Building America Case Study

Low-Cost Evaluation of Energy Savings at the Community Scale

Fresno, California

PROJECT INFORMATION

Project Name: Evaluation of New Construction Pilot Community

Location: Fresno, CA

Partners:

Wathen Castanos Hybrid Homes, Inc.; *wchomes.com*

IBACOS, Inc.; *ibacos.com*

Building Component: Utility evaluation

Application: New and/or retrofit; single and/or multifamily

Year Tested: 2012

Applicable Climate Zone(s): All

PERFORMANCE DATA

Projected energy savings of example house: 51%

Simulation improvement after measuring set point schedule: 10%

Community-scale new construction and retrofit projects evaluate the potential energy and cost savings of replicating improved energy-efficient construction practices across multiple houses. Confirming projected energy savings using measured performance data from actual houses is important for validating predictive energy models. For a single home, a complex and expensive monitoring system using a traditional wired data logger, wired sensors, and telemetry is effective for collecting accurate data on energy use, but can be cost prohibitive at the community scale. In this project, U.S. Department of Energy Building America research team IBACOS partnered with builder Wathen Castanos Hybrid Homes in Fresno, California, to develop a simple and low-cost methodology by which community-scale energy savings can be evaluated based on results at the occupied test house level.

To perform this evaluation, the research team collected data on whole-house energy consumption in five homes for 1 year using homeowner utility bills for both electricity and natural gas. The team also collected indoor temperature measurements in each home at the central thermostat using a single, self-contained data logger installed by the builder's site crew.

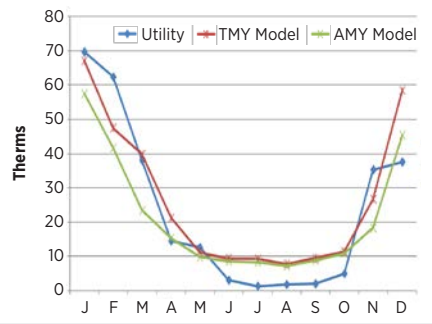
The research team estimated daily and seasonal thermostat set points and setback schedules from measured thermostat temperatures and accounted for any unusual homeowner thermostat control behavior. Using purchased weather data from the test period and the modified thermostat schedules, the team improved the accuracy of the modeled energy use by up to 21% relative to the collected utility bills.

Although the study results may not influence the selection of specific energy efficiency measures over others, this method of validating actual energy savings can provide a more cost-effective means for builders and utility companies to promote and support community-wide adoption of improved energy-efficient construction practices.

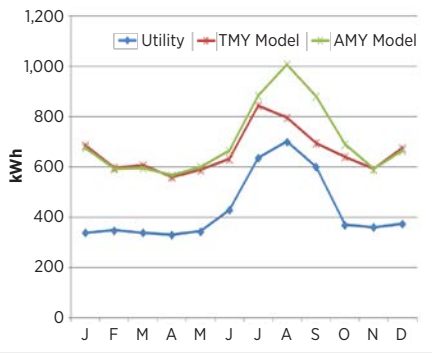
Building America SM U.S. Department of Energy

Description

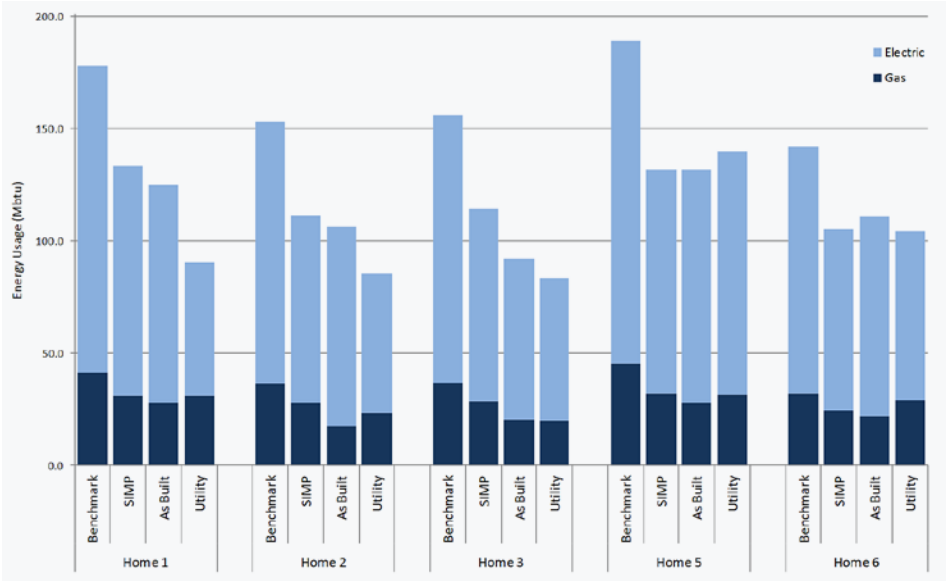
Modeling results for example house. Actual Meteorological Year data were used for the final comparison to utility bills to account for weather normalization.



Comparison of gas consumption



Comparison of electricity consumption



This graph shows 12-month actual utility use versus modeled results for the five final test houses. Home 4 withdrew from the project.

Note: SIMP denotes "systems integrated measures package."

Lessons Learned

- The utility company can provide data directly to the project team, easing the burden on individual homeowners to supply these data.
- A small sample size (e.g., five homes) can lead to large variations in the data.
- There is a risk of data loggers going offline and data being lost without notice because these are remote and disconnected devices.
- Keeping occupants of the homes engaged in the project can provide valuable insight and context for observed data, yet can be a challenge to maintain.
- Simplified equipment and installation procedures can reduce project costs if the equipment can be installed by someone on the builder's site team.
- A complex and expensive (more than $5,000) monitoring system using a traditional wired data logger, wired sensors, and telemetry is an effective approach to collect accurate data on energy consumption, but can be cost prohibitive at the community scale.

For more information, see the Building America report, *Energy Evaluation of a New Construction Pilot Community: Fresno, California,* at: *buildingamerica.gov*

Image credit: All images were created by the IBACOS team.

DOE/GO-102014-4434 • October 2014