

2011 EnergyValue Housing Award Report

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NAHB Research Center

October 2012

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2011 EnergyValue Housing Award Report

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Definitions

ACH50	Air changes per hour at 50 Pascals pressure differential
AFUE	Annual fuel utilization efficiency
BEopt	Building Energy Optimization software
BA	DOE's Building America Research Program
cfm	Cubic feet per minute
DOE	U.S. Department of Energy
EER	Energy efficiency ratio
EERE	DOE's Energy Efficiency and Renewable Energy Program
EF	Energy factor
EVHA	EnergyValue Housing Award
GSHP	Ground source heat pump
HSPF	Heating seasonal performance factor
IECC	International Energy Conservation Code
IBS	International Builders' Show
NAHB	National Association of Home Builders
NAHBRC-IP	NAHB Research Center Industry Partnership
o.c.	On center
PV	Photovoltaic
Research Center	NAHB Research Center
SEER	Seasonal energy efficiency ratio
SES	Source energy savings
SHGC	Solar heat gain coefficient
SIP	Structural insulated panel

Executive Summary

The EnergyValue Housing Award (EVHA), an integral part of the U.S. Department of Energy's Building America (BA) program, seeks to improve and expand the energy efficiency of residential construction nationwide by honoring builders and remodelers and awarding highly efficient homes. Receiving EVHA recognition helps builders and remodelers communicate the value of energy efficiency to prospective customers and distinguish their homes from those built by more traditional residential construction companies. It also provides opportunities for EVHA winning builders and remodelers to set an example for improving the quality and performance of homes throughout the country.

Each year, the project scope of the EVHA includes the application and judging processes, developing the EVHA publication, updating the program and application for the next year, hosting the EVHA banquet, and outreach and technical support. Following the award banquet, the NAHB Research Center evaluates the energy performance of that year's EVHA winning houses. This work is primarily comprised of estimating the energy savings of each home/ or housing unit over the BA Benchmark using energy simulation software and procedures developed by the BA program. The energy evaluations serve as a quantitative measure of the energy efficiency of the units which the judges decided merited an award.

As part of this work, the NAHB Research Center Industry Partnership (NAHBRC-IP) for High Performing Homes strives to make new and existing homes more energy efficient, durable, and affordable through research and development as one of the U.S. Department of Energy's BA teams. Each year, through the EVHA, builder and remodeler partners work with industry partners in a variety of climates endeavor to reach the energy efficiency targets of the BA program. (Department of Energy 2012)

This report details the simulation tool(s) and energy modeling methodology followed in making the energy efficiency estimates and documents the estimated performance of the EVHA award winning houses in comparison with the BA Benchmark and the associated House Simulation Protocols (HSPs). A summary of each building and its features is included with a brief description of the project and the judges' comments. The purpose of this report is to assess the energy performance of the 2011 EVHA winners and to align the EVHA program with the BA program.

1 Background

The EnergyValue Housing Award (EVHA), an integral part of the U.S. Department of Energy's (DOE) Building America (BA) program, seeks to improve and expand the energy efficiency of residential construction nationwide by honoring builders and remodelers and awarding highly efficient homes. Receiving EVHA recognition helps builders and remodelers communicate the value of energy efficiency to prospective customers and distinguish their homes from those built by more traditional residential construction companies. It also provides opportunities for EVHA winning builders and remodelers to set an example for improving the quality and performance of homes throughout the country.

Judges for the EVHA were randomly selected from a group of nominees submitted by professionals within the residential building and remodeling community. Judges' selections followed the framework outlined in Table 1.

The relationship between the EVHA and BA programs provides a valuable liaison to link the building science research with the actual energy efficiency improvements implemented by builders and remodelers. This relationship allows for the evaluation of homes designed and constructed independently and in collaboration with BA teams, introduces builders to certification programs such as Builders Challenge, and provides insight into the marketing and sales activities of high performance builders. It is a unique connection to facilitate research through a single activity such as EVHA.

