Preferences Using HDR Imaging and Deep Learning Techniques
Dongjun Mah, Student¹ and Athanasios Tzempelikos, PhD, Full Member², (1)Purdue University, (2)Purdue University - Civil Engineering, West Lafayette, IN
Modeling for Carbon and Embodied Energy I

Room: Hill Country C-D
Chair: Sedighehsadat Mirianhosseinabadi, Ph.D., Associate, ME-Engineers, Eureka, MO

This session covers important aspects related to building and construction decarbonization. The first presentation emphasizes the need to strike a balance between HVAC system resilience and decarbonization. The second presentation shares results from a modeling framework to quantify material demand and embodied carbon emissions in building construction through mid-century. The third presentation proposes a methodology for mechanical firms to conduct LCA analysis for HVAC systems, with a focus on meeting the MEP 2040 target. The fourth presentation introduces an innovative modular building system based on cross-laminated timber that is carbon-negative cradle-to-grave for single-family homes.

1. Parameters and Metrics for Balancing HVAC Equipment Resilience and Decarbonization
   Akshay Vilas Padwal, EIT, Associate¹, Patrick Pease, PE, Full Member² and Mostafa Tahmasebi, Associate Member², (1)Cove Tool, Inc., Atlanta, GA, (2)cove.tool, Atlanta, GA

2. A Detailed Model to Assess Concrete Demand and Its Embodied Carbon in Building Construction: A Case Study of Single-Family Homes in California
   Aven P Satre-Meloy and Kaiyu Sun, Member, Lawrence Berkeley National Lab, Berkeley, CA

3. Towards Meeting the MEP 2040 Challenge: A Methodology for Conducting Life Cycle Assessment Analysis of HVAC Systems
   John Williams¹, Amulya Surapaneni, Associate¹, Kathryn A Lee, P.E., Full Member² and Cynthia Jocelyne Sandoval, Student¹, (1)Harris Design Studio, Oakland, CA, (2)Harris, Oakland, CA

4. The Circular Home: A Negative-Carbon Modular Residence Designed for Iterative Disassembly and Reuse
   Kieren McCord, Ph.D., Associate¹, Chrissi Antonopoulos, Associate² and Patricia Gunderson¹, (1)Pacific Northwest National Laboratory, Richland, WA, (2)Pacific NW National Laboratory, Richland, WA

Energy Equality, Access and Justice

Room: Texas 5-6
Chair: Walter T Grondzik, P.E., Fellow Life Member, Freelance Consultant, Tallahassee, FL

Extreme heat and other effects of climate change appear to disproportionately affect lower income and traditionally underserved communities in large cities. This session covers four studies that look at various approaches to address energy savings and comfort through evaluating Cooling ECMs, a case study of retrofits using passive and low energy measures, the impact and challenges of electrification and increased grid demand, and how inconsistent and poorly implemented energy code compliance could exacerbate an already challenging situation for at risk populations.

1. Extreme Weather Impact Analysis of Cooling Access Measures Offered by Los Angeles Department of Water and Power Incentive Program through Cool Los Angeles Initiative
   Babak Yazdanpanah, Associate and Sean Lim, Los Angeles Department of Water and Power, Los Angeles, CA

2. Building Electrification: A Holistic Analysis of its Environmental, Economic and Housing Affordability Impacts through Life Cycle and Grid-Response Assessments
   Matthew RT Williams, PhD Candidate, Student¹, Michael Reynolds¹, Chris Parker², Jianli Chen¹ and Kody Powell¹, (1)University of Utah, Salt Lake City, UT, (2)Giv Group

3. Pathway to Improve Resilience and Energy Performance for Multi-Family Buildings in Disadvantaged Community in Los Angeles County
   Sang Hoon Lee, Ph.D. and Tianzhen Hong, PE, Fellow Member, Lawrence Berkeley National Laboratory, Berkeley, CA

4. Equity in Energy Code Compliance
   Chitra Nambia, Associate¹, Yulong Xie, Ph.D., Associate² and Haripriya Sathyarayanan¹, (1)Pacific Northwest National Laboratory, Millbrae, CA, (2)Pacific Northwest National Laboratory, Richland, WA

Modeling Existing Buildings I

Room: Hill Country A-B
Chair: John D Bynum, PhD, Arup Ireland

Modelling and assessment of existing buildings represents a significant challenge to reducing energy consumption and carbon emissions but is essential to meeting national and international reduction targets. This session presents several workflows and
tools designed to aid different stakeholders in reducing energy consumption and carbon emissions including a workflow for existing building calibrated modelling at scale, a tool for rapid assessment of US schools covering energy, health & wellbeing and safety measures/actions and a machine learning technique for Scope 1 & 2 decarbonization. The final session presents a summary of CBECs 2018 with some takeaways from the data.

