BUILDING AMERICA

TECHNICAL UPDATE MEETING

APRIL 29-30, 2013

Answering Critical Building Science Questions About Peak Performance Homes

HOSTED BY

THE U.S. DEPARTMENT OF ENERGY'S BUILDING AMERICA PROGRAM

Building AMERICA®
U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Department of Energy
Washington, DC 20585

April 29, 2013

Dear Attendees:

Thank you for attending the fourth annual Building America Technical Update Meeting in Denver, Colorado, April 29-30, 2013!

The U.S. Department of Energy's (DOE) Building America program strives to develop technical innovations and whole-house solutions that dramatically reduce annual energy use and peak energy loads in existing and new homes while also improving overall building quality, comfort, safety, and durability.

This meeting series was established in 2010 to help bring together residential energy researchers and stakeholders to explore issues and solutions to increase home energy performance and the adoption of research results from the Building America program. This year's meeting focuses on key residential energy efficiency issues and strives to capture and develop recommendations for these issues to achieve significant home energy savings. We are pleased with the overwhelming success of these meetings and are delighted to extend the results of our projects and partnerships to an ever-broadening audience.

We recognize that your time signifies your commitment to address the challenges we face in our nation now and in the upcoming years to find innovative ways to improve energy efficiency in our nation's housing stock.

We hope this meeting provides an excellent opportunity for you to discuss accomplishments, address challenges, and connect with other members of the residential energy efficiency community.

Thank you for your commitment to making a difference!

David Lee

Residential Buildings Team Leader

Building Technologies Office - Energy Efficiency and Renewable Energy

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DAY 2: TUESDAY — APRIL 30, 2013

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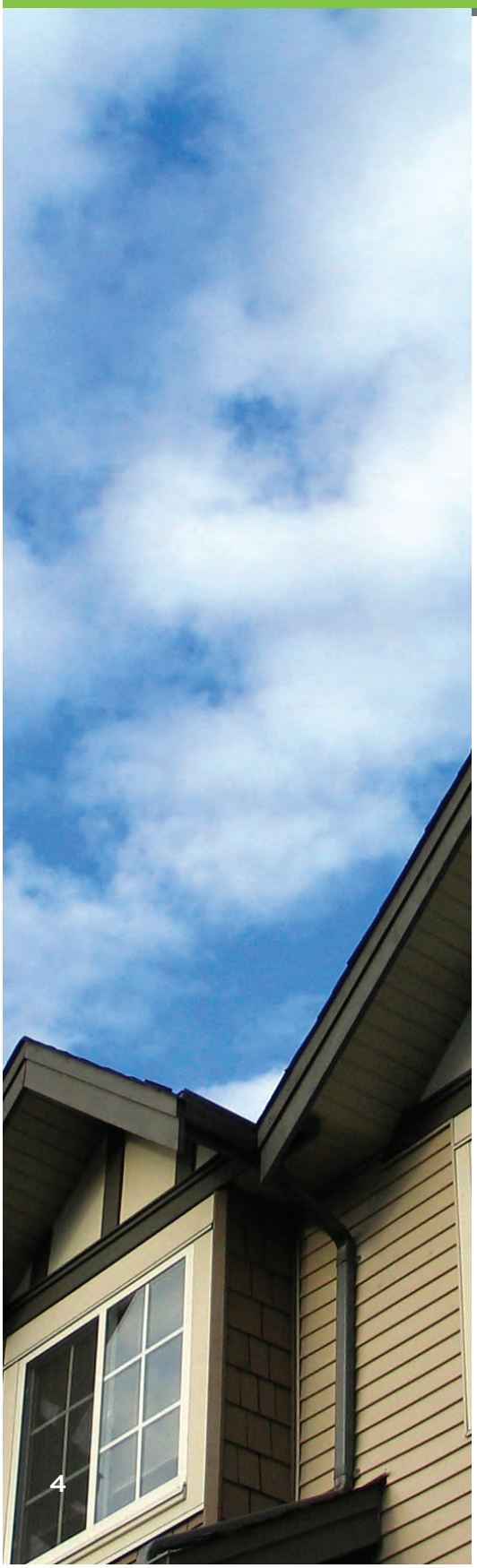
BACKGROUND AND OBJECTIVES



The Building America program strives to be the catalyst that transforms the residential building market, creating innovative home energy system solutions to achieve 50% energy savings in existing and new homes for all U.S. climate regions. Building America works to identify barriers to energy improvements and participates in research partnerships working for the development of robust and innovative solutions.

Building America teams represent world-class building science expertise for high-performance homes. Program customers, including builders, contractors, HERS raters, designers, and consultants, face significant challenges in determining consistent recommendations for key building-related issues. This Technical Update Meeting presents a diverse array of expert perspectives on several of these key issues followed by a facilitated discussion to narrow down the best Building America guidance that can be provided at this time.

