



2021 ASHRAE Building Performance Analysis Conference

November 10th - November 12th, 2021

Wednesday, November 10

Wednesday, November 10, 9:10 AM - 10:10 AM
Seminar 1 (Intermediate)

Modeling Advances I

Chair:

This session presents recent research and advances relating to micro-climatic influences on building cooling load estimations, detailed assessments of interior convective film coefficients and their impact on condensation analysis and a framework for parametric multizone airflow modelling. The sessions will discuss in detail the tools used, the applicability and limitations of the advancements presented as well as related future developments.

1. Effect of Land-Use-Class Based Convective Heat Transfer Coefficient on Cooling Load Estimation

Anwar Demsis Awol¹, Girma Bitsuamlak² and Fitsum Tariku, Member³, (1)University of Western Ontario, London, Canada, (2)Western University, London, ON, Canada, (3)BCIT, Burnaby, BC, Canada

2. Interior Convective Film Coefficients for Condensation Analysis of Fenestration Systems

Robert Abdallah, P.E., Monica Chen and Cheryl Saldanha, P.E., Simpson Gumpertz & Heger, New York, NY

3. A Python Framework for Parametric Multizone Airflow Modeling

Jason W. DeGraw, Ph.D., Member and Prateek Shrestha, Ph.D., Associate Member, Oak Ridge National Laboratory, Oak Ridge, TN

9:10 AM - 10:10 AM
Seminar 2 (Intermediate)

Passive Survivability and Resiliency I

Chair:

Rapidly changing climate and weather patterns are placing new structural and thermal stresses on buildings, and effective responses are needed to maintain building structural integrity, thermal function and community-wide health, safety and economic resilience. This session explores new evidence highlighting the need for improved envelope construction in warming Arctic climates; new methods to quantify the ability of energy efficiency measures to provide thermal resilience during weather-related power outages; and the intersection of building-level energy resilience and community resilience with respect to continuity in business functions and food access, again during interruptions to grid power.

1. Building Durability in Extreme Climates

Robbin Garber-Slaght, P.E., Associate Member¹, Kaufman Zoe², Tanushree Charan³ and Conor Dennehy¹, (1)Cold Climate Housing Research Center - National Renewable Energy Laboratory, Fairbanks, AK, (2)National Renewable Energy Lab, Golden, CO, (3)National Renewable Energy Laboratory, Golden, CO

2. Synergies between Energy Efficiency and Resilience

Eliza Hotchkiss, HBDP and BEMP¹, Tianzhen Hong, Ph.D., Fellow ASHRAE² and Ellen Franconi, Ph.D., BEMP, Member³, (1)NREL, Golden, CO, (2)Lawrence Berkeley National Laboratory, Berkeley, CA, (3)Pacific Northwest National Laboratory, Richland, WA

3. A Building Science Approach to Measuring Community Energy Resilience

Lino Sanchez¹, Paul Mathew, Ph.D., Member¹, Luis Fernandes, Ph.D.¹ and Sang Hoon Lee², (1)Lawrence Berkeley National Laboratory, Berkeley, CA, (2)Lawrence Berkeley National Laboratory, United States of America

9:10 AM - 10:10 AM
Seminar 3 (Intermediate)

Unmet Hours --LIVE!

Chair: Aaron Boranian, Associate Member, 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?

Wednesday, November 10, 10:30 AM - 12:00 PM
Seminar 4 (Intermediate)

Modeling for Energy, Carbon and Cost

Chair:

New tools for the evaluation and forecasting of building energy consumption, carbon emissions, and costs associated with their mitigation are emerging rapidly. This session first presents the Cambium tool, designed by NREL to forecast U.S. electrical sector performance under diverse scenarios, and its integration with EnergyPlus; next explores new features in PNNL's Commercial Building Energy Asset Score that recommend energy- and carbon-saving retrofits for individual existing buildings; and third, introduces new cost evaluation resources compiled by Glumac Inc. to inform the selection of building energy efficiency measures, increasing their chances of inclusion in final designs.