1. Generating Energy Models of Existing Buildings Using Open Data
   Duncan Prahl, Full Member, CUNY Building Performance Lab, New York, NY

2. Quick Building Assessment Tool
   Juan Gonzalez, Pacific Northwest National Lab, Richland, WA

3. Highlights from the 2018 Commercial Buildings Energy Consumption Survey
   Jay Olsen, Tuncay Alparslan, Joelle Michaels, Stacy Angel and Zachary Marohl, U.S. Energy Information Administration

   Aditya Ramnarayan, Graduate Research Assistant, Student, Andres Sarmiento, Armin Gerami and Michael Ohadi, University of Maryland, College Park, MD

1:40 PM - 3:10 PM
Seminar 10 (Advanced)

Thermal and Hygrothermal (envelope) Modeling II
Room: Hill Country C-D
Chair: Susan Collins, Associate, Whole Building Systems, Mt Pleasant, SC
This session covers a range of thermal and hygrothermal considerations ranging from modeling to the field, from asking the right questions to innovative technology and procedures. First, it explores predicting the performance of existing envelopes through non-destructive field measurements. The second speaker reviews lessons learned of building science analysis, with a focus on model inputs and assumptions and asking the right questions early. The third speaker provides a case study on thermolectric systems for heating and cooling. Lastly, the session concludes with a methodology to automate the very time-intensive efforts of thermal bridging takeoffs.

1. Validating Thermal Performance of Existing Wall Assemblies Using in-Field Measurements
   Shibei Huang, RWDI, Philadelphia, PA

2. Building Enclosure Modeling Lessons Learned

3. Intelligent Facades: Integration of Thermolectric Materials into Building Facades for Localized Heating and Cooling
   Mahsa Farid Mohajer, PhD., Sustainable Building Analyst, Stantec Inc.

   Taylor RH Dingwall and Mark McVan, BEMP, Associate, MCW Consultants Ltd, Toronto, ON, Canada

1:40 PM - 3:10 PM
Seminar 11 (Advanced)

Empirical Validation of Building Energy Simulation: Unlocking Opportunities in Energy Efficiency
Room: Texas 1-3
Sponsor: 4.7 Energy Calculations, SSPC140
Chair: Piljae Im, Ph.D., Full Member, Oak Ridge National Laboratory, Oak Ridge, TN
Recently, efforts have been made to provide reliable empirical data for ANSI/ASHRAE Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs, to enable improved accuracy of building energy model (BEM) engines and improved characterization of their accuracy. This seminar will present the progress and results of the multinational lab efforts to empirically validate the whole building energy models based on the high-quality dataset from full scale test buildings. The buildings includes both residential and commercial buildings, and the validation has been done in whole building energy use, end use, and indoor environmental data.

1. ETNA Empirical Validation Test Specification Development
   Joel Neymark, P.E., Full Member, J. Neymark & Associates, Golden, CO

2. ETNA Empirical Validation Test: Uncertainty Analysis
   Ji Hyun Kim, Ph.D., BEMP, Associate, Argonne National Lab, Lemont, IL

3. NREL Empirical Validation Test Specification Development
   Matt Leach, Life Member, NREL, Golden, CO
*Sungkyun Jung, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN*

Monday, September 11, 3:30 PM - 5:00 PM
Panel (Basic)

**Unmet Hours: LIVE!**
*Room: Texas 1-3*
*Chair: Aaron Patrick Boranian, Senior Energy Engineer, Associate, Big Ladder Software, Denver, CO*

This session presents attendees with an opportunity to interact with their peers and "crowd source" answers to their burning questions. This is the same intent as unmethours.com -- the question-answer forum for building energy simulations -- but offered in a live, interactive, and dynamic format for conference attendees. Participants are given time to think of a challenge they are facing before presenting their problem to a group for brainstorming. This allows participants to seek out as well as provide peer-supported advice on solving each other's challenges. What answers will you find (or give) in Unmet Hours -- LIVE?

