

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

**August 2009**

**IBACOS**<sup>®</sup>  
| Home Quality + Performance |

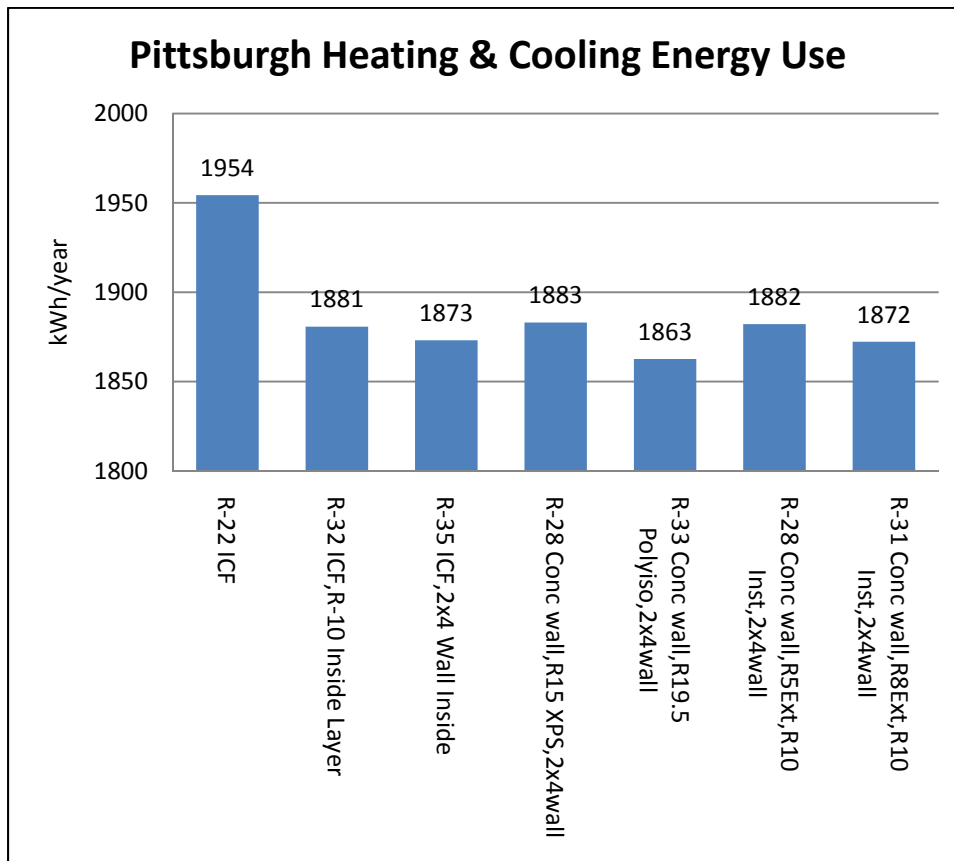
**MONTHLY STATUS REPORT, August 2009**  
**Cooperative Agreement DE-FC26-08NT 02231**  
**Prepared by IBACOS**

**I. CURRENT PROGRESS AT EACH GATE LEVEL**

**Task 2**

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

- IBACOS conducted TRNSYS modeling on a variety of basement foundation wall systems. The modeling showed that the energy performance of the wall systems increases as insulation is designed into the system, with little difference in energy use between them once they reach a nominal R-value of R-28. The results of the modeling are below. The concrete foundation wall systems used in this modeling are assumed to be 8” thick.



- IBACOS advocated that the builder for the lab house use a basement foundation wall system similar to one the builder already uses. It is a poured concrete wall with R-5 exterior insulation board above grade (R-10 exterior insulation board below grade) and R-10 insulation board on the inside face of the foundation wall. In addition, a 2x4 wood framed wall with fiberglass batts in cavities (R-13) is installed on the interior side of the foundation wall. This system displayed good energy efficiency, does not have any thermal gaps (it includes exterior insulation), and can be integrated with the recommended wall system.
- IBACOS recommended a 2x8 wall system with staggered 2x4 studs, a layer of OSB sheathing, and 2" of exterior insulating sheathing. This decision was based on wall mock-up research, TRNSYS modeling, and discussions with S&A Homes and its structural engineer. This system provides excellent energy savings and can be constructed in a production homebuilding environment. The OSB sheathing is a sensible choice as a wall bracing strategy, and it offers a nailing base for wall siding and trim. Strapping will be integrated into the exterior insulating sheathing.
- IBACOS received updated pricing information for the Gorell window being researched and made corrective adjustments to the pricing for the Owens Corning Solace KR90 window. As a result, the incremental construction cost and energy savings information for the windows was updated, and the cost vs. energy saving values for these two windows, along with the Serious 501 unit, came out between \$0.51 and \$0.53. The Gorell unit exhibited the best value.

