



# **BUILDING AMERICA CONSORTIA AND NATIONAL LABORATORY STATUS REPORT**

**March 2010  
&  
Second Quarter FY2010  
(January 1 – March 31)**

**Cooperative Agreement:  
DE-FC26-08NT 02231**

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## I. CURRENT PROGRESS AT EACH GATE LEVEL

### Task 2

#### Gate 1A – *Expected Whole House Energy Savings and Cost Targets*

- IBACOS began detailed TRNSYS modeling of a slab-on-grade house design. The design is based on the lab house plan for Phoenix, AZ. The modeling will examine the repercussions of using under-slab insulation in this climate. Modeling results are expected in April 2010.
- IBACOS continued integrating technical details and results from the December mock-up activities into the final construction documentation for the Pittsburgh Zero Energy Lab Home.
- IBACOS evaluated the constructability and durability of a 4” thick Exterior Insulation and Finish System (EIFS) over a 2x6 stud frame with continuous 7/16” OSB structural sheathing. The EIFS system incorporated a fluid-applied drainage plane material and drainage channels formed using the base coat adhesive material behind the foam. IBACOS also assessed the flashing details for one window installed in the wall assembly.

#### Gate 1B – *Systems Evaluations and Specifications*

- The field test at The New American Home® 2009 in Las Vegas, NV continued to take measurements related to the gas engine-fired mini-split heat pump system and the gas-fired tankless water heater.
- The field test at The New American Home 2008 in Orlando, FL continued to take measurements related to the thermal and moisture performance of the aerated concrete block wall. IBACOS expects to conclude this test in the summer of 2010.

### Task 3

#### Gate 2 – *Prototype House Evaluations*

- **Ecological Construction Laboratory – Champaign, IL, 50%, Cold.** Monitoring and data collection continued in March.
- **Harvard Communities – Denver, CO, 50%, Cold.** Data acquisition is underway and will continue for the rest of 2010. The new homeowners now occupy the house and have given their consent to permit ongoing monitoring. Now that the house is occupied, IBACOS can evaluate the performance of the domestic water heating (DHW) system.
- **Imagine Homes – San Antonio, TX, 50%, Hot-Humid.** Detail drawings for key framing details and drainage plane integration using exterior extruded polystyrene (XPS) foam sheathing were sent to builder on March 25. Roth Heliostar® S252 high-selectively coated, flat plate collectors and a Bradford-White EcoStor™ SC 80-gallon solar indirect storage tank will be used for the solar thermal water heating system. Based on TRNSYS simulations of

the selected products, the optimal solar thermal system will consist of 54 sq ft<sup>2</sup> of panels and a single 115-gallon tank with an integral backup element. The project is set to break ground in early April.

