



SimBuild 2012

5th National Conference of IBPSA-USA
August 1-3, 2012 – Madison, WI

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Conference Program

PRE-CONFERENCE WORKSHOPS

MONDAY JULY 30, 2012

Registration 7:30-8:00 am

MADISON CONCOURSE HOTEL

Workshops 8:00 am–5:00 pm

IES Virtual Environment –
Advanced Building Systems
Modeling: Loads, HVAC Systems,
and Energy

SENATE ROOM A

Introduction to TRNSYS

UNIVERSITY ROOM CD

Building Energy Modeling with
OpenStudio

UNIVERSITY ROOM AB

TUESDAY JULY 31, 2012

Registration 7:30-8:00 am

MADISON CONCOURSE HOTEL

Workshops 8:00 am–5:00 pm

IES Virtual Environment –
Advanced Building Systems
Modeling: Loads, HVAC Systems,
and Energy

SENATE ROOM A

Advanced HVAC Simulation With
EnergyPlus

UNIVERSITY ROOM AB

Workshops 8:00 am–12:00 Noon

eQUEST/DOE-2 INTRO

UNIVERSITY ROOM CD

Workshops 1:00 pm–5:00 pm

eQUEST/DOE-2 ADVANCED

UNIVERSITY ROOM CD

TUESDAY JULY 31, 2012

Tour 1: Fire Station 12 / Holy Wisdom Monastery

<http://www.cityofmadison.com/fire/stations/station12.cfm>

<http://www.buildinggreen.com/auth/article.cfm/2010/4/12/Benedictine-Monastery-Receives-Highest-LEED-Score/>

Depart Downtown at 2:30 pm
Arrive at Holy Wisdom at 3:00 pm
Tour until 4:00 pm
Depart at 4:00 pm
Arrive at Fire Station 12 at 4:30pm
Tour until 5:30pm
Depart at 5:30pm
Return Downtown at 6:00pm

Tour 2: Green Technology Training & Enterprise Center

<http://www.aeieng.com/solutions/G-TTEC/index.php>

Depart Downtown at 2:45 pm
Arrive at GTTEC at 3:45 pm
Tour until 5:00 pm
Return Downtown at 6:00pm

To reserve your spot in a tour:
email simbuild2012@gmail.com

Welcome Party 6:00–8:00 pm

Please join us to check in early and mingle with fellow conference attendees in a relaxed setting overlooking Lake Mendota. Light hors d'oeuvres will be served. A cash bar will be available.



*The Alumni Lounge at The Pyle Center
702 Langdon Street Madison, WI 53706
Front Desk: 608-262-1122*

WEDNESDAY AUGUST 1, 2012

Registration 7:30-8:00 am

MADISON CONCOURSE HOTEL

Opening Session 8:00-9:10 am

WISCONSIN BALLROOM

Welcome

Timothy McDowell, Conference Chair
Michael Wetter, President IBPSA-USA

Plenary



Professor Don Greenberg
From Mickey Mouse to Building Simulation

Two cultures, the entertainment industry and the mechanical engineering industry, have much more in common than meets the eye. This brief presentation will pictorially show the similarities and solutions to the same type of problems and hopefully introduce some novel ideas for improving building simulation technology. Dr. Greenberg joined the Faculty of Cornell in 1968, with a joint appointment in the Departments of Architecture and Structural Engineering. For more than two decades he taught structural concepts and architectural design courses in the architecture department, educating thousands of undergraduate architecture students. He initiated the first computer-aided architectural design studio in the United States in 1984. His early software developed at Cornell influenced the development of many software products still in use today.

Since 1966, Dr. Greenberg has been researching and teaching in the field of computer graphics. During the past 40 years, he has been primarily concerned with research advancing the state-of-the-art in computer graphics and utilizing these techniques as they may be applied to a variety of disciplines. His current computer science research projects involve realistic image generation, parallel processing

algorithms for rendering, new graphical user interfaces, and computer animation. He is now working on new techniques for “sketching input” so that CAD applications can be used in the early conceptual stages of design. He currently leads a major multi-million dollar Department of Energy research project developing techniques for sustainable design in architecture.

Technical Session 1 9:20-10:20 am

Paper Session 1a

WISCONSIN BALLROOM

Real-Time Optimization Strategies for Building Systems: V. Zavala

Simulation-Based Optimization of HVAC Control for Demand Response in Large Commercial Buildings: J. Zhu, L. Shen, R. Yin, Y. Lu

Multi-Objective Optimization for Building Retrofit Strategies: E. Asadi

Paper Session 1b

UNIVERSITY ROOM

Mapping HVAC Systems for Simulation in EnergyPlus: M. Basarkar, J. O'Donnell, P. Haves, K. Settlemyre, T. Maile

Development of a Flexible Multizone Multifamily Building Simulation Model: M. Malhotra, P. Im

Creating Zoning Approximations to Building Energy Models Using The Koopman Operator: M. Georgescu, B. Eisenhower, I. Mezić