1. Using the Cambium Database in Conjunction with Existing Building Modeling Tools to Evaluate Future Emissions

Elaina Present, Noel Merket, P.E., Scott Horowitz, Eric Wilson and Pieter Gagnon, National Renewable Energy Laboratory, Golden, CO

2. Approximating Measure Level Carbon Savings with Building Energy Asset Score

Juan Gonzalez Matamoros and Sarah Newman, Ph.D., Pacific Northwest National Laboratory, Richland, WA

3. The Cost of Multifamily Energy Efficiency in Oregon

Katherine Anderson, Glumac, Portland, OR

10:30 AM - 12:00 PM
Seminar 5 (Intermediate)

Occupant Behavior & Comfort

Chair:

In the wake of increased occurrences of heat waves, the first presentation looks at methodologies for modeling a building's thermal resilience with occupant behaviors to analyze six different behaviors and their impacts on thermal resilience using heat index (HI) and Standard Effective Temperature (SET). The second presentation analyzes two case studies for two LEED Platinum and Living Building Certified projects by covering aspects among the projects that affect occupant behavior. The last presentation offers a comprehensive overview of how occupant behavior affects indoor environmental quality with a focus on human health, comfort, and performance.

1. Exploration of Behavioral Measures to Improve Thermal Resilience in Residential Buildings during Heatwaves

Lishan Niu, South China University of Technology, Guangzhou, China

2. Occupant Behavior & Comfort

Erica McBride¹ and Shruti Borle, Associate Member², (1)Architectural Nexus, Sacramento, CA, (2)Architectural Nexus, Salt Lake City, UT

3. Advancing Human Outcome Analytics in Office Buildings to Build Confidence in Indoor Environmental Quality Investment

Kevin Keene, Pacific Northwest National Laboratory, Richland, WA

10:30 AM - 12:00 PM
Seminar 6 (Intermediate)

The Pursuit of More Foundational Data: Benchmark Dataset Development and Applications

Sponsor: 4.7 Energy Calculations, 7.6 Building Energy Performance

Chair: Lieko Earle, Ph.D., National Renewable Energy Laboratory, Golden, CO

The dearth of research-grade datasets from real buildings has been a stubborn barrier in the field of building science. It significantly limits our analysis capabilities but broad-scale instrumentation efforts are very resource-intensive. A new, collaborative effort between four National Laboratories and funded by the U.S. DOE seeks to address this need through 1) collecting, curating, and making publicly available high-resolution data from a small number of buildings that have broad applicability to a variety of high-impact use cases, and 2) developing an end-to-end, extensible framework to design, describe, and archive building data for maximum impact.

1. Data-Driven Strategic Approach to Reducing Energy and Emissions in Buildings

Harry Bergmann, U.S. Department of Energy, Washington, DC

2. Designing Field Data Collection: Mapping Use Cases to Dataset Needs

Lieko Earle, Ph.D., National Renewable Energy Laboratory, Golden, CO

3. New and Existing Data Collection Efforts

Piljae Im, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

4. Metadata Schema and Dataset Representation

Tianzhen Hong, Ph.D., Fellow ASHRAE, Lawrence Berkeley National Laboratory, Berkeley, CA

5. Data Hosting and Management: The Data Portal

Vikas Chandan, Ph.D., Pacific Northwest National Laboratory, Richland, WA

Wednesday, November 10, 1:40 PM - 3:10 PM
Seminar 7 (Intermediate)

Intelligent Building Operations

Chair:

This session explores the connection between buildings and various sources of transient data they generate that can be used to improve their operations. First, presenters will discuss the accuracy of self-reported energy consumption from power distribution units (PDUs) commonly used in data centers. Next, presenters will discuss a simulation study that optimized night setback control for space heating loads, energy use, and emissions for a school and office building in Montreal, Canada. Finally,

presenters will discuss how data from smart watches can be used to characterize occupant's well-being and improve indoor environmental quality (IEQ).

