U.S. Department of Energy Building America Program

Expert Meeting

Habitat for Humanity High Performance Homes: Experience, Lessons, Future Plans

Marriott Marquis Hotel
Downtown, Atlanta, GA
Meeting location: Lobby level, Room L508

Wednesday, March 25, 2015
5:30 pm to 7:00 pm

The Levy Partnership

Habitat for Humanity®

Building AMERICA U.S. Department of Energy

ARIES Collaborative

Building America Expert Meeting

Habitat for Humanity High Performance Homes: Experience and Future Plans

The U.S. Department of Energy's Building America (BA) program develops technologies with the goal of reducing residential building energy use by 30 to 50%. Toward this goal, the program sponsors "Expert Meetings" focused on specific building technology topics. The meetings are intended to sharpen Building America research priorities, create a forum for sharing information among industry leaders and build partnerships with professionals and others that can help support the program's research needs and objectives.

This meeting will focus on the opportunities for reducing energy use in homes constructed by Affiliates of Habitat for Humanity International (HFHI). HFHI is a non-profit organization with more than 1,400 local affiliates in the United States and more than 70 national organizations around the world. Habitat and its affiliates have helped to build or repair more than 800,000 houses and serve more than 4 million people worldwide since 1976. Habitat for Humanity's U.S. and international affiliates build durable, healthy and sustainable houses at the lowest possible cost.

Meeting Topic

The expert meeting will center on the experiences of Affiliates building low load homes with simplified (point-source) space conditioning and ventilation systems. Participants will review project status, discuss technical and operational barriers, suggest research needs and describe actions that would help other Affiliates evaluate and adopt high performance designs and technologies.

Meeting Objectives

The objectives of the meeting are:

1. Review recent efforts by Habitat to build high performance homes.
2. Share knowledge on and experience with recent high performance Habitat projects: what worked, what didn't work and why, and what's new.
3. Describe the barriers to expanding the share of Habitat projects that pursue a high performance approach.
4. Identify research and educational needs that can help overcome these barriers.
5. Deepen the relationship between the Building America program and longtime partner Habitat for Humanity that could lead to cost shared research on ways to overcome existing BA research gaps and barriers, and to achieve BA energy target performance (>50% savings relative to IECC 2009).

Presentation Topics

Presentation topics will include:

- Introductions and meeting objectives (ARIES)
- Habitat Case Study 1: Hot-Humid Climate, **Habitat of South Sarasota, FL with Building America Team Lead FSEC** (Michael Sollitto and Janet McIlvaine)
- Habitat Case Study 2: Mixed Humid Climate; **Habitat for Humanity of St. Louis, MO** (Kyle Hunsberger)
- Habitat Case Study 3: Cold Climate; **Habitat of Columbia County, NY and ARIES Building America Team** (Brenda Adams and Jordan Dentz)
- Habitat Case Study 4: Very Cold Climate; **St Croix Valley Habitat for Humanity, WI** (Jim Cooper)
- Common issues, common challenges, future R&D needs (All)

A summary of the discussion will be prepared for dissemination to the Habitat and Building America communities.

Habitat Expert Meeting Presentation Outline

The Expert Meeting is an opportunity to discuss with colleagues also working on high performance homes the results of four prominent Affiliate projects. These projects highlight the efficacy of the specific technologies/ approaches that were used in moving toward zero energy performance and pose questions about the findings that might suggest future research opportunities. Finding common ground for future research is a goal of the meeting.

The four projects that will be presented are the result of explorations by Habitat Affiliates into ultra-high energy performance design and construction. The solutions are similar in that they all rely on very efficient and tight thermal envelopes, small-capacity-high-efficiency HVAC equipment (typically using mini-split heat pumps) and controlled ventilation. The presentations focus exclusively on space conditioning energy use, performance and comfort(including ventilation) and occupant behavior impacts (note: water heating, lighting, appliances or other energy end uses will not be covered in this meeting).

The presentation will start with an orientation slide listing the sponsoring Affiliate, technical team members, location of project, type of building (single family detached, etc.), building size, floor plan and elevations, photos, project costs ($/sf and other measures of affordability), energy use (projected and/or measured) and a statement of goal regarding energy (e.g., achieve zero net energy, Passive House certification, etc.).

The body of the presentation will focus on areas where the Affiliates approach or experience provided valuable lessons or posed challenges that need better resolutions (i.e., research). The presenter will discuss how the project plows new ground. Presenters will note where important questions about energy impacts, construction methods, or other results suggest the need for more evaluation and could be the basis of future research. Topics covered may include:

1. Envelope characteristics: insulation levels, window products, airtightness details
2. Space conditioning system(s): heating and cooling, distribution strategy details

3. Energy performance compared to code-home projections or another meaningful benchmark
4. Comfort performance compared to accepted standards (ACCA Manual RS, ASHRAE 55-2010) including effectiveness of distribution system
5. Homeowner behavior and impact on home performance

Each presentation will be 15 minutes, including a few minutes for clarifying questions from the expert panel. A longer discussion period will follow the presentations. The general discussion is an opportunity for the panel members to weigh in on ideas or research directions suggested by the projects.

The following are a few sample research questions that might be suggested and/or addressed by the project presentations:

Envelope characteristics
- What level of envelope efficiency (by component: wall, floor, window, etc.) is optimal from a cost and performance standpoint?
- What approaches are effective at balancing (from cost and performance perspectives) the envelope design and the HVAC equipment selection?

Space conditioning and ventilation system
- What is the strategy for locating the heating/cooling source and distribution system components (including return air pathways) to achieve desired airflow and temperature distribution?
- How can heat recovery ventilation be affordably integrated into Habitat homes to optimize ventilation performance and IAQ?
- What is the in-service efficiency of the space conditioning system, including distribution? How does this compare to specifications?

Energy performance and affordability
- How can affordability be effectively measured to provide the homeowner with the lowest overall cost of ownership?

Comfort
- What levels of comfort (as compared to accepted standards) can be achieved with point-source space conditioning (e.g., single head mini-split heat pumps)?

Behavior
- How are homeowners likely to interact with innovative features of the space conditioning system in ways that degrade performance? How do these behaviors suggest design changes?
- What type of control system(s) can be used to integrate point-source heating/cooling equipment with distribution and ventilation systems?

Who Should Attend

The meeting will bring together a select group of about 30-40 experts with experience in high performance homebuilding – in particular low-load homes with simplified space conditioning systems. Attendees will include Habitat affiliates, Building America researchers, representatives from national labs, and building materials and equipment suppliers.

Sponsors

The meeting is being organized by the following organizations:

- Habitat for Humanity International
- U.S. Department of Energy, Building Technology Office and the National Energy Renewable Laboratory
- ARIES Collaborative, Building America research team led by The Levy Partnership, Inc.

For more information on the Building America program, please visit http://www1.eere.energy.gov/buildings/building_america/about.html.

If you have questions about this meeting, please contact:

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Logistics

- Date: Wednesday, March 25, 2015
- Time: 5:30pm – 7:00pm
- Location: Marriott Marquis Hotel, Downtown Atlanta, lobby level, Room L508

There is no fee to attend the meeting.