THE GOAL OF THE BUILDING AMERICA TECHNICAL UPDATE MEETING IS TO INFORM THE INDUSTRY OF THE MOST RELEVANT, UP-TO-DATE INFORMATION ON THE BUILDING SCIENCE INNOVATIONS THAT BUILDING AMERICA HAS BEEN DEVELOPING DURING THE PAST YEAR.

DAY 1: MONDAY, APRIL 29, 2013
8:00 – 10:00

8:00am - 8:45am

U.S. DEPARTMENT OF ENERGY'S UPDATE ON DOE AND RESIDENTIAL BUILDINGS PROGRAM PRIORITIES

DAVID LEE, U.S DEPARTMENT OF ENERGY

David Lee is currently the supervisor for the Residential Building Technologies Program at the U.S. Department of Energy (DOE). He has served as the director for the Residential Branch, overseeing the ENERGY STAR New and Existing Homes Program at the Environmental Protection Agency. Prior to the ENERGY STAR program, David was the branch chief responsible for the regulatory program to phase out the use of ozone-depleting chemicals at EPA.

SAM RASHKIN, U.S DEPARTMENT OF ENERGY

As Chief Architect for the DOE's Building Technologies Program, Sam's primary role is to help deploy successful energy efficiency research for new and existing homes. This includes developing the Building America Solution Center (BASC), a new resource tool that will make the latest innovations and best practices from world-class research fully accessible to residential new construction and retrofit stakeholders, as well as overseeing the complete revamp of the DOE Challenge Home Program, a voluntary labeling program for leading edge home builders. Previously, he managed ENERGY STAR for Homes since its start in 1996. He has served on the national Steering Committees for USGBC's LEED for Homes, NAHB's Green Builder Guidelines, and EPA's Water Sense label and on the development team for EPA's Indoor airPLUS label. Sam recently authored a book titled "Retooling the U.S. Housing Industry: How It Got Here, Why It's Broken, and How to Fix It."

ERIC WERLING, U.S DEPARTMENT OF ENERGY

Eric Werling is the National Coordinator of DOE's Building America program. Recently, he served as National Coordinator for EPA's Indoor airPLUS home labeling program, which he launched in 2009. While at the EPA, he also developed the EPA's Healthy Indoor Environment Protocols for Home Energy Upgrades. Eric also served as a consultant with ICF Consulting, where he helped EPA build the successful ENERGY STAR for New Homes program from 1995 through 2004, and managed the New York ENERGY STAR Homes program from 2001 through 2003. He has served on the Boards of ACI and RESNET and is a voting member of ASHRAE Standard 62.2. He holds a master's degree in architectural engineering and a MBA from Penn State University. He served in the U.S. Navy and earned a bachelor's degree from the U.S. Naval Academy.

8:45am - 10:00am

CRITICAL QUESTION #1 – HOW DO WE RETROFIT THE TOUGH BUILDINGS?

What are some strategies in designing air sealing and insulation solutions for energy retrofits of the more challenging buildings? What are some examples of durable solutions that are relatively inexpensive? What hasn't worked and why? What looks promising?

HIGH-PERFORMANCE ENCLOSURE RETROFIT FOR COLD CLIMATE CAPE COD HOUSES AND OCCUPIED MASONRY STRUCTURES: KEN NEUHAUSER, BUILDING SCIENCE CORPORATION

Cape Cod style (or story-and-a-half) houses and masonry walls both present challenges to high performance retrofit of existing homes. The challenge is that "normal" retrofit strategies just don't achieve high performance. This presentation offers strategies for both the story-and-a-half and masonry walls that side step the typical limitations.

Ken Neuhauser is a senior associate at Building Science Corporation (BSC). Since 2009, Ken has taken a lead role in deep energy retrofit initiatives at BSC. As part of the architectural design team at BSC, Ken participates in designing innovative, high-performance building solutions. He advises developers, builders, design professionals, building owners, and utility representatives about durable, energy efficient, and healthful building practices. Ken's professional background includes experience in architecture, energy efficiency program design, efficiency program implementation, large building testing, building performance consulting, construction, and economic research.

FOUNDATION INSULATION FOR EXISTING HOMES IN COLD CLIMATES: PAT HUELMAN, CENTER FOR ENERGY AND ENVIRONMENT, NORTHERNSTAR

Adding insulation to a cold, wet foundation wall is not a simple task. Moisture impacts must be carefully assessed. Prospective robust, universal solutions can be expensive, and a quantitative assessment approach to determine potential wetness of foundation walls can change with the season, the weather, and/or new landscaping. These realities put additional research pressure on our approach to below-grade insulation for existing homes. This presentation will discuss basement and crawlspace foundations in cold climates, including a look at some innovative techniques from inside, outside, and in between.