3:30 PM - 5:00 PM
**Seminar 12 (Intermediate)**

**Modeling Advances: Tools and Workflows II**
*Room: Texas 5-6*
*Chair: Nicole Peterson, Associate, Thornton Tomasetti, Portland, ME*

This session includes a demonstration of a Python-EMS-Based Building Simulation Platform that enables co-simulation among multiple buildings to support decision-making, and optimization. Then an educational resource called BEMcyclopedia is introduced, which serves as a comprehensive knowledgebase about building energy modeling. A paper on optimizing window performance examines various building design decisions such as site orientation, occupant behavior etc. and its impact on the selection of window solar heat gain coefficient (SHGC). In closing, a single unified coefficient is introduced to explore potential synergies between energy use intensity, daylighting, operational & embodied carbon, and construction cost.

1. Py-Cosim: An Open-Source Python-EMS-Based Energyplus Co-Simulation Platform
*Liang Zhang, Assistant Professor, Associate, The University of Arizona, Tucson, AZ*

2. Educating the Next Generation of BEM Practitioners
*Dimitri S Contoyannis, Full Member, Model Efficiency, Concord, MA*

3. Considering an Old Question in a Changing Context: Case Study of Optimizing Window Properties
*Holly Samuelson, DDes, RA¹ and Amir Baniassadi, Ph.D., Student², (1)Harvard Graduate School of Design, Cambridge, MA, (2)Harvard University, Cambridge, MA*

4. The Coefficient of Awesomeness: An Unified Metric of Building Performance Fitness
*Alfonso E Hernandez, AIA LEED BD+C, Gensler, Houston, TX*

3:30 PM - 5:00 PM
**Seminar 13 (Intermediate)**

**CFD Applications for Architectural Decision Making**
*Room: Hill Country A-B*
*Chair: Krishnan Gowri, PhD, Fellow Member, Intertek Inc., Bothell, WA*

This session begins with a validated CFD model simulating reactive species, such as hydrogen peroxide, generated by air cleaners to analyze the impact of air cleaner locations, reactive species concentrations, and air flow rates from cleaners. It discusses SimScale, an example of CFD tools in the cloud commonly used for microclimate studies and DCRES, Dynamic and Climate Responsive Enclosure System that provides occupant comfort, energy, and carbon benefits over passive envelope strategies. This session concludes with a CFD case study establishing more uniform pressure in the ductwork distribution of a new clinical and research laboratory.

1. CFD Modeling for Reactive Species Air Cleaner Applications in a Classroom
*Youngbo Won, Dr., Student¹ and William P Bahnfleth, Ph.D., P.E., Presidential Fellow Life SBA Member², (1)The Pennsylvania State University, (2)The Pennsylvania State University, State College, PA*

2. Building Performance Analysis in the Cloud: Development of the All-Cloud Software Stack
*Naghman Khan, SimScale GmbH*

3. The Ventilation and Thermal Performance of Dynamic and Climate Responsive Enclosure Systems (DCRES)
*Zhan Shi, Ph. D. student, Student and Erica Cochran Hameen, Faculty, Carnegie Mellon University, Pittsburgh, PA*
4. Optimizing Ductwork Distribution in a Large Clinical Application Using CFD: A Case Study
Saber Khoshdel Nikkho, PE, BEMP, Associate1 and Mehran Salehi, Associate1, (1)Affiliated Engineers Inc, Walnut Creek, CA, (2)Harris, Sterling, VA

3:30 PM - 5:00 PM
Seminar 14 (Intermediate)

Modeling for Carbon and Embodied Energy II
Room: Hill Country C-D
Chair: Sedighehsadat Mirianhosseinabadi, Ph.D., Associate, ME-Engineers, Eureka, MO
This session begins with focusing on the importance of thermal energy demand intensity (TEDI) of a building design, what design measures affect TEDI, and how progressive building codes and voluntary standards have included TEDI as a targeted metric. This session continues with two case studies, one achieving net zero energy and carbon for a public cultural arts center outside Chicago, and another achieving net zero carbon for a privately-owned wet biology laboratory building in climate zone 5A. This session concludes with proposing an early-phase modeling framework to assess and compare mechanical and architectural alternatives that yield fully electric laboratories.