The culmination of the EVHA program is the award banquet and ceremony held annually in conjunction with the International Builders' Show (IBS). The 2011 EVHA banquet was held in January at the Atlantic Dance Hall at Disney's Boardwalk in Orlando, FL. In addition, each year's activities also include facilitating the application and judging processes; developing the EVHA publication, outreach, technical support, and building simulations; and facilitating an educational session during the IBS. Continuous re-evaluation and adaptation of the EVHA materials and judging processes ensure that the EVHA program is relevant to the industry and BA.

EVHA has evolved in response to market and DOE needs. Initially, only new construction projects were eligible to receive an award, but now renovation projects are also a regular feature of award offerings. As an example, the 2012 EVHA banquet will unveil the addition of a building science educator's award that was overseen by the Consortium of Housing Research Centers. In the past, DOE has utilized this event to showcase new initiatives and to recognize notable contributions of DOE's Energy Efficiency and Renewable Energy (EERE) program.

Table 1. EVHA Housing Award Judging Criteria

Criteria	Construction Type and Weight of Scores		
	Custom (New)	New Construction	Remodeled
Application Completeness: This criterion examines whether all required materials are submitted and whether all referenced supporting documents are furnished.	5%	5%	5%
Energy Value: This criterion examines what makes the home more energy efficient than code requirements or other homes in the local market.	48%	33%	48%
Design: This criterion examines how energy efficiency is considered during the design process.	21%	21%	21%
Construction: This criterion examines management methods and construction processes related to energy and resource efficiency.	13%	20%	13%
Marketing and Customer Relations: This criterion examines how energy efficiency is incorporated into marketing, customer relations and customer education efforts; presentation of energy efficiency financing opportunities; and the use of incentives and rebates to promote energy efficiency	7%	15%	7%
Energy/Green Building Programs: This criterion documents the certification of the EVHA entered home in energy or green programs, such as Home Performance with ENERGY STAR, ENERGY STAR, Builders Challenge, and local and national green building programs, etc.	6%	6%	6%

2 Introduction

The NAHB Research Center (Research Center) has administered the EVHA since its inception in 1996. The purpose of the EVHA program is to recognize the achievements of builders and remodelers who construct high performance homes. The EVHA program also demonstrates to other builders, manufacturers, and others the feasibility and benefits of high performing homes. For their part, EVHA builders and remodelers have consistently raised the level of competition as they reach increasing levels of energy efficiency by using advanced design and building practices, innovative materials, and high efficiency equipment. At the same time, the EVHA applicants have also demonstrated how these practices are incorporated into their business model and are marketed to homebuyers (NAHB Research Center 2012).

The EVHA program's core partners are the National Association of Home Builders (NAHB), DOE's BA program, and the National Renewable Energy Laboratory. Each year a number of additional partners contribute to the success of the EVHA program. These include applicants, builders, remodelers, manufacturers, media partners, trade and professional organizations, federal, state, and local government offices and agencies, and others. Many of the partners provide support for the annual awards banquet and printing of the EVHA publication while others provide in-kind support such as publicity, awards for finalists, etc. Past EVHA sponsors include: BASF, WaterFurnace, Andersen Windows, Dow Building Solutions, SEISCO International Limited, DuPont, the Vinyl Siding Institute, and Whirlpool among others.

Each year, the project scope of the EVHA includes the application and judging processes, developing the EVHA publication, updating the program and application for the upcoming year, hosting the EVHA banquet, and outreach and technical support. Following the award banquet, the NAHBRC evaluates the energy performance of that year's EVHA winning houses. This work is primarily comprised of estimating the energy savings of each home or dwelling unit over the BA Benchmark using energy simulation software and procedures developed by the BA program. The energy evaluations serve as quantitative measure of the energy efficiency of the units which the judges decided merited an award.

As part of this work, the NAHB Research Center Industry Partnership (NAHBRC-IP) for High Performing Homes strives to make new and existing homes more energy efficient, durable, and affordable through research and development as one of DOE's Building America teams. Through the EVHA each year, builder and remodeler partners work with industry partners in a variety of climates endeavor to reach the energy efficiency targets of the BA program (Department of Energy 2012).