Paper Session 1C

MADISON BALLROOM

An Investigation to Optimize the Mechanical Systems to Meet Comfort Criteria in a Large Atrium: A. Marston, E. Yazdanshenas, O. Baumann

Towards Better Modeling of Residential Thermostats: B. Urban, D. Elliott, and O. Sachs

Application and Assessment of Stochastic Occupant Models in EnergyPlus: S. Dutton

Break 10:20-10:40 am

CAPITOL BALLROOM A

Technical Session 2 10:40-12:00 Noon

Paper Session 2a

SENATE ROOM

Window-Wall Interface Correction Factors: Thermal Modeling of Integrated Fenestration and Opaque Envelope Systems for Improved Prediction of Energy Use: M. Bhandari, R. Srinivasan

Virtual Mock-up Modeling as Study Model of Building Envelope Performance and Design: M. Maing

Thermal Performance of Three-Dimensional Building Envelope Assemblies and Details for Improving the Accuracy of Whole Building Performance Simulation: C. Cianfrone, N. Norris, P. Roppel

The Database of Egyptian Building Envelopes (DEBE): A Tool for Building Energy Simulations: O. Wanas, S. Attia

Paper Session 2b

UNIVERSITY ROOM

Swimming Pool Hall HVAC Modelling, Simulation and End of Setback Artificial Neural Network Prediction: A Detailed Case Study: A. Costa, R. Sterling, M. Keane, T. Messervey

Control-Oriented Modeling and Calibration of Building Energy Models Using Modelica: B. Eisenhower

Automated Calibration of Design Stage Energy Models for Use in Building Operations: M. Munshi, B. Coffey, M. Munshi, J. An

Comparison of Two Different Simulation Programs While Calibrating the Same Building: S. Singh, A. Martinez, K. Kensek, M. Schiler

Invited Session 2c

MADISON BALLROOM

Jason Glazer

ASHRAE SPC 209 Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings

This session will be an informative overview of how the new standard will define minimum requirements for providing energy design assistance using building energy simulation and analysis. Jason Glazer, chair of SPC 209, will present on the standard and field questions from the audience. Jason Glazer is the primary developer of many of the utility programs distributed with EnergyPlus and has also developed the tabular reports, utility tariff, and life-cycle costing portions of EnergyPlus. He currently is a voting member of SSPC 90.1 and chair of the Energy Cost Budget subcommittee. He recently initiated the formation of the new ASHRAE Standard 209 Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings and is currently serving as chair. Mr. Glazer founded the BLDG-SIM mailing list and operates the onebuilding.org web site and mailing lists. He has performed several ASHRAE research projects in the past and is currently working on 1651-RP related to finding maximum technically achievable energy targets for commercial buildings.

Dan Katzenberger

USGBC/GBCI, behind the black curtain

This session will allow people to understand who is responsible for LEED and the LEED Certification Reviews, and gives a brief overview of the guiding principles and certification processes surrounding the LEED Rating Systems. During this presentation, Dan Katzenberger will give some tips and tricks that are not commonly known throughout the energy modeling community. Dan has been involved in energy modeling for 20 years, starting with DOE2.1d doing energy design assistance models for utility clients as part of their

demand side management programs. He has experience doing so in both Missouri and Minnesota, each for five years. He has also designed mechanical systems for a large and diverse set of commercial building clients. In addition, he served on the USGBC EA-TAG for three years (helping to support LEED v2.2 and create LEED v2009) before joining USGBC/GBCI as an employee in October of 2010 as a LEED Certification Reviewer on the Energy Team. Currently, he reviews and performs quality control for the Energy and Atmosphere and some of the Indoor Environmental Quality LEED project team submittals.

Lunch 12:00 Noon-1:30 pm

ON YOUR OWN, PLEASE SEE LIST OF AREA RESTAURANTS

Technical Session 3 1:30-2:50 pm

Paper Session 3a

SENATE ROOM

Comparative Analysis of Air-To-Air Heat Pump Models for Building Energy Simulation: H. Blervaque, S. Filfi, P. Stabat, C. Muresan, D. Marchio

An Evaluation of the Effectiveness of Pre-Cooling in a Hybrid Ground Source Heat Pump: A. Pertzborn, G. Nellis, S. Klein

Feasibility of Combined Solar/Heat Pump Systems for Net-Zero Buildings: G. Marsicek

The Energy Saving Potential of Membrane-Based Enthalpy Recovery in VAV System for Commercial Office Buildings: L. Wang, P. Haves, J. Breshears

Paper Session 3b

UNIVERSITY ROOM

Zonal Approach to Dynamic Modeling of Thermally Stratified Spaces: T. Moore

Streamlined Multizone Model Creation: J. DeGraw, W. Bahnfleth, A. Musser

Application of New Natural Ventilation System Design Tools to a School Building: S. Emmerich, W. Dols, B. Polidoro

Wind-Driven Natural Ventilation in a Low-Rise Building: G. Bitsuamlak



Invited Session 3c

MADISON BALLROOM

Simulated vs Actual

Much ado has been made concerning the differences between the simulated and actual performance of buildings, especially high performance buildings. The panelists will present current work on reconciling these differences and calibrating models and lead a discussion of causes of the differences and ways of improving the match.