Tuesday, September 12

Tuesday, September 12, 8:10 AM - 9:00 AM
Keynote (Intermediate)

Whole Life Carbon, is This the Right Approach?
Room: Texas 1-3
Chair: Duncan Cox, Thornton Tomasetti, London, United Kingdom
Life Cycle Assessments are being embraced throughout the construction industry, and it’s exciting to see the positive impacts these assessments are having on reducing embodied carbon in design and delivery on site. They’ve typically focused on the upfront embodied carbon associated to structural material choice and design. It’s become evident that there’s been an underestimation of the carbon emissions associated with the building enclosure, as well as the commonly missing elements such as MEP systems and internal building architecture. Duncan presents a whole life carbon approach to consider both embodied and operational carbon during the early stage of design.

Tuesday, September 12, 9:10 AM - 10:10 AM
Panel 1 (Intermediate)

Making the Most of Modeling
Room: Texas 1-3
Moderator and Panelists: Ante Vulin1, Michael J Adams1, Ivan A Jose, Associate2 and Nathan Kegel, Associate Member3, (1)Glumac, Portland, OR(2)McKinstry, Seattle, WA(3)DLR Group, Cleveland, OH
The sustainable design community is increasingly aware of the environmental impacts of energy time of use, grid energy composition, embodied carbon and refrigerant. At the same time, energy modelers are most commonly engaged for a limited set of services, especially energy code compliance and LEED documentation, that may not consider these factors at all. In this moderated panel, professional practitioners will share how conventional scopes can still yield meaningful performance improvements in buildings. A variety of tools, resources and approaches will be shared.
Seminar 15 (Intermediate)

Intelligent Building Operations: Efficiencies and Load Management II
Room: Texas 5-6
Chair: Ralph T Muehleisen, Ph.D., P.E., Full Member, Argonne National Laboratory, Lemont, IL

This session begins with a study investigating the heating and cooling energy savings from installing automated interior insulating shades with four different control algorithms in a Chicago high-rise office building. This session continues with using two prototype residential building models in Orlando, FL, and Indianapolis, IN to investigate the impact of refrigerant charge faults on building indoor conditions and HVAC system operation under different thermostat setpoint temperatures. This session concludes with leveraging building management system data for medical office buildings to compare modeled cooling loads to actual loads, including additional data sources to provide a more accurate comparison.

1. Energy End-Use Analysis on the Novel Automated Interior Insulating Window Shades in a High-Rise Office Building
Jongki Lee, Student¹ and Mohammad Heidarinejad, Ph.D., P.E., S-B-a Member², (1)Illinois institute of technology, Chicago, IL, (2)Illinois institute of Technology, Chicago, IL

2. Impact of Refrigerant Charge Faults on Building Indoor and System Operation Under the Different Indoor Air Set-Point Temperature Settings
Yeobeom Yoon, Associate¹, Jon Winkler², Piljae Im, Ph.D., Full Member¹ and Jeffrey D Munk², (1)Oak Ridge National Laboratory, Oak Ridge, TN, (2)National Renewable Energy Laboratory, Golden, CO

3. Leveraging 300 Million Data Points to Enhance Energy Efficiency in Medical Office Buildings
Harshana Thimmanna, BEMP¹ and Peter McNally², (1)Smithgroup, San Francisco, CA, (2)Smithgroup, Ann Arbor, MI

Seminar 16 (Intermediate)

Occupant Health, Wellbeing and Comfort
Room: Hill Country A-B
Chair: Walter T Grondzik, P.E., Fellow Life Member, Freelance Consultant, Tallahassee, FL

Three presentations engage occupant comfort in indoor and outdoor settings and from the thermal and visual perspectives. The first presentation uses case studies to give an overview of city-scale outdoor microclimate simulations and their practical use in urban planning. The second addresses occupant seating choices as influenced by user perceptions of visual environmental quality. The third assesses the ability of personal micro-zonal thermal controls to improve occupant experiences and energy efficiency.