### ***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. The 2x8 wall system was constructed with an insulating sheathing product that is normally used in basements. The product, DOW's WALLMATE™, has recessed channels that allow furring strips to be installed (on the interior face) when the panels are placed against a basement wall. If the sheathing is installed so the recessed channels are facing outboard (instead of inboard for a basement wall), then ¾" x 3" furring strips can be installed within the channels, resulting in a uniform, flush surface without protrusions. Both vinyl and fiber cement cladding systems were successfully installed on this wall system. Furthermore, there were no constructability issues with fastening the vinyl siding at 24" o.c. increments directly to the wall system studs. The vinyl siding could also be fastened to the OSB sheathing layer in the wall, if necessary.
- IBACOS initiated research into how each of the leading windows could be installed in the favored wall system. By using the wall mock-up, IBACOS explored issues like attachment details through insulating sheathing and integration with vinyl and fiber cement siding. At this early stage in the investigation, the Gorell window appears to be the most suitable for use in a production homebuilding environment.

- IBACOS continued to work on the lighting demonstration area in its facility. Three prototype assemblies for cove lighting systems using T5 and LED technologies were constructed to work out designs that are simple to build using off-the-shelf materials. The prototype assemblies were also designed with the intent to minimize the cove size. The cove assemblies will allow multiple mounting locations to show the light distribution on the wall and ceiling at different mounting heights. The cove area evaluates ambient lighting and energy benefits in context with the construction details and process. Various light fixtures and lamps have been installed and evaluated, including a low-cost LED floodlight available at a mainstream wholesale store.
- IBACOS explored photographic techniques for documenting fixture light character. A rigid, medium-grey board and manual settings on a digital camera were used to show beam spread, cutoff, and other attributes of the presentation of light from a fixture.
- A lighting analysis was conducted at a model house built by S&A Homes in the same community where IBACOS' first lab house will be located. The model house includes an upgraded lighting package that is a standard offering by the builder. With a few important exceptions, the light levels in most areas of the house were adequate for circulation and tasks (where appropriate) per IESNA guidelines. The kitchen counter task surfaces showed the most significant deficiency in light levels relative to accepted minimum levels. The lab house's lighting will be compared to this work.
- Discussions continued in August with Progress Lighting to participate in the lighting demonstration area and the lab house, as well as offer builder-positive designs using their products.

### 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 August.
- **Harvard Communities – Denver, CO, 50%, Cold.** Data acquisition is underway and will continue for the rest of 2009. IBACOS plans to complete the second three months of data analysis prior to the end of September, which is ahead of the original goal, due to tours. The prototype house will be toured by participants from the EEBA conference in Denver, CO on September 28<sup>th</sup>. For Harvard Communities, the standard practice is to build to approximately a 38% level of energy savings. Due to the state of the housing market, moving to 50% is not practical at this time.
- **Imagine Homes – San Antonio, TX, 50%, Hot-Humid.** The 3177 house plan was selected for the first 50% whole house energy savings prototype house. Subsequent research and discussions have been focused on transitioning the builder from traditional 2x4 framing to

2x6 advanced framing and identifying a favorable solar water heating system. In September, the framing will be designed for the 3177 plan and the selection will narrow to one or two solar water heating package options for the prototype. Analysis continued on design strategies relative to the G2 “Must Meet” criteria.

- **Insight Homes – Greenwood, DE, 50%, Mixed-Humid.** Work continued on developing durability and moisture management details for Insight Homes, part of the effort to ensure the builder passes all G2 “Must Meet” criteria. Due to its largely Hispanic trade base, Insight Homes decided to have a third party translate the details into Spanish to increase their effectiveness. Preliminary HVAC designs for two house types were reviewed with the builder. Discussions continued around selecting a plan type and community to use for the development of a 50% prototype house.
- **Pine Mountain Builders – Pine Mountain, GA, 50%, Mixed-Humid.** Monitoring of the two completed 50% prototypes continued. IBACOS is simulating typical domestic hot water consumption in the two monitored houses in order to determine the effect of the desuperheater on hot water energy consumption. Discussions occurred around developing a strategic plan for community-scale implementation of the outlined 50% specifications; these discussions have included other 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 in late 2009. Wathen-Castanos is interested in moving toward 50% on a community scale. This builder has experienced a wave of sales in the past three months and needs to clear some of its workload before focusing more intently on prototype development.