Pat Huelman is an associate professor in residential energy and building systems in the Department of Bioproducts and Biosystems Engineering at the University of Minnesota and serves as coordinator of the Cold Climate Housing Program. He is the lead faculty for the Residential Building Science and Technology undergraduate degree, a principal investigator for hygrothermal testing at the Cloquet Residential Research Facility, and is directing the NorthernSTAR Building America Team.

PRESSURE REGAIN STRATEGIES FOR EXISTING AIR DISTRIBUTION SYSTEMS: ARLAN BURDICK, IBACOS

In many cold climate houses, thermal enclosure upgrades can reduce peak loads by 50%. If the furnace is right-sized for this new peak load, and the ducts are not modified or replaced, the resulting airflows at the supply registers will be significantly reduced. Will the outlets meet industry standards for performance? Should they be replaced to achieve good room air mixing? Should the end of the duct be modified to improve airflow characteristics? This presentation will address these questions and more.

Arlan Burdick works with builders' teams to execute accurate HVAC designs, prevent and control risk, and help builders deal with construction defect issues that range from water intrusion and structural failure to occupant comfort and indoor air quality. Prior to joining IBACOS, Arn worked at a large-scale production homebuilding company as Warranty Manager, Construction Superintendent, and Purchasing Agent. He has been certified by the North American Board of Certified Energy Practitioners in PV solar system designs and is a LEED Accredited Professional.

DAY 1: MONDAY, APRIL 29, 2013
10:00 - 10:45

10:00am - 10:30am

WALL SYSTEM INNOVATION: FAMILIAR MATERIALS, BETTER PERFORMANCE

The presentation discusses an innovative approach to building an R25+ wall system that uses typical construction materials in a manner that results in minimal framing changes compared to the traditional 2x4 wall but addresses many construction and performance issues associated with other high-R wall alternatives.

VLADIMIR KOCHKIN, HOME INNOVATION RESEARCH LABS, PARTNERSHIP FOR HOME INNOVATION

Vladimir Kochkin oversees engineering research programs on structural, moisture, and energy performance of residential construction. He also manages the ANSI process for the development of the National Green Building Standard.

10:30am - 10:45am — Break

10:45am - 12:00pm

CRITICAL QUESTION #2 – WHAT ARE THE BEST PRACTICES FOR VENTILATION SPECIFIC TO MULTIFAMILY BUILDINGS?

What is the best practice to address ASHRAE 62.2 Addendum J (multifamily)? Why is exhaust only (with supply in hallway) the current standard practice? Are there options to avoid air exchange with neighbors? How do stack and wind pressures affect ventilation performance in multifamily homes? What systems actually function as intended and can be implemented by builders and contractors?

THE BEST WAY TO MEET ASHRAE 62.2 IN MULTIFAMILY BUILDINGS: IAIN WALKER, LAWRENCE BERKELEY NATIONAL LABORATORY

Ventilating multifamily buildings presents challenges such as air transfer from other apartments and problems with applying traditional air-tightness measurement techniques. This presentation will discuss how ASHRAE 62.2 attempts to deal with these issues for multifamily buildings, simple approaches for complying with the standard, and other considerations for improving multifamily ventilation.

Dr. Iain Walker is a scientist at the Lawrence Berkley National Laboratory (LBL). He has more than 20 years of experience as a building scientist and consultant, conducting research on energy use, ventilation, moisture, performance simulation, and commissioning/diagnostic issues in residential buildings. His current work focuses on retrofits, zero/low energy homes, and HVAC systems in residential buildings through field and laboratory evaluations, modeling and simulation activities, and standards setting.

MULTIFAMILY VENTILATION – BEST PRACTICE?: DIANNE GRIFFITHS, STEVEN WINTER ASSOCIATES, INC., CONSORTIUM FOR ADVANCED RESIDENTIAL BUILDINGS

In multifamily buildings, exhaust ventilation strategies are the norm for meeting both local

exhaust and whole-unit ventilation, but different approaches are taken for providing make-up air. Understanding how make-up air strategies interact and integrate with other building systems is important. This presentation will discuss a research plan for determining how well these make-up air strategies work.

Dianne Griffiths has been involved in Building America research for nearly 15 years with the Consortium for Advanced Residential Buildings (CARB). She is a licensed professional engineer with over thirty years' experience in evaluating residential, commercial, and industrial energy systems with specific emphasis on energy efficiency and HVAC systems. Her experience includes energy modeling, product development, laboratory testing, new technology field testing and demonstration, and energy savings measurement and verification.

12:00pm - 1:30pm — Lunch on Own

1:30pm - 2:00pm

BUILDING AMERICA TOP THREE INNOVATIONS DIRECTLY RELATED TO OVERCOMING CODES AND STANDARDS BARRIERS

Transformation of U.S. housing markets to favor high-performance homes presents significant challenges, from education to technology to infrastructure and cost barriers. Some of the most difficult challenges involve industry codes and standards that may prevent or slow the innovation process.