1. Regulating Comfort: The City of London Thermal Comfort Guidelines and Beyond
Ryan Danks, P.Eng., RWDI, Toronto, ON, Canada

2. The Interactive Relationship of Visual Environments and Mobility within Workplace
JeeEun Lee, Student and Ying Hua, Ph.D., Cornell University, Ithaca, NY

3. Enhancing Thermal Comfort and Reducing Energy Consumption Using Personalised Micro-Zonal Occupant Centric Control (P-MZOCC)
Jeslu Celine Jacob, B.Arch, Student Member¹, Debarapratim Pandit, Associate Professor² and Joy Sen, Professor², (1)IIT Kharagpur, Kharagpur, India, (2)IIT Kharagpur, Kharagpur, India

Tuesday, September 12, 10:30 AM - 12:00 PM

Panel 2 (Basic)

Project StaSIO Competition Winners
Room: Texas 1-3
Moderator: Alejandra Menchaca, Judges 1 Competition¹, Judges 2 Competition², Judges 3 Competition³ and Winners Competition⁴, (1)from Industry(2)from academy(3)competition winners
Project StaSIO (Standard Simulation Inputs and Outputs), an initiative of IBPSA-USA’s Research Committee, is an web-based crowd-sourced repository of simulation graphics and case studies organized around the ASHRAE 209 framework. Project StaSIO continues to organize the 2023 Annual Competition for world-wide organizations or individuals, and winners will be announced in the 2023 ASHRAE Building Performance Analysis Conference. This panel session aims to provide a platform for professionals to showcase their high-quality work to building simulation community. The competition winners and judges will be invited to join this panel session and have in-person discussion for the winning projects.
Modeling Advances: Tools and Workflows III
Room: Texas 5-6
Chair: Ranojoy Dutta, BEMP, Associate, View Inc, SAN JOSE, CA
This session begins with a generic framework for data-driven building energy flexibility quantification which considers different levels of data availability and use cases. A unified set of prototype models are presented to represent California’s building stock and provide the agencies with a single set of prototypes for conducting their analysis. The following research project aims to develop a simulation-based approach for modeling the impact of crowded occupancy on building energy performance and indoor comfort. In the final presentation, the residential BEM landscape is explored, the HPXML/OpenStudio workflow and its software architecture and benefits accrued to DOE and industry are highlighted.

1. Data-Driven Modeling and Simulation for Building Energy Flexibility Quantification
Han Li, Associate¹ and Tianzhen Hong, PE, Fellow Member², (1)Lawrence Berkeley National Lab, Berkeley, CA, (2)LBNL, Berkeley, CA

2. Developing Single Family Prototype Models for California
Mohammad Dabbagh, Building Performance Engineer, CHD, Student¹, Mohammad Dabbagh, Building Performance Engineer, CHD, Student¹, Rahul Athalye, Director of Codes and Standards¹, Andres Fergadiotti, Engineer, PE, Member¹ and Bryan Boyce, Associate Director, Member¹, (1)NORESCO, Boulder, CO, (2)Southern California Edison, CA, (3)Energy Solutions

Akram Abdul Hamid, Eng, Student, Lund University, Faculty of Engineering, Department of Building and Environmental Technology, Division of Building Physics, Lund, Sweden

4. How Hpxml/Openstudio Accelerated Energyplus into the Residential Buildings Market
Scott Horowitz, Full Member, Dave Roberts, Noel Merket, Joe Robertson, Yueyue Zhou and Ben Park, Associate, NREL

Modeling Existing Buildings II
Room: Hill Country A-B
Chair: John D Bynum, PhD, Arup Ireland
Building upon the earlier session of a similar title, this session presents three different tools and methodologies for analysing existing buildings and one detailed international adaptive reuse case study. First, this session presents two Department of Energy tools for rapidly assessing building performance and potential improvement opportunities, a semi-automated autocalibration methodology for building energy models to assist with energy efficiency upgrades and a new method of grouping buildings based on their microclimates instead of their climate zone. The final presentation outlines a detailed case study of adaptive reuse of a distillery in Sweden including energy and hygrothermal modelling.

1. Better Together
Alex Chapin, PE, BEMP, Associate, NREL, Lakewood, CO, United States

2. Adaptive Reuse of an Old Distillery in Southern Sweden
Emil Palmenas, Student and Edwin Ottosson, Student, Lunds University, Lund, Sweden

Sedi Lawrence, Iowa State University, Ames, IA

Ladan Ghobad, Ph.D., Associate¹, Peng Yin, Ph.D.², Ebuka Osunwoke² and Yihong He¹, (1)ENERlite Consulting, Sacramento, CA, (2)University of Louisiana, Lafayette, LA

Tuesday, September 12, 1:30 PM - 3:30 PM
LowDown ShowDown 1 (Basic)