Bryan Eisenhower

Model-based Building Design Considering Uncertainty

Building energy models are constructed using numerous assumptions regarding the actual design, construction, operation, or usage of the building. In this talk we discuss how to rapidly capture and quantify the influence of these assumptions and uncertain model information on its predictions. The method includes sampling the model by varying almost all of its parameters to get bounds on the energy and thermal comfort predictions. The results of these numerical experiments also are also used to identify critical parameters which are most important for calibration, optimization, or model-based failure mode assessment. Bryan Eisenhower is currently the Associate Director of the Center for Energy Efficient Design and Assistant Researcher at the University of California Santa Barbara and an active consultant in the fields of building energy modeling and data analysis. Bryan received degrees from Virginia Tech prior to joining United Technologies Research Center where he developed design and operational tools for energy intensive equipment ranging from jet engines, to fuel cells, transcritical heat pumps, and combined heat and power systems. Bryan received his Ph.D. with a focus in Applied Dynamical Systems from the UCSB and has multiple patents and publications in the field of control and design of complex dynamical and energy systems. His current work and publications is summarized at <http://engineering.ucsb.edu/~bryane/index.html>.

Philip Haves

Use of Simulation to Support Building Operations

The presentation will start by describing a vision of using simulation to link design, commissioning, operation and retrofit and thereby enable accountability for energy performance. The use of building energy simulation to monitor building performance in real time to detect operational faults and other problems will then be described, with examples. The presentation will conclude with a discussion about how this life-cycle approach can start to address the current disconnect between simulated and actual performance. Philip Haves is the Leader of the Simulation Research Group. He has worked on many different aspects of commercial buildings since 1986, with particular interest in simulation and building operations. He is a Fellow of ASHRAE, the immediate past chair of its Technical Committee on Energy Calculations and a former Chair of its Technical Committee on Building Operation Dynamics. He is a past president of

IBPSA-USA, the U.S. affiliate of the International Building Performance Simulation Association. He has a B.A. in Physics from Oxford University and a Ph.D. in Radio Astronomy from Manchester University

Michael Utzinger

Comparing Simulated and Actual Energy Use in Buildings

The simulated and actual EUI of four LEED certified buildings is considered. Differences between how the buildings were programmed to be used, what LEED required for the proposed building simulation and how the buildings were actually occupied are discussed relative to simulated and actual performance. In addition to EUI, performance is scaled to other metrics including annual energy per full time equivalent occupant and annual carbon dioxide emissions per gross area. An associate professor of architecture at University of Wisconsin-Milwaukee, Michael Utzinger began working on simulation models in the late nineteen seventies at the Solar Energy Laboratory, UW-Madison. In addition to teaching he has consulted on a number of LEED and high performance building projects. His experience includes establishing project energy goals (including net zero energy), integrating simulation into the design process and post occupancy evaluation of energy performance.

Break: 2:50 - 3:10 pm

CAPITOL BALLROOM A

Software Demos and Student Posters: 3:10 - 5:10 pm

Software Demos "Speed Dating"

UNIVERSITY ROOM

Each program will get 5 minutes for a sales pitch – then each will be available at tables around the room for the remainder of the session to demo the software.

Student Posters

WISCONSIN BALLROOM

Students will present their on-going research in poster format. The students will be available to explain and discuss their work

Building Tour or Student Reception: 5:10 – 7:00 pm

Student/Employer Reception

WISCONSIN BALLROOM

A reception for students will be held immediately following the poster presentation session. Employers stop by and meet potential new employees and discuss their research projects. Students stay around to meet with potential employers and meet other students working in the same field as you.

Light hors d'oeuvres and soft drinks will be served.

Tour: Wisconsin Institutes for Discovery

MORGRIGE INSTITUTE FOR RESEARCH



<http://discovery.wisc.edu>

http://www.aeieng.com/solutions/UW-Madison_institutes_for_discovery/index.php

Tour starts at 5:30 pm at 330 North Orchard Street (~20 minute walk west from conference)

Tour ends at 7:00 pm

Space is limited – so reserve your spot in a tour to simbuild2012@gmail.com

THURSDAY AUGUST 2, 2012

Registration 7:30-8:00 am

MADISON CONCOURSE HOTEL

Plenary Session: 8:00 – 8:50 am

WISCONSIN BALLROOM

New Software for Compliance with the 2013 California Energy Standards

The California Energy Commission, with support from the California investor owned utilities, is carrying out a major update to the software it provides for performance

compliance with building energy efficiency requirements for both residential and nonresidential buildings. The project features a structure where compliance rules are stored and applied to building descriptions in software modules that are separate from energy simulation modules. The software will be made available under open source licensing to encourage participation in the project by private software vendors and collaboration with other public entities interested in building energy performance calculations. The speakers are principals carrying out the project and will discuss the structure and operation of the software, the rules processing function and a sophisticated new residential energy simulation program.