The Building America program is implementing a new Codes and Standards Innovation Team to coordinate and focus Building America efforts to help stakeholders accelerate codes and standards innovation. The goal is to leverage Building America research to support productive code and standards changes that help accelerate market adoption of Building America best practices. This presentation will discuss this new team and its work.

PAM COLE, PACIFIC NORTHWEST NATIONAL LABORATORY

Pam Cole is a Building Energy Efficiency Scientist at the Pacific Northwest National Laboratory (PNNL). For over 12 years, her research has focused on increasing the energy efficiency of buildings nationwide. For DOE's Building Energy Codes Program, she leads technical assistance efforts for state and local governments to increase the adoption of and compliance with residential and commercial building energy codes. Most recently, she has been applying her codes expertise to guide Building America's Codes and Standards Innovation Team in identifying and removing barriers so building science innovations can reach the market successfully.

2:00pm - 3:15pm

CRITICAL QUESTION #3 – WHAT ARE THE BEST OPTIONS FOR ALL-ELECTRIC HOMES?

In moving towards net zero energy homes, the challenge of specifying components for all-electric homes is inevitable. In this case, what are the most cost-effective and reliable options for water heating and space conditioning?

ALL-ELECTRIC HOUSES? STRATEGIES AND MEASURED RESULTS IN COLD CLIMATES: DUNCAN PRAHL, IBACOS

Eliminate natural gas from a house and save at least $8.00 per month in service charges, which pays for over $1,200 of financed (30-year, 7% loan) energy improvements. "All-electric" may have negative consumer connotations, and utilities worry about power factor and peak loads. This presentation will discuss pros and cons of "no natural gas" houses using case studies and monitored energy and comfort data.

Duncan Prahl has over 11 years of experience at IBACOS assisting builders and developers with implementing high-performance housing using Building America research results. His research focuses on process-related barriers in most builders' organizations with the goal of creating new process models for builders. He is a registered architect in New York.

PERFORMANCE ANALYSIS OF AIR-SOURCE VARIABLE SPEED HEAT PUMPS AND VARIOUS ELECTRIC WATER HEATING OPTIONS: JEFFREY MUNK, OAK RIDGE NATIONAL LABORATORY

There are many options available for space conditioning and water heating in all-electric homes. This presentation evaluates the field performance of several different types of equipment installed in both unoccupied and occupied research homes in a mixed-humid climate. The space conditioning equipment analysis is focused on variable speed heat pumps, while the water heating equipment covered includes standard resistance, heat pump, and solar water heaters.

Jeffrey Munk is a researcher in the Building Equipment Research group at the Oak Ridge National Laboratory (ORNL). Recent work includes development and field testing of both air-source and ground-source heat pumps for space conditioning and water heating. Prior to joining ORNL, he worked for five years with Carrier Corporation on residential gas furnaces and small packaged products.

3:15pm - 3:30pm — Break

DAY 1: MONDAY, APRIL 29, 2013
3:30 - 5:00

3:30pm - 4:00pm

LABORATORY PERFORMANCE TESTING OF RESIDENTIAL WINDOW AIR CONDITIONERS

Laboratory tests were performed on multiple window air conditioners. This included performance mapping and quantifying building infiltration. These units are cheap to install but have low efficiency; therefore, there is a need to develop accurate models for building energy optimization. This presentation discusses the testing and several methods that were identified for cost effectively increasing installed performance.

CHUCK BOOTEN AND JON WINKLER, NATIONAL RENEWABLE ENERGY LABORATORY

Chuck Booten is a senior engineer at the National Renewable Energy Laboratory (NREL) where he is involved in system testing and development of novel test methods. He is also interested in improving the accuracy of building simulation tools such as DOE2 and EnergyPlus. Prior to joining NREL in 2010, Chuck was a project manager at Protonex Technology, LLC, where he directed the development of solid-oxide fuel cell (SOFC) systems. He earned his Ph.D. from Stanford University developing rapid heat transfer measurement techniques for gas turbines.

Jon Winkler is a mechanical engineer at the National Renewable Energy Laboratory (NREL) where he is primarily involved in developing HVAC component models for use in the residential building simulation/optimization tool, BEopt. He is also involved in experimental testing of residential HVAC equipment and analyzing experimental performance data to further develop residential building simulation tools. Prior to working at NREL, Jon was a Faculty Research Assistant in the Mechanical Engineering Department at the University of Maryland where he co-led the development effort of simulation and optimization software used by HVAC manufacturers.

4:00pm

CRITICAL QUESTION #4 – WHAT ARE THE BEST OFF-THE-SHELF HVAC SOLUTIONS FOR LOW-LOAD, HIGH-PERFORMANCE HOMES AND APARTMENTS?