ASHRAE LowDown Showdown
Room: Texas 1-3
Chair: Walter T Grondzik, P.E., Fellow Life Member, Freelance Consultant, Tallahassee, FL
This year’s selection for the model building is an existing building – the one and only Houston Astrodome! The Astrodome, built in 1965 served as a sports arena for over three decades until the early 2000’s. It now sits in disrepair, despite multiple attempts to repurpose the building over the last 20 years. Teams are asked to envision a new creative reuse of the Astrodome to provide
needed urban amenities and to do so within the constraints of reduced fossil fuel use and reduced carbon emissions to bring meaningful activities and/or services to downtown Houston.

1. Carbon Lighters  
*Alfonso E Hernandez, AIA LEED BD+C*, Gensler, Houston, TX

2. CO2 Crew  
*Samira Zare Mohazabieh*, Stantec, Calgary, AB, Canada

3. Dome Dynasty  
*Geoffrey Tears*, Microdesk

4. Watt's Up Dome  
*William Edward McCann*, Branch Pattern

**Fish Bowl**  
*Room: Texas 1-3*

*Chair: John D Bynum, PhD, Arup Ireland*

A fishbowl panel discussion comes from a popular open fishbowl conversation format. Members of the audience sit on stage or in the center of the room to discuss a topic introduced by the panel moderator. At any time, any member of the audience can join the fishbowl panel by replacing an existing participant. The discussion continues with participants frequently entering and leaving the panel until the time is up. The moderator then summarizes the discussion.

**Wednesday, September 13**

**Seminar 19 (Intermediate)**  
**Infusion of Building Energy Modeling and Modeling Tools in an Architectural Engineering Program**  
*Room: Texas 1-3*

*Chair: Mohammad Heidarinejad, Ph.D., P.E., S-B-a Member, Illinois institute of Technology, Chicago, IL*

This session aims at summarizing different teaching tools and approaches implemented in the Architectural Engineering program at the Illinois Institute of Technology to teach building energy modeling in order to educate the next generation of the architectural engineers. The session starts first with introducing the courses that are part of this program and then speakers will provide insights about how OpenStudio, EnergyPlus, Revit software tools are included as part of the competency goals. The courses presented in this session are part of the U.S. Department of Energy (DOE) project to develop building engineering curricula between several institutions.

1. An Overview of Developing Educational Building Energy Modeling and Modeling Tools Resources  
*Mohammad Heidarinejad, Ph.D., P.E., S-B-a Member, Illinois institute of Technology, Chicago, IL*

2. Experiential Building Energy Modeling Learning with Openstudio Application  
*Jongki Lee, Student, Illinois institute of technology, Chicago, IL*

3. Improving Building Energy Modeling and Building Information Modeling Using Ladybug and Revit Tools  
*Alexander Mitchell, Associate, Illinois Institute of Technology, Chicago, IL*

**Seminar 20 (Intermediate)**  
**Urban and Community Scale Modeling**  
*Room: Texas 5-6*

*Chair: Susan Collins, Associate, Whole Building Systems, Mt Pleasant, SC*

Population increases and migration to urban areas is a future reality. While some cities have instituted regulations and are obtaining and analyzing data, there is still much work to be done. This session examines existing analysis methods for urban scale building energy modeling (UBEM), approaches for predictive modeling of future performance (4D), and also address how the changing nature of climate change itself will impact our ability to deliver on a 2050 goal of decarbonization.
Rezvan Mohammadizaji1 and Melissa Bilec2, (1)Energy Solutions, Oakland, CA, (2)University of Pittsburgh, Pittsburgh, PA
Kushagra Varma, Doctoral fellow and Erica Cochran Hameen, Faculty, Carnegie Mellon University, Pittsburgh, PA
3. Future Climate Considerations for Portfolio-Wide Decarbonization Planning
Alexander B Harris, CEM - Certified Energy Manager, Associate and Bryanna Krekeler, HGA, Minneapolis, MN