Bruce A. Wilcox, P.E., Berkeley, CA

Bruce Wilcox is a licensed Mechanical Engineer in the State of California and has a degree in architecture from UC Berkeley. He has spent his entire professional career in the field of building energy efficiency. He started a consulting practice in 1974 specializing in passive and active solar design and construction. He later worked as an energy consultant on architectural design teams for projects ranging in size from single family homes to million square foot offices. He developed significant computer programs for building energy analysis including the California Energy Commission's original CALRES public-domain performance compliance tool. He is prime contractor and project manager for the 2013 California Residential Compliance Software Project.

Charles S. Barnaby, Wrightsoft Corporation, Lexington, MA

Charles S. "Chip" Barnaby is Vice President of Research at Wrightsoft. He focuses on implementation of load calculation, energy simulation, and operating cost methods in Wrightsoft's software products, including the California Simulation Engine (CSE). He is Vice-President of the International Building Performance Simulation Association (IBPSA) and Treasurer of its US affiliate (IBPSA-USA). He is active in ASHRAE, serving on several technical committees and is chair of SPC-205 (Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment). Mr. Barnaby holds degrees in engineering and applied physics from Harvard and architecture from UC Berkeley.

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

Jason Glazer is the primary developer of many of the utility programs distributed with EnergyPlus and has also developed the tabular reports, utility tariff, and life-cycle costing portions of EnergyPlus. He currently is a voting member of SSPC 90.1 and chair of the Energy Cost Budget subcommittee. He recently initiated the formation of the new ASHRAE Standard 209 Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings and is currently serving as chair. Mr. Glazer founded the BLDG-SIM mailing list and operates the onebuilding.org web site and mailing lists. He has performed several ASHRAE research projects in the past and is currently working on 1651-RP related to finding maximum technically achievable energy targets for commercial buildings.

Technical Session 4: 9:00-10:20 am

Paper Session 4a

CAPITOL BALLROOM A

Assessing Thermal Bridges in Commercial Wall Systems: A. Love

A Parametric Study of the Thermal Performance of Double Skin Facades at Different Geographical Locations Using Annual Energy Simulation: E. Pekdemir, R. Muehleisen

Conduction Transfer Functions in TRNSYS Multizone Building Model: Current Implementation, Limitations and Possible Improvements: B. Delcroix, M. Kummert, A. Daoud, M. Hiller

Passivhaus and Net Zero Residential Designs: a Simulation Based Design Process for the Next Generation of Green Homes: M. Soltaniehha, J. Gardzelewski, G. Tan

Paper Session 4b

UNIVERSITY ROOM

Prediction of Urban-Related Perturbations in Climate to be Used in Building Energy Analyses: B. Bueno, L. Norford

Urban Microclimate and Pedestrian Thermal Comfort: Assessment and Application in Urban Planning and Design Practice: J. Huang

Generative Urban Modeling: A Design Tool for Sustainable Cities: T. Rakha, C. Reinhart, J. Jakubiec

Environment Mapping for Fast and Robust Calculation of Indirect Radiant Energy: L. Schumann, D. Greenberg

Invited Session 4c

MADISON BALLROOM

Practitioner Case Studies and Tricks

Interested in knowing how other users have approached those modeling projects like yours? This session will present case studies and user 'tricks' from existing buildings and new construction projects. Practitioners will share their experiences in lighting and energy simulation for whole building and component modeling.

James Shields, HGA

A lead designer in HGA's Milwaukee office, James Shields has been described as "a master of his craft" who focuses on scale, proportion and site to let "the bones of a building express themselves." Working collaboratively with clients, he creates innovative, beautiful and functional architecture. His buildings reflect an elegant simplicity, often known for leading-edge engineering technology, regional materials, and use of day lighting. Additionally, he is an Associate Professor of Architecture at the University of Wisconsin-Milwaukee, where as Exhibitions Curator he has organized more than 25 exhibitions on contemporary architecture in the Upper Midwest. A recognized authority of worship spaces for the Catholic liturgy, he is the author of two books: "The Cities of James Duane Doty," and "Architectural Representation."

Matthew B. Brugman, LEED AP, AEI

Matthew Brugman's experience includes work in areas such as daylighting design, environmental systems, envelope and energy analysis, material selections, and off-grid building design. Recently he also has been developing side-projects involving the display of data and information graphics, developing software tools for climate analysis and utility rate analysis and he enjoys exploring the issues of energy and sustainability for the master-planning of communities. Matthew graduated from the University of Colorado with a Master's in Civil Engineering and is currently a systems analyst at Affiliated Engineers.

