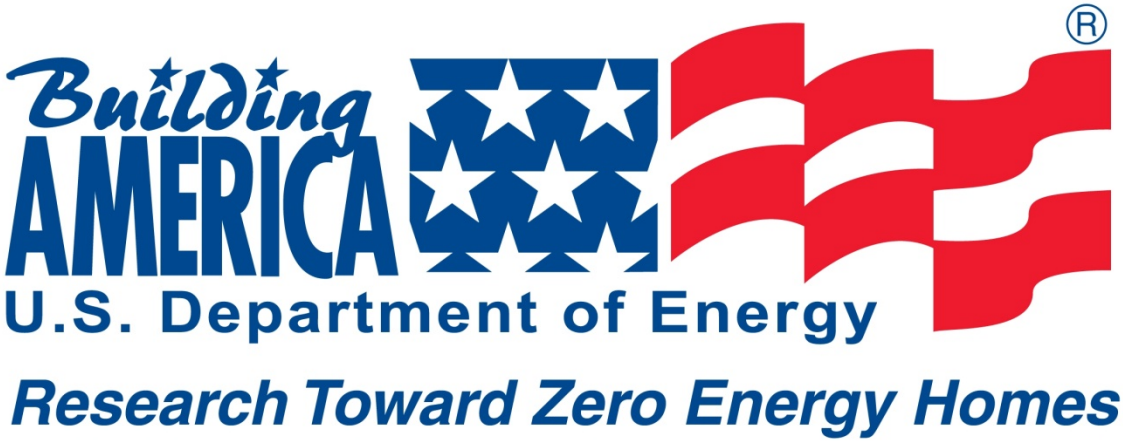

BUILDING AMERICA CONSORTIA AND NATIONAL LABORATORY STATUS REPORT

October 2009

MONTHLY STATUS REPORT, October 2009
Cooperative Agreement DE-FC26-08NT 02231
Prepared by IBACOS

I. CURRENT PROGRESS AT EACH GATE LEVEL

Task 2
Gate 1A – *Expected Whole House Energy Savings and Cost Targets*

- IBACOS finished developing a TRNSYS model for the house plan S&A Homes will use for the Cold-Pittsburgh lab house. Work is underway on integrating the components of the mechanical system.
- IBACOS selected the window for the basement slider in the lab house. It matches the high performance windows used in other locations. The rough frame for the basement window will be made of wood to facilitate the window's installation; initially, a metal frame was advocated, but it restricted the number of possible window configurations. IBACOS discussed the window well with the manufacturer and learned that the window well could be integrated with the foundation wall without using a metal window frame.
- IBACOS conducted TRNSYS and THERM modeling to determine the performance of the foundation wall with and without below-grade exterior R-10 extruded polystyrene (XPS) insulation. Research into using XPS foam board insulation below grade indicated that fire retardants in the material may potentially pollute the ground. Without insulation, THERM modeling showed there would be an insignificant temperature drop (0.1°C) on the interior face of the foundation wall at its most vulnerable location. With insulation, TRNSYS modeling indicated that a total of 33 kWh/yr in heating and cooling energy would be saved annually, a substantial enough amount to warrant the use of insulation. S&A Homes already uses an insulation product, Shockwave™, in other projects as a drainage board; it is now favored for the foundation wall. One inch of the material provides approximately R-4 thermal performance.

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 wall mock-up research continued in the IBACOS facility. IBACOS documented the installation of insulating sheathing, furring strips, housewrap, and vinyl siding on one of the OSB sheathed wall systems for training reasons. In addition, the team integrated the window trim that the lab house builder is likely to use into the mock-up to test constructability. IBACOS also began to research how best to install the entrance doors and a hinged patio

door within the 2x8 staggered stud wall system. The doors specified in the house plans are inswing, favoring an interior/recessed placement in the wall, which requires a wider door threshold and jamb extension. Placing an inswing door on the exterior side of the wall requires adequate clearance for the door latch as the door swings inside; this would likely require a larger rough opening and a greater amount of rough door framing, reducing the overall thermal performance of the wall system. Part of this research included speaking with several manufacturers about their products and collaborating with Building Science Corporation on their past research—answers and results are expected next month.