9:10 AM - 10:10 AM
Seminar 21 (Intermediate)
Intelligent Building Operations: Grid Interactions and Distributed Energy Resources
Room: Hill Country A-B
Chair: Ranojoy Dutta, BEMP, Associate, View Inc, SAN JOSE, CA
This session begins with practical considerations for modeling existing buildings using gray-box and black-box methods to analyze the demand flexibility within buildings to provide grid services (building sector electrification, e.g.). This session continues with a large-scale modeling framework to reduce energy costs across different climates and HVAC system types for single-family homes with roof top photovoltaic panels, battery energy storage systems, and electric vehicle charging. This session concludes with analyzing the bill-saving potential of load shifting technologies by simulating hundreds of thousands of different scenarios for time-of-use electricity tariffs and price-informed battery storage strategies using high-fidelity EnergyPlus commercial building models.
1. Data-Driven Modeling of Demand Flexibility in Grid-Interactive Efficient Buildings: Modeling and Forecasting with BAS Data
James McNeill Jr, PHD, PE, BEMP, Full Member, Mingyu Kim and Easan Drury, PHD, Edo, Seattle, WA
Cary Faulkner, Student, Pacific Northwest National Laboratory, Boulder, CO
3. How Can Time-of-Use Tariffs Drive Energy Storage Adoption in Buildings: A Large-Scale Simulation-Based Investigation
Xuechen Lei, Ph.D., Associate, Ellen M Franconi, PhD, Full Member, Vrushali Mendon, Associate and Yunyang Ye, Ph.D., Associate, Pacific Northwest National Laboratory, Richland, WA

Wednesday, September 13, 10:30 AM - 12:00 PM
Seminar 22 (Intermediate)
Modeling Advances: Tools and Workflows IV
Room: Texas 5-6
Chair: Walter T Grondzik, P.E., Fellow Life Member, Freelance Consultant, Tallahassee, FL
One of the challenges modeling practitioners face today is being nimble enough to iterate simulations to address the conflicting priorities of the design team, owner and other stakeholders. This session presents a case study for a large health care facility in its quest for net zero carbon, a case study using co-simulation to integrate data to optimize design and performance evaluation for a commercial office building with VRF, and the development of an open source web interface tool for Open Studio that's designed to be simpler to use by being tailored to a few high frequency applications and analysis types.
1. Modeling with Conceptual Design Uncertainties: Modeling a Large Healthcare Building for Actionable Energy/Thermal Load Results
Amir Rezaei-Bazkiaei, Ph.D., BEMP, Associate1, Brett Horin2 and Conor Rielly2, (1)Cyclone Energy Group, Buffalo, NY, (2)CannonDesign, Chicago, IL
2. Co-Simulation: Connecting Detailed Equipment Model to Building Energy Simulations
Hanlong Wan, Ph.D., Associate, Bo Shen, PhD, Full Member and Yanfei Li, Ph.D., Associate Member, Oak Ridge National Laboratory, Oak Ridge, TN
3. Implementing Data Schemas to Achieve Energy Model Interoperability Among Disciplines
Brett Horin, Student, CannonDesign, Chicago, IL
4. A Web Application for Running Large-Scale Analyses on Openstudio Server
Jocelyn Lorrey, VEIC, Winooski, VT
Holistic Performance Advances
Room: Hill Country A-B
Chair: Alfonso E Hernandez, AIA LEED BD+C, Gensler, Houston, TX
This session focuses on thinking holistically, demonstrating frameworks and analyses used for optimization, linking various areas of building performance. The first speaker ties carbon reduction and human comfort to daylight, energy, and community growth with a California-based case study. The second speaker will showcase an all-electric multifamily high-rise in Chicago, demonstrating a range of technologies that worked together to inform decision-making. The third speaker explores balancing comfort and energy through electrochromic glazing and radiant cooling. The fourth speaker presents a simulation-based multi-objective optimization method to select glazing and shading products during early design.
Ladan Ghobad, Ph.D., Associate, ENERlite Consulting, Sacramento, CA
2. Design and Simulation of a Large Scale All Electric High-Rise Multifamily Building in Chicago
Weijun Allen Mei, P.E., C.E.M., LEED AP, BEMP, Associate, Cyclone Energy Group, Chicago, IL
3. Exploring Synergies between Electrochromic Glazing and Radiant Cooling for Achieving Comfort and Energy Efficiency
Ranojoy Dutta, BEMP, BEMP and HBDP, Associate, View Inc, SAN JOSE, CA
Sichen Lu, Student Member¹ and Athanasios Tzempelikos, PhD, Full Member², (1)Purdue University, West Lafayette, IN, (2)Purdue University - Civil Engineering, West Lafayette, IN