Michael J. Witte, Ph.D., GARD Analytics

Dr. Witte is a Principal Engineer at GARD Analytics, Inc. in Arlington Heights, Illinois. He holds a B.S. in Mechanical Engineering from Valparaiso University and a Ph.D. in M.E. from the University of Illinois at Urbana-Champaign. He has led GARD's EnergyPlus activities since 1999, including user support, testing and validation, training, and software development. Dr. Witte has developed and presented more than 40 EnergyPlus training workshops and webinars to more than 650 persons. He has specialized in building energy modeling since 1983, providing user support and training for BLAST, developing software tools based on DOE-2.1E, and applying DOE-2.1E and EnergyPlus in various analyses.

Shanta Tucker, Atelier Ten

Shanta Tucker is an associate director at Atelier Ten and has particular experience with the engineering and design of HVAC systems, as well as modeling and analysis techniques for optimizing energy efficiency of high performance building envelope, mechanical, and electrical systems. Shanta served on the ASHRAE sub-committee to create and write the Building Energy Modeling Professional (BEMP) certification exam. Her professional affiliations include ASHRAE, ASHRAE-NY, the USGBC and IBPSA-USA, for which she will be President starting in August 2012.

Break: 10:20 - 10:40 am

CAPITOL BALLROOM A

Technical Session 5: 10:40 am - 12:00 noon

Paper Session 5a

CAPITOL BALLROOM B

Auto-tune E+ Building Energy Models: J. New, J. Sanyal, M. Bhandari, S. Shrestha

Defaults Data of Thermal and Mechanical Systems Descriptors for Simplified Energy Use Evaluation of Canadian Houses: A. Parekh, C. Kirney
An Interactive Workbench for Monitoring, Identification and Calibration of Building Energy Models: P. Dybskiy, R. Richman

Estimation of Thermal Parameters of Buildings through Inverse Modeling and Clustering for a Portfolio of Buildings: Y. Lee, L. An, R. Horesh, Y. Chae

Paper Session 5b

UNIVERSITY ROOM

Assessment of the Technical Potential of Natural Ventilation in Existing California Commercial Buildings Using Models Derived from a Building Stock Database: S. Brunswick, S. Dutton, C. Banks, P. Haves

Annual Coupled EnergyPlus and Computational Fluid Dynamics Simulation of Natural Ventilation: R. Zhang

Using CFD Simulations to Improve the Modeling of Window Discharge Coefficients: E. Hult, M. Fischer, G. Iaccarino

Coupled EnergyPlus and CFD for Annual Natural Ventilation Simulation: R. Zhang, K. Lam, S. Yao, Y. Zhang

Invited Session 5c

MADISON BALLROOM

Modeling Multiple Buildings; Energy Forecasting and Case Studies

A panel with three energy analysis consultants and one software vendor discuss the current challenges and opportunities in modeling multiple buildings. Each will present case studies and the following conversation will cover the following topics: modeling development phasing to account for growth, creating baselines and benchmarks for comparing existing and new developments, comparing building efficiency to infrastructure efficiency, choosing between centralized or decentralized central plants and modeling thereof, software selection for modeling campuses.

Moderator: Shanta Tucker

Panelists:

Cassie Waddell, P.E., LEED AP, ARUP

Cassie is a mechanical engineer / energy specialist with Arup in San Francisco. Cassie has contributed to numerous projects for mechanical and façade system design and assessment. She has proven success in analysis and simulation as well as stakeholder communication for various scales and types of projects.

Paul Erikson, AEI

As AEI's Sustainable Practice Leader, Mr. Erickson manages the firm's sustainable design services. Mr. Erickson's participation in the design and analysis of high-performance buildings has led to significant experience in mechanical system design, lighting, daylighting, renewable energy, and building performance simulation. This experience follows up his Master's of Science degree from the University of Colorado's Building Systems Program and related research at NREL. Apart from his design efforts, Mr. Erickson has been a presenter at Greenbuild, ASHRAE, and Labs21, and an instructor at the University of Wisconsin.

Nathan Kegel, IES

Nathan has been using simulation software to inform the design process at all stages of the design for more than 10 years. Currently, he aids in the development of simulation tools for architects, engineers, designers, academics, and modelers. Over the course of the past year, he has trained over 500 architects, engineers, and academics on how to use simulation software to aid design at all stages of the design process.

Madhav Munshi, Atelier Ten

As a member of Atelier Ten's environmental design and energy analysis practice Madhav has expertise in building systems optimization, HVAC controls and systems selection. He has also worked closely with Atelier Ten's masterplanning practice, mapping carbon profiles for master plans and projecting future emissions based on economics, efficiency and growth projections. His wide range of project experience includes universities and corporate campuses, healthcare, and commercial high-rise buildings.

Lunch: 12:00 noon – 1:30 pm

On Your Own – Please see list and map of nearby restaurants.