This report details the simulation tools and energy modeling methodology followed in making the energy efficiency estimates and documents the estimated performance of the EVHA award winning houses in comparison with the BA Benchmark and the associated HSPs. A summary of each building and its features is included with a brief description of the project and the judges' comments. The purpose of this report is to assess the energy performance of the 2011 EVHA winners and to align the EVHA program with the BA program.

3 2011 EnergyValue Housing Award Winning House Summary

Each year, the EVHA judges evaluate and recognize the superior energy performance of residential buildings submitted for consideration of an award. Judges are professionals in the fields of energy efficiency, architecture, engineering, marketing, and home construction. The judging evaluation process is well defined and established and considers many aspects of energy efficient home construction, marketing, industry outreach, and performance. To be selected, each entry is evaluated based on the home's design, energy efficiency, and all of the applicant's submitted data. This includes architectural plans, builder vision and action, marketing, peer and consumer education, and third party energy simulations.

Awards are separated into New and Existing Homes Divisions. Each division has the following categories and climate regions:

New Homes Division

- ***Categories***
 - Affordable, Custom/Demonstration, Production, Multifamily
- ***Climate Regions***
 - Cold, Moderate, Hot

Existing Homes Division

- ***Categories***
 - Single Family Existing Home, Multifamily Existing Building, Reconstruction/Demonstration
- ***Climate Regions***
 - Cold, Moderate, Hot

There are two levels of awards; Gold and Silver EVHA winners. A Gold Award is defined as outstanding in energy performance, testing, value, and in all other categories. A Silver Award is superior in energy performance and perhaps has one category that is not as strong. The 2011 EVHA judges selected 13 award winning homes. Eleven of the homes were in the New Homes Division. Two of the homes were in the Existing Homes Division. The energy performance of all thirteen 2011 EVHA winners was evaluated for energy savings over the BA Benchmark based on the current version of the HSP. The results note the improvement in whole-house energy usage with and without renewable energy, as well as the source energy savings (SES) with inclusion of site production from renewable energy (photovoltaic [PV] and wind) systems.

A summary of the 2011 EVHA submittals for newly constructed homes and for remodels that the judges deemed as outstanding or superior is detailed in alphabetical order by level of merit in Table 2 and Table 3. Five of the 2011 Gold EVHA Winners were awarded to newly constructed houses and one was awarded to an existing remodeled house.

Table 2. 2011 EVHA New Homes Division Winners

BA Climate Region and Category	IECC* 2009 Climate Zone	Builder	Construction Type	Winning Level	
				Gold	Silver
Cold, Custom	5A	Cobblestone Homes	New construction	X	
Moderate, Custom	4C	CVH, Inc.	New construction	X	
Hot, Custom	3A	Ferrier Custom Homes	New construction	X	
Hot, Custom	3A	GreenCraft Builders, LLC	New construction	X	
Moderate, Production	3B	Wathen-Castanos Hybrid Homes	New construction	X	
Moderate, Production	4A	Baldwin Homes	New construction		X
Hot, Production	2A	Imagine Homes	New construction		X
Hot, Production	2B	Meritage Homes	New construction		X
Cold, Custom	6A	Near Zero Maine	New construction		X
Moderate, Custom	4C	Scott Homes	New construction		X
Cold, Custom	5A	Treasure Homes, Inc.	New construction		X

* International Energy Conservation Code

Table 3. 2011 EVHA Existing Homes Winners

BA Climate Region and Category	IECC 2009 Climate Zone	Remodeler	Construction Type	Winning Level	
				Gold	Silver
Moderate, Custom	4C	CVH, Inc.	Existing remodel	X	
Hot, Custom	3B	Green Builder Media et.al.	Existing remodel		X

4 Benchmarking Energy Performance

The energy simulations and benchmarking procedures in this report followed procedures outlined in *Building America House Simulation Protocols* (Hendron and Engebrecht 2010) and were performed using Building Energy Optimization (BEopt) version 1.1 software.

An updated BA Benchmark was included in the most recent release of the BEopt software. The new metric is consistent with the 2009 IECC rather than the benchmark of prior versions that approximated a house constructed to building codes in place in the mid-1990s. This more stringent benchmark cannot be effectively compared to the metric that was used in reporting EVHA winners for previous years (2010 and earlier). Thus, the 2011 EVHA winners' simulated energy performance is not comparable with prior year winners in this report. The whole-house energy performance of the eleven newly constructed 2011 EVHA winners was simulated against the updated BA Benchmark based on the HSP using the set points of 71°F (heating) and 76°F (cooling).