What is currently in the market? What are the limitations of these systems? What are the desired specifications for these systems? What are the realistic space conditioning loads of these high-performance homes and apartments?

FORCED AIR SYSTEMS IN HIGH-PERFORMANCE HOMES: IAIN WALKER, LAWRENCE BERKELEY NATIONAL LABORATORY

High-performance homes have low sensible loads and therefore require smaller heating and cooling systems. This presentation will discuss how well modern HVAC equipment functions in low-load homes, and how to address issues of undiminished latent loads and uniformity of thermal conditions throughout a home.

Dr. Iain Walker is a scientist at the Lawrence Berkeley National Laboratory (LBL). He has more than 20 years of experience as a building scientist and consultant, conducting research on energy use, ventilation, moisture, performance simulation, and commissioning/diagnostic issues in residential buildings. His current work focuses on retrofits, zero/low energy homes, and HVAC systems in residential buildings through field and laboratory evaluations, modeling and simulation activities, and standards setting.

RESULTS OF SIMPLIFIED SPACE CONDITIONING STRATEGIES IN LOW-LOAD HOMES: DUNCAN PRAHL, IBACOS

In a low-load house, how comfortable do you want to be? How much do you want to spend? How much privacy does the occupant need? Pick two, and I'll tell you the other one, along with a reasonable space condition distribution strategy. This presentation will cover measured data from test houses in cold and mixed climates using a variety of space conditioning distribution strategies.

Duncan Prahl has over 11 years of experience at IBACOS assisting builders and developers with implementing high-performance housing using Building America research results. His research focuses on process-related barriers in most builders' organizations with the goal of creating new process models for builders. He is a registered architect in New York.

FIELD PERFORMANCE MEASUREMENT OF A NEW CONCEPT OF COST-EFFECTIVE GROUND HEAT EXCHANGER FOR LOW-LOAD, HIGH-PERFORMANCE HOMES: PILJAE IM, OAK RIDGE NATIONAL LABORATORY

A new foundation heat exchanger (FHX) technology was proposed to reduce first cost by placing the heat exchanger into the excavations made during the course of construction. This presentation introduces the FHX technology including the design, construction, and a demonstration of the FHX and presents performance monitoring results of the FHX after one year of monitoring.

Dr. Im is a research and development staff member in the Building Technologies Research and Integration Center at the Oak Ridge National Laboratory (ORNL). At ORNL, he has been conducting numerous projects including a new concept of cost effective ground heat exchanger for geothermal heat pump systems, development of multifamily CHP analysis tool, development of ORNL's new multifamily audit tool, calibrated simulation modeling, and validation for residential and light commercial buildings. He is an active member of ASHRAE and International Building Performance Simulation Association (IBPSA).

DAY 2: TUESDAY, APRIL 30, 2013
8:00 - 10:00

8:00am - 8:45am

UPDATE ON DOE AND RESIDENTIAL BUILDINGS PROGRAM PRIORITIES

8:45am - 10:00am

CRITICAL QUESTION #5 – WHAT ARE RECENT INNOVATIONS IN AIR DISTRIBUTION SYSTEMS?

The majority of heating systems are forced air. What kinds of innovations have been developed to make these systems more efficient?

DUCT SPLITTER BOX ANALYSIS AND RECOMMENDATIONS: ROBERT BEACH, IBACOS

Regardless of your opinion on flex duct and splitter box air distribution systems, it remains the go-to solution for many production builders across the country. This presentation will cover research results about the relationship between pressure and physical configurations of flexible duct junction boxes. Preferential geometries will be discussed.

Robert Beach is a building performance specialist, but his responsibilities cover a wide range. He serves as technical illustrator and graphic artist for IBACOS projects as well as assisting in creating CFD/solid models. He helps to monitor the ongoing testing at the occupied and unoccupied test homes, such as the Energy Efficiency Lab Home, and works on process development and optimization for IBACOS research documents.

ATTIC DUCTS: ENCAPSULATING WITH FOAM AND BURYING: ROBB ALDRICH, STEVEN WINTER ASSOCIATES, INC., CONSORTIUM FOR ADVANCED RESIDENTIAL BUILDINGS

Moving ducts within conditioned space is the preferred method of preventing duct thermal losses. When this is not possible or practical, encapsulating ducts with closed-cell spray foam and burying beneath blown-in insulation can sometimes provide equivalent performance cost effectively. This presentation will highlight research results, costs, and best practices.

Robb Aldrich works with the Consortium for Advanced Residential Buildings (CARB), and received his master's degree from the Building Systems Engineering program at the University of Colorado. Since then, he has focused on high-performance home energy systems: envelope technologies, HVAC, solar electric, and solar thermal. He has designed, installed, researched, and monitored energy systems in hundreds of homes across the country.