- **Insight Homes – Sussex County, DE, 50%, Mixed-Humid.** Insight Homes began to evaluate the costs associated with the various specification package options identified by IBACOS to reach the 50% level of energy savings, which include the use of balanced ventilation, a ground source heat pump with an integral desuperheater, continuous exterior foam sheathing on above-grade walls, and enhanced attic insulation. To-date, energy use modeling was done using EnergyGauge USA, which showed Insight Homes' standard building package achieving 48.2% whole house energy use savings. During March, the same building specification package was entered into BeOpt modeling software for comparison, which showed the house achieving 53% whole house energy use savings. IBACOS will review the inputs used for modeling with each program as a step toward determining where the possible discrepancy may be occurring, as well as which program and level of energy savings most accurately represents the builder's current practices.
- **K. Hovnanian Homes – Ontario, CA, 50% Hot-Dry.** IBACOS finalized a 50% solution specification package for the prototype house back in February. To achieve the 50% performance level, the builder upgraded to a 92% AFUE furnace with a 14 SEER a/c unit and a Navien 0.98 EF tankless water heater. The most significant change in the building methodology was in using a traditional three-coat stucco system over open-stud framing to a one-coat system over 1" expanded polystyrene (EPS) insulation foam board panels. The house is now scheduled to start construction between May 15 and June 15, 2010.
- **Meritage Homes – Phoenix/Tucson, AZ, 50% Hot-Dry.** The builder is still planning to use insulating concrete forms (ICF) construction technology in its Phoenix high performance package and advanced framing for its Tucson package.
- **Pine Mountain Builders – Pine Mountain, GA, 50%, Mixed-Humid.** Monitoring continued on the two completed 50% prototype houses. Discussions around a new 50% prototype house centered on applications of exterior foam sheathing, such as ½" XPS or ½" SIS™, advanced framing, improved insulation strategies, and reduced infiltration strategies, with the goal of developing more cost-effective design strategies that still meet the 50% level of source energy savings. IBACOS has looked at partnering with Pine Mountain Builders and Dow to field test the air sealing benefits of SIS.
- **Wathen-Castanos – Fresno, CA, 50%, Hot-Dry.** Construction is underway on the builder's prototype house. IBACOS visited the project on March 31 to inspect its progress and collect images of the installed assemblies. The home has a 94.7% AFUE Bryant furnace, a 19 SEER condensing unit and a 0.98 EF Navien tankless water heater. To meet California ventilation requirements a system consisting of a bathroom exhaust fan on a two speed switch and a fresh air supply duct connected to the return side of the air handler will be used. To achieve better air tightness, they are sealing all the perimeter edges of the drywall panels to the framing with drywall adhesive. All penetrations through the drywall will be sealed with caulk prior to paint. The home is scheduled to be completed at the beginning of June 2010.

## Task 4

### Gate 3 – Initial Community-Scale Evaluations

- **Imagine Homes – San Antonio, TX, 40%, Hot-Humid.** The builder met all G3 “Must Meet” and “Should Meet” criteria. More than 10 houses are complete.
- **Pine Mountain Builders – Pine Mountain, GA, 40%, Mixed-Humid.** The builder met all G3 “Must Meet” and “Should Meet” criteria. More than 10 houses are complete.
- **Tindall Homes – Mansfield, NJ, 40%, Mixed-Humid.** The builder met all G3 “Must Meet” and “Should Meet” criteria. More than 10 houses are complete.
- **Insight Homes – Sussex County, DE, 40%, Mixed-Humid.** IBACOS continued to work with Insight Homes on various “Should Meet” Stage Gate criteria for communities, as well as other criteria related to prototype houses, including the development of standard construction details for bulk water management on roof assemblies. IBACOS also continued to focus on compiling the work completed with the builder at the 40% community-scale level for inclusion in the 2010 Mixed-Humid Project Management Milestone (PMM) Report.
- **The New American Home 2010.** Construction activities continued at the house with an emphasis on interior finishing and HVAC work. The house is scheduled to be complete by May 1, 2010 in time to participate in a local parade of homes event.
- **The New American Home 2011.** Construction on the house continued this month with structural work. According to the December 2009 Benchmark, the house design attains 45% whole house source energy savings. The use of the house size multiplier had a noticeable effect on the energy savings for this project (8,883 sq ft<sup>2</sup> of floor area); without the effect of the multiplier, the source energy savings were 56%.

## II. SUMMARY OF TECHNICAL HIGHLIGHTS FOR THE PREVIOUS THREE MONTHS (INPUT FOR HQ QUARTERLY REPORT)

- IBACOS conducted a parametric study of high performance wall and window systems in house designs in the Cold, Mixed-Humid, and Hot-Dry climates. The study determined that three wall types equally exhibited the best comfort conditions in each climate—a 2x8 staggered stud wall with 2” of exterior insulating sheathing, a 2x6 stud wall with 3” of exterior insulating sheathing and a layer of spray polyurethane foam insulation (with blown fiberglass insulation in the wall cavities), and a 2x6 stud wall with 4” of exterior insulating sheathing. Window modeling indicated that windows with triple glazing, a U-value of 0.19 or less, and a SHGC of 0.22 or less provided the best comfort situations in all three climate zones.
- Mock-up research on the most appropriate way to install an exterior door with a 9” wide threshold in an exterior wall over 10” wide without affecting wall durability determined that a custom-made aluminum threshold was not necessary. The best approach for installing the door was to position it toward the exterior and install a modified plastic flashing pan

underneath the threshold to manage water.