The updated benchmark includes a house size multiplier that is applied to the benchmark reference home's SES estimate (and thus, impacts energy savings of the energy efficient home relative to the benchmark building). The size adjusted benchmark source energy calculation is based on a house size of 2,400 ft² with three bedrooms and adheres to the following formula:

$$\text{Adjusted Benchmark Source Energy (MBtu)} = M_{\text{size}} \times \text{Source Energy (MBtu)}$$

Where M_{size} :

$$M_{\text{size}} = \left(\frac{N_{\text{br}}}{3}\right)^{0.034} \times \left(\frac{2400}{\text{Floor Area}}\right)^{0.167}$$

The house size multiplier, M_{size} , is included in the calculation of the SES metric on the Cost/Energy Graph. All other displays and outputs exclude the house size multiplier. (National Renewable Energy Laboratory 2012)

The average square footage of the 13 winning homes was 2,777 ft² of conditioned space versus the benchmark's reference of 2,400 ft². The median size is 2,324 ft² and as shown in Table 4, seven of the EVHA winners exceeded the benchmark's size reference.

Table 4. House Size and Climate Zone Summary

BA Climate Region and Category	IECC 2009 Climate Zone	Builder/ Remodeler	Type	Conditioned Area (ft ²)		Number of Bedrooms	Size Adjustment Factor
				Finished	Unfinished		
Cold, Custom	5A	Cobblestone Homes	New	1,875	1,875	3	93%
Moderate, Custom	4C	CVH, Inc.	New	2,750		1	94%
Hot, Custom	3A	Ferrier Custom Homes	New	1,009		2	113%
Hot, Custom	3A	GreenCraft Builders, LLC	New	2,453		3	100%
Moderate, Production	3B	Wathen-Castanos Hybrid Homes	New	2,065		3	103%
Moderate, Production	4A	Baldwin Homes	New	6,950	374	6	85%
Hot, Production	2A	Imagine Homes	New	3,588		5	95%
Hot, Production	2B	Meritage Homes	New	2,090		3	102%
Cold, Custom	6A	Near Zero Maine	New	744	744	3	108%
Moderate, Custom	4C	Scott Homes	New	2,324		4	102%
Cold, Custom	5A	Treasure Homes	New	1,704	1,238	3	95%
Moderate, Custom	4C	Clifton View Homes	Remodel	3,282		2	94%
Hot, Custom	3B	Green Builder Media	Remodel	2,059		3	103%

Simulation results are presented in whole-house energy usage based on calculated usage of energy type (kWh, therms, etc.) and for the equivalent source energy, using the BA program conversion factors shown in Table 5.

Table 5. Source Energy Conversions by Fuel Type

Fuel	Source Energy Conversion
Electric	3.365
Natural Gas	1.092
Fuel Oil/Kerosene	1.158
Liquid Petroleum Gas	1.151

One of the 2011 EVHA entries built by Ferrier Custom Homes uses a wind turbine to manufacture energy onsite; thus, this report refers to onsite PV and wind as *site renewable energy*. Energy simulation estimates of the turbine's performance in the location installed were submitted with the application and post-processed with the BEopt simulation results to report the net usage including the renewable energy reported by the manufacturer and based on the local historical wind conditions.

Homes with high-efficiency heat pumps and ground-source heat pumps were processed in BEopt using standard efficiency air-source equipment for heating and cooling. The annual estimates for heating and cooling energy that resulted from BEopt's output were modified based on a linear efficiency factor derived from the higher coefficient of performance (COP) and energy efficiency ratio (EER) of the installed equipment as stated by the manufacturer; for example, 15 EER is roughly 13% more efficient than 13 EER. This approach, while rudimentary, serves as an approximate estimate of savings based on the higher efficiency equipment. The lack of detailed modeling parameters including ground temperatures, runtime, and part load efficiencies, may have served to understate the savings estimates associated with geothermal and air to hydronic equipment in some cases.