#### Task 4

##### Gate 3 – *Initial Community-Scale Evaluations*

- **ELDI/S&A Homes – Pittsburgh, PA, 40%, Cold.** From the prototype house experience, the developer is reviewing and revising the energy efficient specifications for this project, while staying committed to 40%. Due to slow house sales, this process has been prolonged but IBACOS will work with the developer and the builder to revise the specifications in order to maintain the 40% energy savings level.
- **Imagine Homes – San Antonio, TX, 40%, Hot-Humid.** IBACOS continued to help the builder evaluate and document G3 criteria of 40% whole house energy savings at the community scale.

- **Insight Homes – Greenwood, DE, 40%, Mixed-Humid.** Insight Homes has been working with a design team to develop new elevation options and color schemes to make its houses more regionally appropriate for the new communities where they will be building. Construction continued on the first model house at one of the builder’s new communities, and work got underway on another model house at a second new community. IBACOS continued to help create 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 and more than 10 houses are complete.
- **Tindall Homes – Mansfield, NJ, 40%, Mixed-Humid.** The builder met all G3 “Must Meet” and “Should Meet” criteria and more than 10 houses are complete.

## II. SUMMARY OF TECHNICAL HIGHLIGHTS

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

IBACOS attended the August DOE Quarterly meeting and presented on our modeling work with EnergyGauge USA, BEopt, and TRNSYS, focusing specifically on gaps and inconsistencies between EnergyGauge and BEopt.

### **Task 2**

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

IBACOS continued to work with the National Renewable Energy Laboratory (NREL) on the Building America Benchmark process for 2009. IBACOS also worked on the review of proposed detailed analysis methods for the lighting and miscellaneous electric loads categories.

### **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 a 50% energy savings level. Possible technical solutions include modeling 2x6 framing with 1” expanded polystyrene foam (EPS), moving the ducts and forced air unit (FAU) into conditioned space, and upgrading the tankless water heater to a higher efficiency unit. A construction start date for the prototype house has not been determined.

- **Imagine Homes.** Construction on the prototype house is expected to begin in Q4 2009 or Q1 2010. The primary technical solutions under investigation for this Hot-humid house include 2x6 advanced framing, solar thermal water heating, and energy recovery ventilation (ERV). IBACOS is currently facilitating 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.** The construction of The New American Home 2010 in Las Vegas, NV has progressed slowly due to financing issues encountered by the builder with key lenders. Only drywall installation and finishing work were accomplished in August. The house needs to be completed by October 15<sup>th</sup> to accommodate photography shoots.
- IBACOS continued to actively collect monitoring data from ten houses.

#### Task 4

##### Stage 3 – *Initial Community-Scale Evaluations*

- **Insight Homes.** IBACOS began to evaluate the use of ducted mini-split heat pumps as a strategy for conditioning the second floor zone on some of the builder's 1½ story plan types. However, the extremely low loads for the upstairs zone made it a challenge to find appropriately sized equipment. In addition, IBACOS is currently working with Insight Homes to investigate the source of high humidity levels in some of its newly constructed houses. Relative humidity levels are reaching nearly 75% in some of the houses, but it is unclear at this point if those levels are due to moisture from typical new construction materials or if the HVAC systems are not operating properly to dehumidify the houses. Additional work is needed to diagnose the problem.

#### 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.

## I. PROJECT MANAGEMENT ISSUES

While feedback was received for the American Recovery and Reinvestment Act (ARRA) proposal submitted by IBACOS, there is still no endpoint for the contract revision or the receipt of funding. In addition, upper management is now revisiting the plan for retrofit work within the Building America program. While it is prudent to create a sufficient plan for the retrofit work, this creates a difficult dynamic with respect to planning, budgets, and staffing for IBACOS.

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

Event Date: October 19-20, 2009; 6:00 – 9:00 pm and 8:00 am – 3:00 pm  
Event: **Best Practices Research Alliance Welcome Dinner and Annual Meeting**  
Location: Pittsburgh, PA; with limited access via webinar  
Description: Welcome dinner for in-person attendees at IBACOS' office on October 19, the evening before the meeting. Alliance Annual Meeting for members with updates and discussions regarding Research, Outreach, Policy and Education activities—including presentations from builders, IBACOS and business experts.  
Participants: builders, select industry suppliers, business experts, and media partners  
Action: Dane Christensen of NREL is planning to attend.  
Program Contact: Elizabeth Scott, 412-325-1514

## CONFERENCE PRESENTATIONS

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IBACOS did not present at any conferences in August.