1. How Accurate Is the Self-Reported Energy Consumption of Connected Devices?

Anay Waghale and Michael Poplawski, P.E., Pacific Northwest National Laboratory, PORTLAND, OR

2. Optimization of Night Setback Control for Thermal Load, Energy and GHG Emissions KPIs

Pedro Guaraldi, P.Eng., Student Member, Bouthillette Parizeau Inc., Montréal, QC, Canada

3. How Might Data from Wearable Devices Be Used to Improve Indoor Environmental Quality in Buildings?

Belal Abboushi, Ph.D., Sarah Safranek and Yan Chen, Ph.D., Pacific Northwest National Laboratory, Portland, OR

1:40 PM - 3:10 PM

Seminar 8 (Intermediate)

Thermal Resilience Modeling and Analysis to Inform Building Design and Strategy for Improving Occupant's Health in Buildings

Sponsor: MTG.OBB Occupant Behavior in Buildings, 2.10 Resilience and Security

Chair: Tianzhen Hong, Ph.D., Fellow ASHRAE, Lawrence Berkeley National Laboratory, United States of America

With climate change, extreme weather events have become more frequent and intense. How to design, operate and retrofit our buildings to provide a resilient environment for occupants is an essential topic. The seminar includes four diverse but integrated talks covering methods, tools, data and analysis to characterize and evaluate thermal resilience of occupants in buildings, aiming to inform strategies and policy on climate resilience of the built environment, as well as nexus of building energy efficiency and thermal resilience.

1. CAL-Thrives: A California Toolkit for Heat Resilience in Underserved Environments

Max Wei, Ph.D., Lawrence Berkeley National Laboratory, Berkeley, CA

2. Calculation and Reporting of Resilience Metrics in Energyplus

Xuan Luo, LBNL, United States of America, Berkeley, CA

3. International Energy Agency Annex 80: Resilient Cooling of Buildings

Ronnen Levinson, Ph.D., Lawrence Berkeley National Laboratory, United States of America

4. Analysis of the Ecobee Smart Thermostat Dataset to Inform Planning of Rolling Power Outages

Tianzhen Hong, Ph.D., Fellow ASHRAE, Lawrence Berkeley National Laboratory, Berkeley, CA

1:40 PM - 3:10 PM

Seminar 9 (Intermediate)

Urban Scale Modeling I

Chair:

This session delves into urban building energy modeling (UBEM). Presentation 1 discusses a process used to create a preliminary energy model of almost every U.S. building. The second presentation talks about UBEM for a small city, which was used to establish a tiered building retrofit program. The third presentation discusses an approach which uses random forest predictive modeling on pre-generated simulation results and Commercial Building Energy Consumption Survey (CBECS) to estimate energy use by end use for different use types and energy savings potential for common retrofit technologies for national building stock data.

1. Data-Driven Approach for Urban Energy Modeling to Support Energy Efficiency Planning

Kevin Keene, Pacific Northwest National Laboratory, Richland, WA

2. Using Urban Building Energy Modeling to Meet Emissions Reduction Targets in a Small American City

Zachary Berzolla, Member, Massachusetts Institute of Technology, Cambridge, MA

3. Expanding the Scale of Urban Building Energy Modeling

Joshua New, Member¹ and Brett Bass², (1) Oak Ridge National Laboratory, Knoxville, TN, (2) Oak Ridge National Laboratory, Oak Ridge, TN

Wednesday, November 10, 3:30 PM - 5:00 PM

Panel 1 (Intermediate)

ASHRAE Standard for Evaluating Ruleset Implementation in Building Performance Modeling Software