- IBACOS is currently working with Johns Manville to understand the moisture characteristics of its Spider® insulation within a 2x8 staggered stud wall system. Johns Manville used WUFI software to estimate the moisture content of the insulation over time. If the insulation was installed in October, it dried significantly after seven days. Johns Manville plans to repeat the WUFI modeling for April, the scheduled month for the lab house installation.
- IBACOS researched the possibility of using Spider insulation as attic insulation. A 14" thick layer of the insulation achieves R-60. A similar thermal performance can be achieved with 17" of loose-fill cellulose insulation and 23" of fiberglass blown-in insulation. However, IBACOS favors Spider insulation because only 12" of insulation can go at the attic eaves due to the height of the roof trusses' heel. In other words, the thicker the insulation, the more it will have to taper toward the eaves. TRNSYS modeling indicated that the most extreme case of insulation tapering at the eaves will raise energy consumption by 16 kWh/yr. Since Spider insulation is not typically used in a flat attic, IBACOS is also researching the installation considerations for this approach.
- IBACOS began to research products suitable for insulating the inside face of the foundation walls in the unfinished basement. Using XPS foam board insulation requires a thermal barrier. IBACOS was unable to find a suitable thermal barrier product, other than by using a framed wall assembly with drywall, which contradicts the point of an unfinished basement. As a result, the team favors using polyisocyanurate foam core insulation board with a foil facing, which does not require a thermal barrier, to provide R-19 thermal performance at the inside face of the foundation wall.
- IBACOS and Progress Lighting continued to refine the design and develop the lighting specifications and scope of work for the lab house's lighting.
- IBACOS continued to work on the HVAC research lab, compiling a detailed work schedule and purchase orders.

Task 3
Gate 2 – *Prototype House Evaluations*

- **American Heritage Homes – Carroll, OH, 50%, Cold.** Initial discussions have begun with this builder regarding a 50% prototype house. American Heritage Homes is a semi-custom, production-focused, "build-on-your-lot" homebuilder in the Columbus, OH market.

- **Ecological Construction Laboratory – Champaign, IL, 50%, Cold.** Monitoring and data collection continued in October. Data collected from the house was presented at the North American Passive House Conference and over 100 participants toured the prototype house.
- **Harvard Communities – Denver, CO, 50%, Cold.** Data acquisition is underway and will continue for the rest of 2009. IBACOS has completed the second three months of data analysis ahead of the original goal. The house sold and is expected to be occupied starting in January. IBACOS is working with Harvard Communities to put a monitoring agreement in place with the new homeowner to continue collecting data.
- **Imagine Homes – San Antonio, TX, 50%, Hot-Humid.** Research continued into finding an appropriate solar water heating system for the prototype house. The final selection will probably occur in early November 2009. Efforts are currently underway to engineer an advanced framing plan for the house. Decisions were made regarding the HVAC equipment, ventilation, and exterior wall insulation strategies. Efforts next month will focus on finalizing the framing plan and product selection and acquiring detailed pricing information. Ground-breaking is expected in early January 2010.
- **Insight Homes – Greenwood, DE, 50%, Mixed-Humid.** Work focused on finalizing the HVAC designs for two of Insight Homes' house types. The builder's current ductwork supplier does not carry products that meet the size requirements specified in the HVAC design created by IBACOS, so alternative suppliers are being explored.
- **K. Hovnanian Homes – Ontario, CA, 50% Hot-Dry.** An initial site visit and introductory meeting is scheduled for early November to discuss the feasibility of pursuing a 50% prototype house. IBACOS conducted initial modeling on a one-story, three-bedroom house plan.
- **Meritage Homes – Phoenix/Tucson, AZ, 50% Hot-Dry.** IBACOS held an initial site visit and planning meetings with Meritage Homes to look at the opportunities associated with the builder's push toward a systems-engineering approach to achieve significantly higher performing houses. The builder's goal is a HERS rating of 50 or less. IBACOS will be working with Meritage Homes to evaluate its technical packages and compare it with the Building America 50% targets. Filed analysis, modeling, and further meetings with key managers will occur next month.
- **Pine Mountain Builders – Pine Mountain, GA, 50%, Mixed-Humid.** Monitoring continued on the two completed 50% prototype houses. IBACOS studied the effect of the ground-source heat pump desuperheater on hot water energy consumption. Discussions with the builder continued around developing a strategic plan for community-scale implementation of the existing 50% specifications, as well as exploring the implementation of more cost-effective design strategies that still meet the 50% savings milestone.
- **Robson Communities – Phoenix, AZ, 50%, Hot-Dry/Mixed-Dry.** Due to the prolonged downturn in the housing market, this division is unable to pursue the construction of a 50% prototype house at this time.
- **studio26 – Orefield, PA, 40%, Cold.** The prototype houses are complete. IBACOS delivered a final process mapping report to the builder. No future work is anticipated.

- **Wathen-Castanos – Fresno, CA, 50%, Hot-Dry.** IBACOS recently formed a partnership with Wathen-Castanos. The builder plans to start construction on a 50% prototype house at the start of 2010. Wathen-Castanos is interested in moving toward 50% on a community scale. In addition to defining a 50% solution, IBACOS is working closely with the builder as it designs a quality management process that affects every aspect of its operations.

Task 4
Gate 3 – ***Initial Community-Scale Evaluations***

- **ELDI/S&A Homes – Pittsburgh, PA, 40%, Cold.** The builder met all G3 "Must Meet" and "Should Meet" criteria and contributed to the 40% Joule milestone for the Cold climate that was delivered in 2009.
- **Imagine Homes – San Antonio, TX, 40%, Hot-Humid.** IBACOS continued to help the builder evaluate and document all G3 criteria at the 40% whole-house energy savings level on the community scale.
- **Insight Homes – Greenwood, DE, 40%, Mixed-Humid.** Insight Homes continued to construct houses on scattered lots, as well as within community developments. The builder incorporated construction details to address water management and durability issues in order to pass all G3 "Must Meet" and "Should Meet" criteria.
- **K. Hovnanian/Landover Group – Clinton, MD and Woodbridge, VA, 40%, Mixed-Humid.** No additional work is planned at the 40% level at this time.
- **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.