- When Spider® sprayed-in fiberglass insulation was installed in the 2x8 wall portion of the mock-up, IBACOS made the following observations:
  - The insulation could not always be contained effectively within the staggered stud wall cavity.
  - A framing member for interior wall attachment obstructed the placement of insulation in the wall, resulting in incomplete insulation coverage in this area.
  - The moisture content of the insulation was higher than recommended levels, a situation likely due to improperly mixing the insulation with its binding agent.
  - The installer's device for measuring the moisture content of the insulation could only be used on 2x4 and 2x6 walls and not 2x8 walls.
- One of the key findings from IBACOS' mock-up work related to the use of Dow STYROFOAM™ Brand WALLMATE™ insulation as exterior insulation on above-grade walls was that while foam sheathing is becoming increasingly common in the market, the use of foam with integrated recessed furring strips in exterior wall applications is still a fairly uncommon practice requiring additional tools.
- IBACOS evaluated the constructability and durability of a 4" thick EIFS over a 2x6 stud frame with continuous 7/16" OSB structural sheathing. Major conclusions are that EIFS is an easy way to increase wall insulation values without affecting the framing details or interior dimensions and layout. However, troweled-on adhesive must be applied properly to maintain the drainage channels behind the foam.
- Work continued with Verve Living Systems and Progress Lighting on the design and construction of the IBACOS Lighting Demonstration Area, which will highlight a range of high performance lighting solutions for targeted residential applications. A Verve controller will be used to design specific lighting "scenes," and the Verve system will be evaluated based on its ease of installation and usability.
- Results collected over the past 6 months from the hot water study at the Pine Mountain Builder houses indicate that the desuperheater is contributing less to hot water generation than originally anticipated. Closer inspection of the system setup is planned to determine the causes.
- IBACOS completed work on the construction drawings and documentation required for permit applications for the Pittsburgh Zero Energy Lab Home. Documents were submitted to the township for review and are currently being evaluated for approval. Additionally, IBACOS and S&A Homes hosted a groundbreaking ceremony at the Cobblestone Community in Ohio Township north of Pittsburgh, PA for the start of construction of the lab home. Participants at the event included representatives of IBACOS, S&A Homes, the community developer, local trade partners, manufacturer partners, township and code officials, and local media personnel. Construction of the home is expected to get underway in April 2010.

### III. PROJECT MANAGEMENT ISSUES

Recent conversations with the DOE regarding IBACOS' proposed BP3 PMP has resulted in small revisions (submitted April 1, 2010). Although minor in nature, receiving prompt and direct feedback from DOE, leading to timely acceptance of the PMP, is becoming critical. IBACOS anticipates reaching its authorized funding cap of \$500K in early April.

The cancellation of the April Building America Quarterly Team meeting will result in an elapsed time of over 9 months since the Teams have been together in front of the DOE. Although having the time to prepare submissions for a new solicitation is appreciated, the lack of dialogue with the DOE on the Teams' progress, challenges, and findings is a concern.

#### **IV. INPUT ON UPCOMING EVENTS FOR EERE'S 30-60-90 DAY REPORT**

IBACOS does not currently have an event for the EERE'S 30-60-90 Day Report.

#### **CONFERENCE PRESENTATIONS / WORKSHOPS**

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IBACOS attended an Oak Ridge National Laboratory (ORNL) workshop called "Shaping the Future of BTRIC User Facilities" on March 22-23, 2010 in Oak Ridge, TN.