Sponsor: SPC 229P, SSPC 90.1

Chair: Amir Roth, US Dept. of Energy

Energy modeling, increasingly used for code and beyond-code compliance using rulesets like ASHRAE Standard 90.1 Performance Rating Method (Appendix-G), is complex, error-prone and currently requires manual verification. This seminar discusses ASHRAE Standard 229P, which will establish a BEM tool and ruleset independent framework to automatically verify the implementation of modeling rulesets. The Standard will facilitate the automation of submittal reviews and improve the consistency of compliance outcomes thereby reducing the burden on rating authorities and jurisdictions that adopt performance-based codes. Initially, Standard 229P will focus on Appendix-G, but can be easily adapted for other rulesets (ie: RESNET-HERS, CA-ACM).

1. Overview of ASHRAE Standard 229P

Supriya Goel, Pacific Northwest National Laboratory

2. Development of RMR

Jason Glazer, P.E., Member, GARD Analytics, Inc., Arlington Heights, IL

3. Development of RMR Tests

Maria Karpman, BEMP, Member, Karpman Consulting, Glastonbury, CT

4. Development of RCT

James McNeill, Pacific Northwest National Laboratory

5. Performance Based Codes

Michael Rosenberg, Fellow ASHRAE, Pacific Northwest National Laboratory, United States of America

3:30 PM - 5:00 PM

Seminar 10 (Intermediate)

CFD Applications for Architectural Decision Making

Chair:

Computational fluid dynamics (CFD) is a long-established, but often avoided, analysis tool for building airflow patterns. CFD has been perceived as a tool with a steep learning curve perhaps best reserved for specialized situations. The Covid pandemic is such a situation, and the first presentation addresses the use of CFD to model Covid mitigation in an office setting. The second presentation demonstrates the use of CFD to expose synergies between design disciplines relative to emerging HVAC system approaches. The third presentation explores the integration of CFD modelling into the mainstream architectural design process.

1. A Comparison of Covid-19 Mitigation Alternatives in a Typical Open Office Setting Using CFD Modeling

Thomas Squillo, P.E., Member, Environmental Systems Design, Inc., Chicago, IL

2. Improved Restaurant Air Quality with Corresponding Energy Efficiency Gains

Steven Forrester, P.E., BCxP and BEMP, Associate Member and Michael Daly, P.E., Associate Member, DMA Engineering, Golden, CO

3. Evaluation of a Framework for the Integration of CFD into the Early Stages of Architectural Design Using Delphi Method

Soo Jeong Jo¹ and James Jones, Ph.D.², (1) Louisiana State University, Baton Rouge, LA, (2) Virginia Tech, Blacksburg, VA

3:30 PM - 5:00 PM

Seminar 11 (Intermediate)

Modeling Existing Buildings

Chair:

This session covers multiple topics related to analysis of existing buildings. The first presentation discusses the importance of operation data and how year 2020 was an anomaly and can provide insights that can lead to more accurate holiday and weekend occupancy and equipment profiles. The second presentation talks about using Bayesian inference for parameter identification in building energy modeling for existing buildings. The third presentation discusses challenges with modeling historic existing buildings, providing an overview of the many enclosure-related applications for computer modeling in the renovation of historic buildings.

1. 2020 Operational Data Is Gold

Alex Lowrie, Little Diversified Architectural Consulting, Charlotte, NC

2. Guideline of Parameter Identifiability Analysis for Bayesian Inference of Building Energy Model

Dong Hyuk Yi, Ph.D. and Cheol-Soo Park, Ph.D., Seoul National University, Seoul, Korea, Republic of (South)

3. An Overview of Building Energy Modeling Enclosure-Related Applications in Historic Building Renovations
Abigail Anderson, Simpson Gumpertz & Heger, Boston, MA

Thursday, November 11

Thursday, November 11, 9:10 AM - 10:10 AM
Debate (Intermediate)

We Currently Have all the Tools Necessary to Design Resilient and Healthy Buildings

Chair: Walter Grondzik, P.E., Fellow Life Member, Mr, Muncie, IN

Join us for a rousing Oxford-style debate on the hypothesis that we currently have all the tools needed to design buildings that are simultaneously healthy and resilient. Since health and resilience are relative newcomers to the array of expected building performance outcomes the question of design tools seems a fair one to explore at this conference. A proponent team will make the case “for” the proposition; an opponent team will make the case “against” the proposition. You—the audience—will determine which side carries the day.