DAY 2: TUESDAY, APRIL 30, 2013
10:00 - 12:00

10:00am - 10:30am

CODE GAPS AND FUTURE RESEARCH NEEDS OF COMBUSTION SAFETY — BA EXPERT MEETING UPDATE

LARRY BRAND, GAS TECHNOLOGY INSTITUTE, PARTNERSHIP FOR ADVANCED RESIDENTIAL RETROFIT

Larry Brand is a research and development manager at the Gas Technology Institute and the Partnership for Advanced Residential Retrofit (PARR) working in the area of building energy efficiency, product development, codes and standards, and technology deployment. He has 30 years' experience managing building systems research and product development programs for private and public companies, launching over 20 products into the marketplace. Larry is currently the lead investigator for the PARR Building America team and principal investigator for the California Energy Commission Measured Home Performance project.

10:30am - 10:45am — Break

10:45am - 12:00pm

CRITICAL QUESTION #6 – WHAT ARE THE CHALLENGES AND SOLUTIONS FOR MODELING MULTIFAMILY BUILDINGS?

There are a lot of differences between modeling single-family and multifamily buildings in regard to central systems, shared walls, shared spaces, etc. What is the best way to optimize energy efficiency packages? How does Building America work around the challenges of modeling these buildings? What tools do they use? What additions could improve the accuracy of simulation tools?

THE CHALLENGES OF MODELING MULTIFAMILY BUILDINGS:
SRIKANTH PUTTAGUNTA, STEVEN WINTER ASSOCIATES, INC., CONSORTIUM FOR ADVANCED RESIDENTIAL BUILDINGS

Although single-family and low-rise multifamily housing are fairly similar, there are some significant differences that make modeling these low-rise multifamily buildings challenging. Do you model individual apartments or the whole building? How do you input infiltration rates? If there are central systems for space conditioning and hot water, how do you model these for individual apartments? This presentation will share some of the methods used to model multifamily buildings in the BEopt energy modeling software. In addition, gaps in the Building America house simulation protocol for multifamily applications will be discussed.

Srikanth Puttagunta is a senior building systems engineer with the Consortium for Advanced Residential Buildings (CARB). He works on projects for the Consortium for Advanced Residential Buildings, a Department of Energy Building America team, whose goals are to develop cost effective solutions that dramatically reduce the average energy use of housing while improving quality, affordability, and resource efficiency. He has experience in evaluating residential energy systems with specific emphasis on energy efficiency and mechanical systems. Field evaluation and long-term monitoring experience includes ground-source heat pumps, heat pump water heaters, air conditioners, and other building systems.

DAY 2: TUESDAY, APRIL 30, 2013
10:00 - 12:00

CLOSING GAPS IN MODELING MULTIFAMILY BUILDINGS:
JORDAN DENTZ, THE LEVY PARTNERSHIP, INC., ADVANCED RESIDENTIAL INTEGRATED ENERGY SOLUTIONS

Compared to single-family homes, multifamily envelopes are usually responsible for a smaller share of total energy use and are often more expensive to retrofit. Multifamily buildings often have central heating and hot water systems with large distribution inefficiencies. Therefore, heating control and distribution improvements are often more promising retrofit opportunities. However, accurately modeling these measures is challenging. This presentation will review several such measures that will be important to include in Building America's multifamily modeling capabilities.

Jordan Dentz is a vice president with The Levy Partnership, Inc., leaders of the Advanced Residential Integrated Energy Solutions (ARIES) Building America team. He develops and manages building science research projects. He holds degrees in building technology from the Massachusetts Institute of Technology.

STUDY OF MULTIFAMILY ENERGY RETROFIT USING FLEXIBLE, MULTI ZONE BUILDING SIMULATION MODEL:
PILJAE IM, OAK RIDGE NATIONAL LABORATORY

This presentation describes a case study that focuses on the renovation of Maplewood Park Apartments, a multifamily apartment complex in Union City, Georgia. The case study also includes a whole building energy analysis performed to predict post-retrofit energy savings and identify alternative potential energy savings measures that would be more cost effective than currently implemented energy conservation measures.

Dr. Im is a research and development staff member in the Building Technologies Research and Integration Center at the Oak Ridge National Laboratory (ORNL). At ORNL, he has been conducting numerous projects including a new concept of cost-effective ground heat exchanger for geothermal heat pump systems, development of multifamily CHP analysis tool, development of ORNL's new multifamily audit tool, calibrated simulation modeling, and validation for residential and light commercial buildings. He is an active member of ASHRAE and International Building Performance Simulation Association (IBPSA).

USING BEOPT FOR MULTIFAMILY MODELING:
ERIC WILSON, NATIONAL RENEWABLE ENERGY LABORATORY

This presentation will briefly discuss BEopt's current capabilities and workarounds for modeling certain types of multifamily buildings and how the tool could be enhanced to allow analysis and optimization of a wider variety of multifamily buildings.