Technical Session 6: 1:30 - 2:30 pm

Paper Session 6a

CAPITOL BALLROOM B

A New Web-Based Climate & Hourly Time-series Data Delivery System Providing Global Support for Precision Modeling and Analyses: C. Khuen

A Framework for Generating Stochastic Meteorological Years for Risk-Conscious Design of Buildings: B. Lee, Y. Sun, C. Paredis, G. Augenbroe

Simulating the Genius Loci of Wind: B. Wang, T. Dogan, C. Reinhart

Paper Session 6b

UNIVERSITY ROOM

Tilted Glazing in Building Simulation and Form-Refining of Complex Facades: W. Ko, M. Schiler, K. Kensek, P. Simmonds

Scripted Building Energy Modeling and Analysis: E. Hale, D. Macumber, K. Benne, D. Goldwasser

New Methods for the Construction and Interpretation of High Dimensional Parametric Building Energy Models: K. Pratt, D. Bosworth

Paper Session 6c

MADISON BALLROOM

All the Ways of Meeting a Target: Calculating a Solution Surface Using GenOpt: B. Coffey, D. Tuhus-Dubrow

Optimization of Typical US HVAC Systems Through Improved Controls: C. Luo, A. Marston, O. Baumann

Modeling HVAC Optimization Control Strategies for High Performance Buildings: P. Wilkinson, C. Olmsted, V. Priolo

Break: 2:30 - 2:50 pm

CAPITOL BALLROOM A

Technical Session 7: 2:50 - 4:10 pm

Paper Session 7a

CAPITOL BALLROOM B

On the Inter-Model Comparison Exercises of Whole Building HAM Simulation Using the BESTEST Building: D. Costola

A Systematic Approach to Hydrothermal Modeling and Compliance with Failure Criteria Using WUFI: P. Mantha

Proposed TRNSYS Model for Storage Tanks with Encapsulated Phase Change Materials: K. D'Avignon

Numerical Thermal Performance Analysis of PCMs Integrated with Residential Attics: A. Fallahi, N. Shukla, J. Kosny

Paper Session 7b

UNIVERSITY ROOM

Fault Diagnosis in HVAC Systems Based on the Heat Flow Model: A. Schiendorfer, G. Zimmermann, Y. Lu, G. Lo

An Integrated Infrastructure for Real-Time Building Energy Modeling and FDD: B. Dong

Minimizing Training Requirements for Inverse Building Modeling: J. Cai, J. Braun

Continuous Commissioning Based on Extended Fault Detection and Diagnosis: G. Zimmermann, G. Lo, Y. LU

Invited Session 7c

MADISON BALLROOM

The Energy Modeling Punch List Forum

The past year has seen several positive developments in the area of building energy modeling. New IBPSA chapters are forming across the country. EnergyPlus has taken steps forward in speed and functionality and is now supported by multiple graphical front ends. And more and more firms are using energy modeling as the basis for energy consulting and contracting services. Despite this progress, gaps and impedances remain. Inter-operability with design software is far from seamless. Some modeling features (e.g., large spaces with horizontal temperature or humidity gradients, thermal bridges, natural ventilation, non-ideal HVAC operations, duct leakage, etc.) are difficult for non-experts to access or non-existent. There is little support for uses of modeling other than for design, e.g., for operations or controls. Modeling best practices are not effectively shared. In this town hall-style meeting, Amir Roth from DOE's building technologies program will present a status report and near

term plan for DOE's building energy modeling projects and then lead an open discussion of these and other key issues facing the industry.

Host: Amir Roth, Ph.D, DOE

Amir Roth is the technical development manager for building energy modeling at the US Department of Energy in Washington, DC. Prior to that, he was an associate professor in the computer science department at the University of Pennsylvania in Philadelphia, PA. He has a BS in physics from Yale University and a PhD in computer science from the University of Wisconsin-Madison. He is a member of ACM, IEEE, ASHRAE, and IBPSA (National Capital chapter). He is very excited for the 2012 NFL season. Go Eagles!

Technical Session 8: 4:20 - 5:20 pm

Paper Session 8a

CAPITOL BALLROOM B

Building Performance Metrics Calculation and Visualization for K-12 School Buildings in New York City: Y. Lee, F. Liu, H. Jiang, J. Snowdon, M. Bobker

Reality Impacts Energy Use: From Dream Time to Real Time: J. Steinbock, J. Douglas, J. Gauthier, C. Iacono

A Process for, and Results from, Whole Campus Energy Conservation by Statistical Extrapolation of Calibrated Energy Models: P. Erickson

Paper Session 8b

UNIVERSITY ROOM

Energy and Cost Savings of Retro-Commissioning and Retrofit Measures for Large Office Buildings: W. Wang, J. Zhang

The Renovation and Rehabilitation of Historic Building Envelopes: An In-Depth Building Performance and Thermal Comfort Analysis: T. Zakrzewski

Scalable Methodology for Energy Efficiency Retrofit Decision Analysis: Y. Heo, F. Zhao, S. Lee, Y. Sun, J. Kim, G. Augenbroe, D. Graziano, L. Guzowski, R. Muehleisen

Paper Session 8c

MADISON BALLROOM

A Demonstration of the Run-Time Coupling of ESP-r and TRNSYS: F. MacDonald, R. Jost, I. Beausoleil-Morrison, M. Kummert, T. McDowell, A. Ferguson

Validation of the Window and the Room Models of the Modelica Buildings Library: T. Noudui, M. Wetter, W. Zuo

Comparison of EnergyPlus and DOE-2 Detailed Window Heat Transfer Models: N. Kruis, C. Booten, C. Christensen

Banquet: 6:00 – 9:00 pm

The conference banquet will be held on Thursday evening at the Monona Terrace Community and Convention Center.