9:10 AM - 10:10 AM
Seminar 12 (Intermediate)

Modeling Advances II

Chair:

This session conveys recent developments that have been made for simulation of novel technology and controls. First, presenters will discuss simulation and measured data for the EMPOWER smart wall that combines thermal storage and active insulation systems via chilled water connections and advanced power electronics. Second, presenters discuss new CBECC-Res capabilities for simulating load shifting potential of demand response heat pump water heaters. Finally, presenters discuss a new DX cooling coil model in EnergyPlus that can provide precise control over temperature and humidity simultaneously.

1. Empower Wall Cooling Performance Evaluation Based on Building Energy Simulation and Measurement Data
Sungkyun Jung, Ph.D., Piljae Im, Ph.D., Member, Borui Cui, Ph.D. and Jin Dong, Ph.D., Member, Oak Ridge National Laboratory, Oak Ridge, TN

2. Simulating Demand Response Heat Pump Water Heaters for California Code Compliance
Aaron Boranian, BEMP, Associate Member¹ and Ben Larson², (1) Big Ladder Software, Denver, CO, (2) Larson Energy Research, Menomonie, WI

3. A New DX Coil Model with Subcool and Reheat Modes in Energyplus
Lixing Gu, Ph.D., P.E., Member, Florida Solar Energy Center, Cocoa, FL

9:10 AM - 10:10 AM
Seminar 13 (Advanced)

Optimizing Buildings for Zero Carbon Lifetime Operations

Chair: Jamy Bacchus, P.E., Member, ME Engineers, Denver, CO

This session is a follow-up to our 2020 ASHRAE BPAC session: 30-yr GHG Forecasts Using Marginal and Average Emissions, where we reviewed office buildings' lifetime emissions using NREL's hourly Cambium data for multiple cities. We will now attempt to minimize the buildings' operational carbon by employing various strategies including electrification, onsite renewables, load shifting and battery storage. Inevitably some regional electrical grids and buildings will have better alignment with 24/7 options for low carbon energy while others will struggle with limited onsite resources and a carbon intensive grid. We will apply NREL's ZEB 2.0 methodology to our zero carbon goals.

1. Optimizing Buildings for Zero Carbon Lifetime Operations: Intro
Caitlin Anderson, P.E., Member, ME Engineers, Denver, CO

2. Optimizing Buildings for Zero Carbon Lifetime Operations: Onsite Renewables
Sedighehsadat Mirianhosseinabadi, Ph.D., ME Engineers, Golden, CO

3. Optimizing Buildings for Zero Carbon Lifetime Operations: Storage
Jamy Bacchus, P.E., BEMP, Member, ME Engineers, Denver, CO

Thursday, November 11, 10:30 AM - 12:00 PM

Panel 2 (Intermediate)

Data Exchange Mechanisms for Design and Analysis

Sponsor: SPC 229P

Chair: Supriya Goel, Pacific Northwest National Laboratory

Data exchange mechanisms, such as gbXML, BDE, RMR, and BuildingSync define data schemas for representing building data for specific purposes. The schemas allow data to be easily exchanged between users and software. The schemas facilitate the use of multiple analytical tools and minimize manual effort involved in mapping and transforming data across multiple tools and workflows. This panel introduces these schemas, discuss use-cases, and highlight efforts to improve data exchange. A moderated discussion addresses the merits and challenges associated with data exchange mechanisms and how these can streamline the workflow of design, analysis, code compliance, and energy audits.

