



Building America Case Study

Meeting DOE Challenge Home Program Certification

Chicago, Illinois; Denver, Colorado;
Devens, Massachusetts

PROJECT INFORMATION

Construction: New home

Type: Single-family

Builders:

K. Hovnanian Homes
khov.com

David Weekley Homes
davidweekleyhomes.com

Transformations, Inc.
transformations-inc.com

Size: 1,500–3,200 ft²

Price Range: \$250,000–\$350,000

Date Completed: 2012–2013

Climate Zone: Cold

PERFORMANCE DATA

These figures are from the K. Hovnanian house as an example.

HERS Index Range: 45

Projected annual energy cost: \$627

Incremental cost of energy efficiency measures: \$7,000

Incremental annual mortgage: \$648

Billing data: Not available

Three production home builders—K. Hovnanian Homes, David Weekley Homes, and Transformations, Inc.—partnered with U.S. Department of Energy (DOE) Building America team Building Science Corporation (BSC) to evaluate the certification of five test homes to the new DOE Challenge Home program performance standard (now DOE Zero Energy Ready Home program). The builders identified key benefits and barriers that impacted the certification of the test homes, and the likelihood of whether DOE Challenge Home certification would be pursued in future homes.

K. Hovnanian Homes and David Weekley Homes used the performance path for meeting the DOE Challenge Home criteria. This allowed each builder to tailor the energy-related upgrades to suit its specific abilities and preferences. Transformations, Inc. elected to certify via the prescriptive path, and ensured that the specifications of the homes met or exceeded those as stipulated in Exhibit 2 of the DOE Challenge Home National Program Requirements (Revision 03). Energy-related improvements included an enhanced enclosure (added insulation and better windows), increased mechanical systems efficiencies, and improved lighting and appliances. A series of checklists and third-party certification is also required to ensure quality construction and performance.



The Transformations, Inc. homes were 2013 DOE Challenge Home Builder Award winners in the Production and Custom Home categories. Production Home-Lot 6 (left) achieved HERS -37 and Custom Home-Lot 7 (not pictured) achieved a HERS Index of -21. Both included renewable energy systems. Plan 601 for K. Hovnanian (right) achieved a HERS Index of 45, with no active renewable systems installed.

Key Energy Efficiency Measures

These figures are from the K. Hovnanian homes as an example.

HVAC

- 95% AFUE gas furnace with a 13 SEER split air conditioner
- Central fan integrated supply ventilation
- Kitchen and bath fans vented to outside

ENVELOPE:

- R-49 blown fiberglass ceiling insulation in vented attic
- R-13 fiberglass batts in 2x4 frame wall and 1-in. (R-5) XPS insulating sheathing
- R-19 fiberglass batts draped full height at foundation walls
- ENERGY STAR windows, U = 0.29, SHGC = 0.28
- Infiltration: 1.7 ACH 50 (tested)

LIGHTING, APPLIANCES, AND WATER HEATING:

- 100% compact fluorescent lamps
- ENERGY STAR appliances
- Condensing gas tank (0.96 EF) water heater
- EPA WaterSense-compliant hot water distribution system (trunk and branch)

For more information, see the Building America report, *Evaluation of the DOE Challenge Home Program Certification of Production Builders*, at: buildingamerica.gov

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



The two DOE Challenge Home candidates in Devens initially did not meet the Environmental Protection Agency (EPA) WaterSense® “Guide for Efficient Hot Water Delivery Systems” requirement; therefore, the systems needed to be retrofitted. A recirculation pump system with on-demand buttons at remote sinks and laundry room was recommended as a retrofit to meet the requirement.

Lessons Learned and Identified Barriers

- Most of the energy-related improvements (those that lowered the HERS Index to meet the target figure, such as increased insulation and more efficient mechanical systems) represent reasonable improvements that can be marketed to prospective homebuyers. One builder, Transformation, Inc., already satisfies the prescriptive path with its standard design package.
- The required checklists and third-party certifications increased costs that can be classified into two main categories: (1) the added cost and labor for implementing the measures in the checklists (e.g., conduits and other materials required by the Renewable Energy Ready Home checklist); and (2) the additional administrative time invested by the builder to document the checklist and third-party certifications (e.g., verification of volatile organic compound levels in finish materials).
- The DOE Challenge Home program requires some measures that the marketplace is not seeking, (e.g., garage door closers or hot water recirculation pumps).
- Transformations, Inc. received recognition from achieving the DOE Challenge Home label and winning a 2013 Production Builder Award. The builder has been able to use the positive marketing for current and future projects. The builder expressed interest in certifying a limited number of homes in the future, but most likely would not pursue integration into its production environment.
- For builders such as David Weekley Homes and K. Hovnanian, which do not currently construct to a commensurate energy certification program (i.e., ENERGY STAR® Version 3 for homes), the additional administrative costs were high.
- The builders do recognize the potential for future cost reduction with additional experience with the Challenge Home checklists.