Monona Terrace Community and Convention Center opened its doors after nearly 60 years of debate on July 18, 1997. It was first designed by Wisconsin native and internationally-renowned architect Frank Lloyd Wright in 1938 as a cultural, governmental and recreational building. Wright reworked the design several times between 1938 and 1958 before signing off on the final plans seven weeks before his death in 1959.

Madison voters approved referenda to construct Monona Terrace – on the same site Wright had originally proposed – as a community and convention center in 1992. While Wright’s design was used for the building’s exterior, the interior was redesigned by Wright apprentice and Taliesin architect Tony Puttnam to house state-of-the-art exhibition, meeting and public space.

6:00 - 7:15 pm Hors D’oeuvres and Cash Bar

7:15 - 8:15 pm Dinner (House Salad, Wisconsin Cranberry Chicken or Roasted Garlic Sirloin or Vegetable Roulade, Chocolate Raspberry Torte)

8:15 - 8:45 pm Program including awards presentation

FRIDAY, AUGUST 3, 2012

Registration: 7:30 – 8:00 am

MADISON CONCOURSE HOTEL

Plenary Session: 8:00 – 8:50 am

WISCONSIN BALLROOM

Integrated Building Simulation for High Performance Buildings

Achieving successful high performance building projects requires integrating building simulation into the architectural design process. Tom Kubala will present his firm’s architectural design philosophy and illustrate how building simulation is integrated into the design process on their projects.

Tom Kubala is a founding partner of the Kubala Washatko Architects. For the past 18 years they have produced a number of successful ecological design projects including two AIA COTE Top Ten Award winners, the Aldo Leopold Legacy Center and the First Unitarian Society Meeting House in Madison, WI.

Technical Session 9: 9:00 - 10:20 am

Paper Session 9a

CAPITOL BALLROOM B

Building System Energy Failure Modes Analysis Using Whole Building Energy Simulation: K. Otto, B. Eisenhower, Z. O’Neill, S. Yuan, S. Narayanan, I. Mezić

Reduced-Order Building Modeling for Application to Model-Based Predictive Control: D. Kim, J. Braun

Automating Building Thermal Model Reduction with Hierarchical Aggregation: J. Dobbs, B. Hincey

Reduced-Order Modeling for Control of Indoor Building Airflows: S. Ahuja, S. Narayanan, E. Cliff, J. Burns

Paper Session 9b

UNIVERSITY ROOM

The Impact of Systems Integration on the Daylighting Performance of Skylights in Offices: L. Ghobad, W. Place, C. Reinhart

Challenges to Integrated Daylighting and Electric Lighting Simulation Methods in a Whole-Building Energy Simulation Context: R. Guglielmetti, J. Scheib

Hardware Accelerated Computation of Direct Solar Radiation through Transparent Shades and Screens: N. Jones, D. Greenberg

Evaluating the Impact of Shading Devices on the Indoor Thermal Comfort of Residential Buildings in Egypt: A. Ali

Invited Session 9c

MADISON BALLROOM

New Generation Computational Tools

What do the next generation of simulation tools look like? The presenters will present on-going work in the US and IEA shaping the next generation of software for building simulation that uses equation-based modeling based on the Modelica language, co-simulation and model-exchange based on the Functional Mockup Interface standard, and acceleration of CFD and lighting simulation using parallel computing on different hardware.

Michael Wetter

Modular modeling based on Modelica and the Functional Mockup Interface

This talk will present recent developments in modular modeling using the equation-based object-oriented Modelica language, and co-simulation using the Functional Mockup Interface standard.

IEA Annex 60: New generation computational tools for building and community energy systems based on the Modelica and Functional Mockup Interface standards” – Michael Wetter and Christoph van Treeck (RWTH Aachen

University, Germany)

In June 2012, the International Energy Agency, under the implementing agreement on Energy Conservation in Buildings and Community Systems, approved a five-year Annex that has the aim to share, further develop and deploy open-source contributions based on Modelica and the Functional Mockup Interface standard. This talk will present the proposed work.