1. Data Exchange for Design Using Gbxml

Stephen Roth, Carmel Software Corporation

2. Overview of Building Data Exchange

Sagar Rao, Member, Affiliated Engineers, Inc., Madison, WI

3. Ruleset Model Report for Compliance Reporting and Verification

Jason Glazer, P.E., Member, GARD Analytics, Inc., Arlington Heights, IL

4. Buildingsync Schema for Audit Data

Nicholas Long, P.E., Member, National Renewable Energy Laboratory, United States of America, Golden, CO

10:30 AM - 12:00 PM

Seminar 14 (Intermediate)

Cost Effective and Efficient Modelling for Design Support and Facilitation

Chair:

The ability to provide input to design teams in a cost effective manner using a variety of modelling tools when it is most needed and most likely to impact the project outcomes is of great interest to many stakeholders across the industry. This session presents lessons learned in the development of analysis tools intended for architects, a unique application of parametric modelling to a portfolio of buildings and lessons learned in the development of standardized energy modelling process for a university campus.

1. Standardizing Low Energy Buildings in Higher Education

Ethan Heil, P.E., Member, University of Virginia, Charlottesville, VA

2. Rapid Parametric Design Analysis for a Portfolio of Similar Buildings

Jeanie Chan, P.Eng., BEMP¹, Andrea Frisque, Dr. Ing., P.Eng., BEMP², Luisa Drope³ and Oscar Valdes³, (1)Stantec, Vancouver, BC, Canada, (2)BCIT, Vancouver, BC, Canada, (3)Stantec Consulting Ltd., Vancouver, BC, Canada

3. Lessons from Making Software for Architects

Andrew Corney, Trimble, London, United Kingdom

10:30 AM - 12:00 PM

Seminar 15 (Intermediate)

Passive Survivability and Resiliency II

Chair:

Strategies that allow buildings to remain thermally survivable and structurally intact during power outages and natural disasters also have the potential to diminish energy needs, improve durability, and reduce costs during normal operation. Continuing the themes of Passive Survivability and Resiliency I, this session evaluates the ability of dynamic glazing to diminish summer solar heat gain in highly glazed office buildings; explores the roles of advanced passive heating and cooling design in accelerating progress toward fully decarbonized space conditioning; and proposes new criteria for passive survivability, structural integrity, and building functionality following extreme natural and human-caused events.

1. Improving Thermal Resilience with Dynamic Glazing: A Case Study

Ranojoy Dutta, BEMP and HBDP, Associate Member, 1529, SAN JOSE, CA

2. The Role of Advanced Passive Systems in the Rapid Decarbonization of Space Heating and Cooling

Alexandra R. Rempel, Ph.D.¹ and Sandipan Mishra, Ph.D.², (1)University of Oregon, Eugene, OR, (2)Rensselaer Polytechnic Institute, Troy, NY

3. Design of Building Systems for Enhanced Resilience

Scott Campbell, Ph.D., P.E., Member, National Ready Mixed Concrete Association, Boston, MA

Thursday, November 11, 1:30 PM - 3:30 PM

2021 LowDown Showdown Modelling Competition

Chair: John Bynum, Ph.D., Member, ARUP, Dublin, Ireland

The 2021 LowDown Showdown model building will be located in Puerto Rico. Participating Teams will design a 75,000 sf, residential care center located at a site on the island to be chosen by each team. The building will contain residences, offices, amenities and clinical spaces.

TEAMS:

1. Agua Viviente
2. Al-Khwarizmi's Team
3. C +VE (Carbon Positive)
4. C.R.E.A.M.
5. Faro de Luz
6. MARKEL
7. Northern Exposure
8. Shunya Power
9. The Carbonbusters
10. The Planeteers

Friday, November 12

Friday, November 12, 9:10 AM - 10:10 AM

Seminar 16 (Intermediate)

Advancements in Controls, Airflow Modelling and Operations

Chair:

This session covers a variety of topics including advanced lighting controls for a factory building using an Artificial Neural Network (ANN) model based on detailed physics based modelling, calibrated airflow modelling of an existing building for energy analysis using co-simulation, and the development of a continuous improvement process for pandemic resilience focusing on operational strategies.