Eric Wilson is an engineer in the Residential Buildings Research Group at the National Renewable Energy Laboratory (NREL). His current work involves model development for the building energy optimization tool BEopt, the Building America House Simulation Protocols, and community-scale residential building analysis. Prior to joining NREL in 2010, Eric completed his master of science degree in Building Systems Engineering at the University of Colorado at Boulder, where his research focused on the energy implications of pressure drop in residential duct systems.

DAY 2: TUESDAY, APRIL 30, 2013
12:00 - 3:15

12:00pm - 1:30pm — Lunch on Own

1:30pm - 2:00pm

EVALUATION OF AUTOMATED UTILITY BILL CALIBRATION METHODS

Software users often "true-up" or "calibrate" simulation models for existing homes to historical billing data with the goal of increasing the accuracy of retrofit savings predictions. This presentation will cover initial results from research efforts to develop automated calibration methods that improve the accuracy, repeatability, and speed of retrofit analysis.

BEN POLLY AND JOE ROBERTSON, NATIONAL RENEWABLE ENERGY LABORATORY

Ben Polly is an engineer in the Electricity, Resources, and Building Systems Integration Center at the National Renewable Energy Laboratory (NREL). He works in the Residential Buildings Research Group. His primary research activities are related to software validation, building simulation input collection methods, and optimal energy retrofit packages.

Joe Robertson has been involved with residential building research activities at the National Renewable Energy Laboratory (NREL) since 2010. His experience includes developing automated calibration methods using numerical techniques and investigating the tradeoffs between accuracy of retrofit savings predictions and method computational cost. Other projects include using HPXML data format and BEopt software for comparing energy simulation estimates to the measured energy use for homes.

2:00pm - 3:15pm

CRITICAL QUESTION #7 – WHAT ARE THE BEST PRACTICES FOR SINGLE-FAMILY VENTILATION IN ALL CLIMATE REGIONS?

Why ventilate? What are the ultimate goals of ventilation requirements in codes and standards? What are the characteristics of an effective ventilation system in new vs. existing construction? What are the risks and solutions associated with ventilation in hot-humid climates?

KITCHEN VENTILATION SHOULD BE HIGH PERFORMANCE, NOT OPTIONAL: BRETT SINGER, LAWRENCE BERKELEY NATIONAL LABORATORY

Effective cooking exhaust ventilation is essential to indoor air quality. Existing standards, guides, and ratings are inadequate. This presentation will review cooking exhaust performance objectives, present results of lab and field assessments, and report on efforts to spur product innovation, including development of a test method for cooking pollutant capture efficiency.

Brett Singer is a staff scientist, Deputy Leader of the Indoor Environment Group, and a PI in the Residential Building Systems Group at the Lawrence Berkeley National Laboratory (LBL). Dr. Singer has conceived, conducted, and led research projects related to air pollutant emissions, physical-chemical processes, pollutant exposures, and control strategies in both outdoor and indoor environments. Dr. Singer currently leads or co-leads an array of projects aimed at improving both IEQ and energy performance in new and existing homes.

DAY 2: TUESDAY, APRIL 30, 2013
3:15 - 4:00

CHARACTERISTICS OF AN EFFECTIVE VENTILATION SYSTEM: RESEARCH FROM TWO LAB HOUSES: ARMIN RUDD, BUILDING SCIENCE CORPORATION

Utilizing high performing ventilation systems that draw outside air from a known fresh air location, and filter and fully distribute that air to the occupants' breathing zone, should allow for optimization of the ventilation rate to avoid excess energy consumption and moisture control problems of over-ventilation. This presentation will discuss the research on these systems.

Armin Rudd is a Principal at Building Science Corporation (BSC). His educational background is mechanical/energy engineering and construction. Over the course of 25 years of research and consulting, he has gained a wide range of experience in residential and commercial buildings, focusing on space conditioning, ventilation, dehumidification, and product development.

RESEARCH ON THE IMPACT OF VENTILATION IN HOT HUMID CLIMATES: DANNY PARKER, FLORIDA SOLAR ENERGY CENTER, BUILDING AMERICA PARTNERSHIP FOR IMPROVED RESIDENTIAL CONSTRUCTION

While ventilation air is important to maintain good IAQ, introduction of outside air in humid climates, whether through natural or mechanical means, can have profound impacts on energy use and indoor humidity levels. This presentation will share results of testing conducted over the summer of 2012 in FSEC's side-by-side test structures to evaluate energy and moisture effects of differing building leakage rates. Testing also examined the impact of the addition of mechanical ventilation.

Danny Parker works with the Building America Partnership for Improved Residential Construction (BA-PIRC) and specializes in collecting and analyzing measured data taken from residential and commercial buildings to determine how results may be applied to reducing energy needs. He has spent the last 25 years of his career in the field of energy-efficiency research. Much of his research over the last several years has been specifically related to high efficiency buildings and potential impacts when mated with renewable energy resources. He also has extensive experience with large-scale utility monitoring projects and evaluation of load control options. He holds several patents associated with innovative energy efficiency technologies.