Michael Wetter is the Deputy Group Leader of the Simulation Research Group. His research includes the development of next-generation tools for building system modeling, simulation and optimization, the integration of simulation tools into the research process, and their use for design and operation of buildings. He created various software for building energy modeling, simulation and optimization, including the Modelica Buildings library, the Building Controls Virtual Test Bed, and the GenOpt optimization program. He did his dissertation at the University of California at Berkeley and at LBNL, where he created the GenOpt optimization program and the BuildOpt building simulation program and where he developed the first building energy optimization technique that provably converges to the optimal building design. He is a recipient of the Outstanding Young Contributor Award of the International Building Performance Simulation Association (IBPSA), the President of IBPSA-USA, the Treasurer and a member of the Board of Directors of IBPSA, a member of the Editorial Board of the Journal of Building Performance Simulation and a member of ASHRAE.

Wangda Zuo

Put the Pedal to the Metal: How You Can Speed Up Your Simulation

Long computing time is one of the major barriers that hinder the applications of advanced modeling and large scale simulations in building industry. Dr. Zuo will provide suggestions of how to reduce computational time on traditionally lengthy simulations with two case studies. One is a Fast Fluid Dynamics model on GPU that can simulate indoor airflow 1,500 times faster than the CFD on CPU. The other is to speed up the parametric study of Radiance daylighting simulation for up to 12,000 times.

Dr. Wangda Zuo is a Research Scientist at the Lawrence Berkeley National Laboratory. His research focuses on developing innovative physical models and simulation tools for building energy system and indoor environment. He is also working on accelerating building simulations using multi-core CPUs and GPUs. Dr. Zuo received his Ph.D. in Mechanical Engineering from Purdue University and his Master Degree in Computational Engineering from University of Erlangen and Nuremberg in Germany. He is the author of more than 20 peer reviewed papers.

Victor Zavala

Advances in Optimization and Applications to Building Systems

In this talk, we review recent advances in optimization algorithms and discuss potential applications in building systems. In particular, we review real-time and stochastic optimization domains. In addition, we discuss advances in maximum likelihood methods including parameter/state estimation and Gaussian process modeling. We make special emphasis in the need to apply cutting-edge automatic differentiation and linear algebra techniques to building simulation platforms in order to enable high computational efficiency.

Victor M. Zavala is an assistant computational mathematician in the Mathematics and Computer Science Division at Argonne National Laboratory. He is also a fellow in the Computation Institute at the University of Chicago. He received a B.Sc. degree from Universidad Iberoamericana (2003) and a Ph.D. degree from Carnegie Mellon University (2008), both in chemical engineering. He has served as a technical advisor for ExxonMobil Chemical Company (2006–2007), General Electric Company (2008–), and BuildingIQ (2010–) in automation and control. His research interests are in the areas of real-time optimization, predictive control, state estimation, and mathematical modeling of energy and power systems.

Break: 10:20 - 10:40 am

CAPITOL BALLROOM A

Technical Session 10: 10:40 am – 12:00 noon

Paper Session 10a

CAPITOL BALLROOM B

Urban Daylight Analysis - Simulating the Day-lit-Area of Cities Via a Combination of Exterior Daysim Simulations AND Interior Fitting Functions: T. Dogan, C. Reinhart

Performance Modeling for a Sustainable Master Plan: K. Raines

Towards Validated Urban Solar Radiation Maps Based on LiDAR Measurements, GIS Data, and Hourly DAYSIM Simulations: J. Jakubiec, C. Reinhart

Preliminary Evaluation of A Daylight Performance Indicator for Urban Analysis: Facade Vertical Daylight Factor per Unit Floor Area: J. Zhang, C. Heng, L. Malone-Lee, Y. Huang, P. Janssen, J. Hii, I. Nazim

Paper Session 10b

UNIVERSITY ROOM

Influence of Design and Operating Conditions on Underfloor Air Distribution (UFAD) System Energy and Comfort Performance: T. Webster

An Improved Simple Chilled Water Cooling Coil Model: L. Wang, F. Buhl, P. Haves

Issues Arising from the Use of Chilled Beams in Energy Models: F. Betz

A Review of How Different Energy Tools Address Ventilation as Part of Low-Flow VAV HVAC Systems: A. Corney, S. Gardiner

Paper Session 10c

MADISON BALLROOM

Cost-Effective Recommendations for 15% Above Code Energy Efficiency Measures Based on the ASHRAE 90.1-2007 for Commercial Buildings in Texas: Small Office: H. Kim, J. Haberl, J. Baltazar

Cost-Benefit Analysis of Energy Conservation Measures: L. Hendricken, K. Otto, P. Gurian, J. Wen, W. Sisson

Building Envelope Optimization Method and Application to Three House Types in a Proposed Solar District Energy System: C. Kirney, A. Parekh, K. Paget

Simple Design Tools for Earth-Air Heat Exchangers: R. Muehleisen

Closing Session: 12:00 noon – 1:00 pm

WISCONSIN BALLROOM

Conference Wrap-up:

Timothy McDowell – conference chair & Shanta Tucker – incoming president IBPSA-USA