1. Streamlined Process for Improving Pandemic Resilience in the Built Environment

Nancy McClellan, MPH, CIH, CHMM, American Industrial Hygiene Association, Falls Church, VA

2. Empirical Validation of a Combined Multizonal Airflow Network, Contaminant Dispersion, and Building Energy Model of an Existing Building

Prateek Shrestha, Ph.D., Associate Member, Jason DeGraw, Ph.D., Member, Piljae Im, Ph.D., Member, Yeonjin Bae, Ph.D., Associate Member, Seungjae Lee, Ph.D., Associate Member and Sungkyun Jung, Ph.D., Oak Ridge National Laboratory, Oak Ridge, TN

3. Deep Deterministic Policy Gradient-Based Lighting Control for a Factory Building

Young-Sub Kim and Cheol-Soo Park, Ph.D., Seoul National University, Seoul, Korea, Republic of (South)

9:10 AM - 10:10 AM

Seminar 17 (Intermediate)

Climate Resilient Design for Passive House

Chair: Elsa Mullin, Thornton Tomasetti, Portland, ME

With climate change resulting in increased heat and precipitation, coastal flooding, sea level rise and other hazardous events, the built environment is experiencing increased vulnerability, damage and disruption. Incorporating climate resilient design not only protects critical project components from current hazards but helps prepare for and adapt to future challenges. This session will

review three Passive House case studies that incorporate both passive survivability and climate resilient design solutions. Participants will be shown a framework for identifying opportunities for risk-informed, future-focused resilient and sustainable strategies that maximize co-benefits and future climate adaptation and reduce downtime following a hazardous event.

1. Climate Resilient Design for Passive House

Julie Pietrzak, P.E., Thornton Tomasetti, New York, NY

2. Climate Resilient Design for Passive House II

Elsa Mullin, Thornton Tomasetti, Portland, ME

9:10 AM - 10:10 AM
Seminar 18 (Intermediate)

Urban Scale Modeling II

Chair:

This seminar discusses how changes in rooftop solar reflectivity and thermal emissivity affect annual building utility costs across 15 climate zones. The second presentation describes an approach to assessing the energy resilience of an urban district against various anticipated threat conditions. The third presentation delves into building-to-grid interaction through an analysis of the energy and cost performance of a power management system in a connected community using an urban scale building energy modeling framework. Results demonstrate how a connected community can effectively reduce the demand on the grid.

1. The Impact of Optimal Rooftop Radiative Property Combinations on Urban Airshed: Simulations for 15 Climate Zones in the U.S.

Jyothis Anand, Student Member and David Sailor, Arizona State University, Tempe, AZ

2. Modeling the Resilience of Interacting Energy Networks at Urban Scale

Michael O'Keefe, Big Ladder Software, Denver, CO

3. A Power Management System Approach in Connected Communities by Using an Urban Scale Building Energy Modeling Framework

Yunyang Ye, Ph.D., Associate Member¹, Xuechen Lei, Ph.D., Associate Member², Jeremy Lerond, Affiliate² and Jian Zhang, Ph.D., Member³, (1)Pacific Northwest National Laboratory, PORTLAND, OR, (2)Pacific Northwest National Laboratory, Richland, WA, (3)Pacific Northwest National Laboratory, United States of America

Friday, November 12, 10:30 AM - 12:00 PM
Seminar 19 (Intermediate)

District Energy System Modeling: Methods, Tools and Case Studies

Chair: Jordan Clark, Ph.D., Member, Ohio State University, Columbus, OH

As we move toward thinking of and operating buildings as constituents of larger energy systems, modeling techniques and associated software must adapt. In this seminar we will present the results of a recently completed US Department of Energy-sponsored project concerned with district energy system modeling. This includes development and demonstration of performance of low-order building models, development of a 4th and 5th generation district energy system model, implementation of these models in newly developed URBANopt software, and validation on a portion of the Ohio State campus. Model performance and next steps will then be discussed.