3:15pm - 3:30pm — Break

3:30pm - 4:00pm

PREDICTING ENVELOPE LEAKAGE IN ATTACHED DWELLINGS

In attached housing, the commonly performed "solo" blower door test method measures both the air leakage between adjacent units as well as air leakage to the outside. This presentation will discuss research to develop a simplified algorithm to predict envelope leakage for energy use assessment based upon solo test results.

DIANNE GRIFFITHS, STEVEN WINTER ASSOCIATES, INC., CONSORTIUM FOR ADVANCED RESIDENTIAL BUILDINGS

Dianne Griffiths has been involved in Building America research for nearly 15 years with the Consortium for Advanced Residential Buildings (CARB). She is a licensed professional engineer with over thirty years' experience in evaluating residential, commercial, and industrial energy systems with specific emphasis on energy efficiency and HVAC systems. Her experience includes energy modeling, product development, laboratory testing, new technology field testing and demonstration, and energy savings measurement and verification.

4:00pm - 5:00pm

CRITICAL QUESTION #8 – WHEN ARE HEAT PUMP WATER HEATERS THE BEST SOLUTION?

What do we know about actual performance compared to promised performance? What is the best way to manage the space conditioning impacts on a home? Is there an easy decision tree for deciding if this is the best solution for a particular home (climate? utility prices? accessibility? physical space constraints? workforce?)?

ENERGY SAVINGS AND BREAKEVEN COST FOR RESIDENTIAL HEAT PUMP WATER HEATERS IN THE UNITED STATES: JEFF MAGUIRE, NATIONAL RENEWABLE ENERGY LABORATORY

The performance of heat pump water heaters (HPWHs) vary with climate and installation location. A simulation study was performed to determine the impact on the savings and economics of HPWHs. While some savings is always possible when replacing electric water heaters, the economics of installing a HPWH vary significantly across the country.

Jeff Maguire is a research engineer with the National Renewable Energy Laboratory (NREL). His work focuses on the modeling and performance analysis of residential water heaters. This has included analyzing data from field test studies of several water heaters, developing models of new water heating technologies, and performing simulations to determine the impact of use and climate on water heater efficiency. Jeff has worked with NREL as a graduate student at the University of Colorado since 2010 and as a full time employee since 2012.

HEAT PUMP WATER HEATER PERFORMANCE IN LAB HOUSE : CARLOS COLON, FLORIDA SOLAR ENERGY CENTER, BUILDING AMERICA PARTNERSHIP FOR IMPROVED RESIDENTIAL CONSTRUCTION

The modern heat pump water heater (HPWH) may be the best efficient alternative to replace electric resistance water heating. However, evaluations from laboratory and field performance uncover problem areas of this technology such as capacity, cost and installation, noise, and cold air discharge. This presentation will share findings and solutions that may lessen the negative impact of HPWHs.

Carlos Colon has been a member of the research facility at the Florida Solar Energy Center (FSEC) since 1989 and works with the Building America Partnership for Improved Residential Construction (BA-PIRC). Carlos holds a B.S.E.E.T degree from the InterAmerican University in San Juan, P.R. He has performed as project leader conducting energy research for the Florida Energy Office, NYSERDA, DOE, NREL, and FNGA. He currently leads research activities at the HWS laboratory under the Building America Program for Improved Residential Construction.

MONITORING OF HPWHS IN MULTIFAMILY APPLICATIONS : ELIZABETH WEITZEL, DAVIS ENERGY GROUP, ALLIANCE FOR RESIDENTIAL BUILDING INNOVATION

Performance characteristics of central heat pump water heaters are not well understood due to limited market availability and few known installations. Heat pump water heaters use less energy than electric storage water heaters; however, performance and costs need to be evaluated where natural gas is available. This presentation will share research results on integrating central heat pump water heaters into multifamily residences.

Elizabeth Weitzel is a senior engineer at the Alliance for Residential Building Innovation (ARBI). She is responsible for field monitoring and testing, programming, data management and quality control, and data analysis for all laboratory and field testing activities. Her experience extends to control system development and mechanism design.

WEBINAR ACCESS INFORMATION

The Building America Technical Update Meeting is also available via webinar. To access the webinar during the event on Monday, April 29, 2013, please go to https://www.mymeetings.com/nc/join/ to join the webinar and dial 800-369-3169, passcode 8921191. On Tuesday, April 30, 2013, please go to https://www.mymeetings.com/nc/join/ to join the webinar and dial 888-390-0852, passcode 7011728. Presentations will also be available online after the event on the Building America website at www.buildingamerica.gov.

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