II. SUMMARY OF TECHNICAL HIGHLIGHTS

Task 1 – *Building America System Research Management and Technical Support*

IBACOS attended the 4th Annual North American Passive House conference on October 16-18, 2009 and presented the results of monitored data from the Fairview 2 house. The presentation title is listed in Section IV of this report and a PDF of the full presentations is included in the appendix.

Task 2
Stage 1 – *Integrated Solutions for Specific Climate Regions and System Performance Evaluations*

IBACOS provided significant feedback to the National Renewable Energy Laboratory (NREL) on the proposed detailed analysis methods for the lighting category of the Building America Benchmark.

Task 3
Stage 2 – *Prototype Houses*

- **Wathen-Castanos.** IBACOS completed an initial assessment of the builder's current construction practices. IBACOS is preparing to model several potential solutions for a prototype house that will achieve the 50% whole-house energy savings level. IBACOS is still working on a ventilation strategy to meet ASHRAE 62.2. While this work occurs, another solution delivers a 53% source energy reduction when compared to the Benchmark. This solution is a package that includes R-49 attic insulation, a 16 SEER air conditioner, a 94% AFUE furnace, and very tight construction combined with the builder's standard specification package.
- **Meritage Homes.** This builder is exploring several different strategies to achieve significantly higher performance in its houses. These strategies include advanced framing and production-level insulated concrete form (ICF) systems. IBACOS will provide additional analysis to identify other strategies that the builder can cost effectively implement at a production scale and achieve 50% whole-house energy savings.
- **Imagine Homes.** The builder expects to begin construction on the prototype house during the first three months of 2010. The primary technical solutions under investigation for this Hot-Humid house include 2x6 advanced framing and solar thermal water heating. Per the builder's preferences, energy recovery ventilation (ERV) is no longer included in the design strategy. IBACOS is continuing to facilitate discussions among all of the involved parties to understand the technical and practical details of building to advanced framing specifications.
- **The New American Home® 2010.** Construction of The New American Home 2010 in Las Vegas, NV continues to progress slowly due to financing issues encountered by the builder with key lenders. As a result, *BUILDER Magazine* postponed its extensive photography shoot; instead, the house will be photographed in its current state of construction. The new goal is to complete the house in time for public touring during the International Builders' Show (IBS) in January 2010. In October, construction focused on installing the exterior finish insulation system (EIFS) with R-7 thermal performance over the ICF exterior wall system. The EIFS creates a uniform exterior wall finish, a necessity since certain areas of the ICF sustained fire damage due to a fire at the home next door.
- **The New American Home 2011.** An initial design meeting for The New American Home 2011 was held with the builder, architect, and NAHB personnel. The location of the house is

downtown Orlando, FL, and it has already been sold. Due to homeowner preferences, the house will be 6,500 square feet of floor area, despite the NAHB's desire that the house be smaller. The builder is aiming to achieve Builders Challenge and ENERGY STAR® certification, as well as the Emerald level of the NAHB's National Green Building Standard™ (NGBS). Based on early design concepts for the house and preliminary knowledge of the site, IBACOS gave the design team recommendations for energy efficiency and outlined the practices required to achieve the Emerald level of the NGBS. Construction drawings are expected in November 2009.

- IBACOS continued to actively collect monitoring data from ten houses.

Task 4
Stage 3 – *Initial Community-Scale Evaluations*

Insight Homes. IBACOS began to assist Insight Homes with evaluating several foundation drainage options for its typical house type—a single-story house over a conditioned crawlspace. Under discussion are exterior waterproofing and drainage mat products, as well as interior vs. exterior foundation drain options.

Task 5
Stage 4 – *Project Closeout, Final Evaluations of BA Communities*

No 2009 activity planned.

Task 6 - *Other Research Activities*

IBACOS does not currently have work in this Task.

III. PROJECT MANAGEMENT ISSUES

The lack of final guidance and direction for Budget Period 3 (BP3) continues to create a difficult dynamic for IBACOS both in planning and in staffing. There is concern that the continued delay may slow our ability to stay on schedule for BP3 planning and could affect our ability to ramp up effectively. In addition, it may also hinder our ability to effectively provide the quality and scale of effort needed to meet the expectations of the BA program.

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

IBACOS gave one presentation at the North American Passive House Conference on October 17th, 2009.

Monitored Results from Fairview 2	Dave Stecher

IBACOS also participated in the "Measurement Science for Net-Zero Energy Buildings" workshop at the National Institute of Science and Technology (NIST) on October 29th, 2009.