1. Community and District-Scale Energy Modeling Using URBANopt

Ben Polly, NREL, Golden, CO

2. District Energy Modeling Case Study of a Portion of Ohio State Campus

Amy Allen, P.E., Associate Member, National Renewable Energy Laboratory, Golden, CO

3. Low Order Building Model Development for Use in Urban-Based Analyses

Vahid Ahmadi Kalkhorani, Student Member, Ohio State University, Columbus, OH

4. Decarbonization of District Energy System in the United States

Valentin Gavan, Ph.D., Engie Labs, Paris, France

10:30 AM - 12:00 PM
Seminar 20 (Intermediate)

Modeling for the Future

Chair:

The first presentation in this seminar, from the National Centers for Environmental Information analyzes whether the changing climate conditions warrant updating climate normals for building performance simulation programs and how they impact a prototype building. The second presentation summarizes the findings of a recently completed study that explored the impact of switching from existing meteorological datasets for data from 2005 and earlier to recent or future-looking datasets. The final presentation looks at generated anthropogenic heat profiles in urban microclimate models to provide a more accurate estimation of urban air temperature rises during heat waves and their effect on electrical grids.

1. Normal (Climate) Is Changing: How Does That Impact Building Simulation Results?

Drury Crawley, Ph.D., BEMP, Fellow ASHRAE¹ and Linda Lawrie, Member², (1) Bentley Systems, Inc., Washington, DC, (2) DHL Consulting LLC, Pagosa Springs, CO

2. The Future of Weather Files for Building Performance Simulation in New York State

Carrie Brown, Ph.D., Member, Resource Refocus, LLC, Oakland, CA

3. City-Scale Anthropogenic Heating from Buildings during Heat Waves

Xuan Luo¹ and Tianzhen Hong, Ph.D., Fellow ASHRAE², (1) LBNL, United States of America, Berkeley, CA, (2) Lawrence Berkeley National Laboratory, Berkeley, CA

10:30 AM - 12:00 PM
Seminar 21 (Intermediate)

Modelling Advances III

Chair:

Modelling Advances is a popular topic at this conference. This third session of that name includes three presentations that focus on macro-scale issues that address the utility of modelling as a design tool. Collectively, this session demonstrates the evolution and maturation of energy simulation. The first presentation deals with updates to the thermal fabric test cases in ASHRAE Standard 140, the gold standard for modelling tool accuracy. The second presentation reports on new data regarding building space load profiles. The third presentation presents the results of a large-scale study of end-use energy consumption categories.

1. Update of ASHRAE Standard 140/Bestest Thermal Fabric Modeling Test Cases

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

2. A New Database of Space Specific Schedules and Loads for Modeling Building for Code Compliance

Yunyang Ye, Ph.D., Associate Member¹, Wooyoung Jung, Ph.D.¹, Jian Zhang, Ph.D., Member² and Yan Chen, Ph.D.³, (1)Pacific Northwest National Laboratory, PORTLAND, OR, (2)Pacific Northwest National Laboratory, United States of America, (3)Pacific Northwest National Laboratory, Portland, OR

3. Development and Verification of Boiler Plant Control Sequences for a Primary-Only Condensing Boiler Plant, Based on ASHRAE RP-1711

Karthikeya Devaprasad, Associate Member and Yan Chen, Member, Pacific Northwest National Laboratory, Richland, WA

4. End-Use Analysis of ASHRAE Standard 90.1 2019 (On-Demand Only)

Chitra Nambiar, Associate Member, PNNL, United States of America