The Near Zero Maine home, with a solar water heating system used for space heating, required that numerous BEopt simulation runs be performed to identify the daily heating and hot water load and solar hot water production. A modified solar hot water production, (one and a half times the base) was then applied to the hot water supply to accommodate the larger solar system size. Daily space and hot water loads were aggregated, subtracted from solar production, and electric resistance heat was added to make up any heating deficiency.

5 Simulation Results

5.1 Results: Total Source Energy Savings

Table 6 indicates how the EVHA winning houses performed when measured against the BA Benchmark. Due to the revision of the benchmark contained in the software, comparison of these savings to prior year EVHA results is not meaningful and, therefore, is not reported.

Table 6. SES Percentage (EVHA over BA Benchmark)

SES Estimates (Over BA Benchmark)	2011 EVHA Winners
Average Whole House SES	35%
Average Whole House SES Without Benchmark Size Adjustment	38%
Average Whole House SES With Renewable Energy	52%
Average Heating and Cooling Savings	49%
Range of Whole House SES*	3%–68%

*A large house in the moderate climate zone, sized 6,950 finished square feet, results in minimal comparative savings due to the house size multiplier penalty in the benchmark procedures.

The BA simulation protocol requires that houses without air conditioning be modeled with a condenser that has a seasonal energy efficiency ratio (SEER) of 13 or a 9 EER ductless room conditioner, as is appropriate. Four of the winning houses did not include equipment for summer air conditioning due primarily to the mild (summer) climates where they were located and good design. These were the houses submitted by the following builders; Near Zero Maine, CVH, Scott Homes, and Clifton View Homes. The numbers in Table 4 reflect the correct application of the BA simulation protocol for HVAC.

The two EVHA winners in the Existing Remodel category were benchmarked against the *before* or *existing* condition of those structures using the heating and cooling set points of 71°F and 76°F, respectively. In addition, because the existing remodeled EVHA entries performed so well, a reference new-home benchmark design was created for each of these retrofits in order to estimate simulated post-remodel energy performance against current new construction standards (defined by the BA Benchmark). The remodeled homes have been compared to the benchmark, and the *before* condition, in this report.

SES for the two remodeled houses are included in the reported savings over the benchmark in Table 6. In Table 7, the existing remodel winners have been compared to the *before* condition using the traditional HSP.

Table 7. SES Before and After the Energy Efficiency Remodel of Existing Home EVHA Winners

SES Estimates	Clifton View Homes	Green Builder Media
Source Energy (MBtu) Usage Before Remodel	401	259
Source Energy (MBtu) Usage After Remodel	192	124
Source Energy (MBtu) Usage With Renewable	192	40
% SES	52%	52%
% SES With Renewable Energy	n/a	85%

The percentage of whole-house SES simulated for each of the 2011 EVHA winning entrants versus the BA Benchmark by climate zone is shown in Table 8.

Table 8. Whole House SES by Climate Location

Builder/Remodeler	Percent SES Over BA Benchmark by Climate		
	Cold	Moderate	Hot
Cobblestone Homes	50%		
CVH		18%	
Ferrier Custom Homes			38%
GreenCraft Builders			34%
Wathen-Castanos Hybrid Homes		27%	
Baldwin Homes		3%	
Imagine Homes			33%
Meritage Homes			48%
Near Zero Maine	68%		
Scott Homes		44%	
Treasure Homes	37%		
Clifton View Homes (Remodel)		26%	
Green Builder Media et al. (Remodel)			34%

5.2 Results: Normalized Energy Performance

Energy performance was analyzed through simulation of the energy required to heat and cool each conditioned square foot of a house on an annual basis, which is expressed as Btu/SF/CFA (British Thermal Units per square foot of conditioned floor area). Viewed against a scale of the cumulative heating and cooling degree days (HDD and CDD), respectively, for the location and for the same time period (30-year annual averages are used), the information presents a meaningful picture of simulated performance and a method to compare dissimilar designs and

locations. Figure 1 and Figure 2 show this relationship between house size, climate severity, and cost to condition with and without site generated renewable energy.

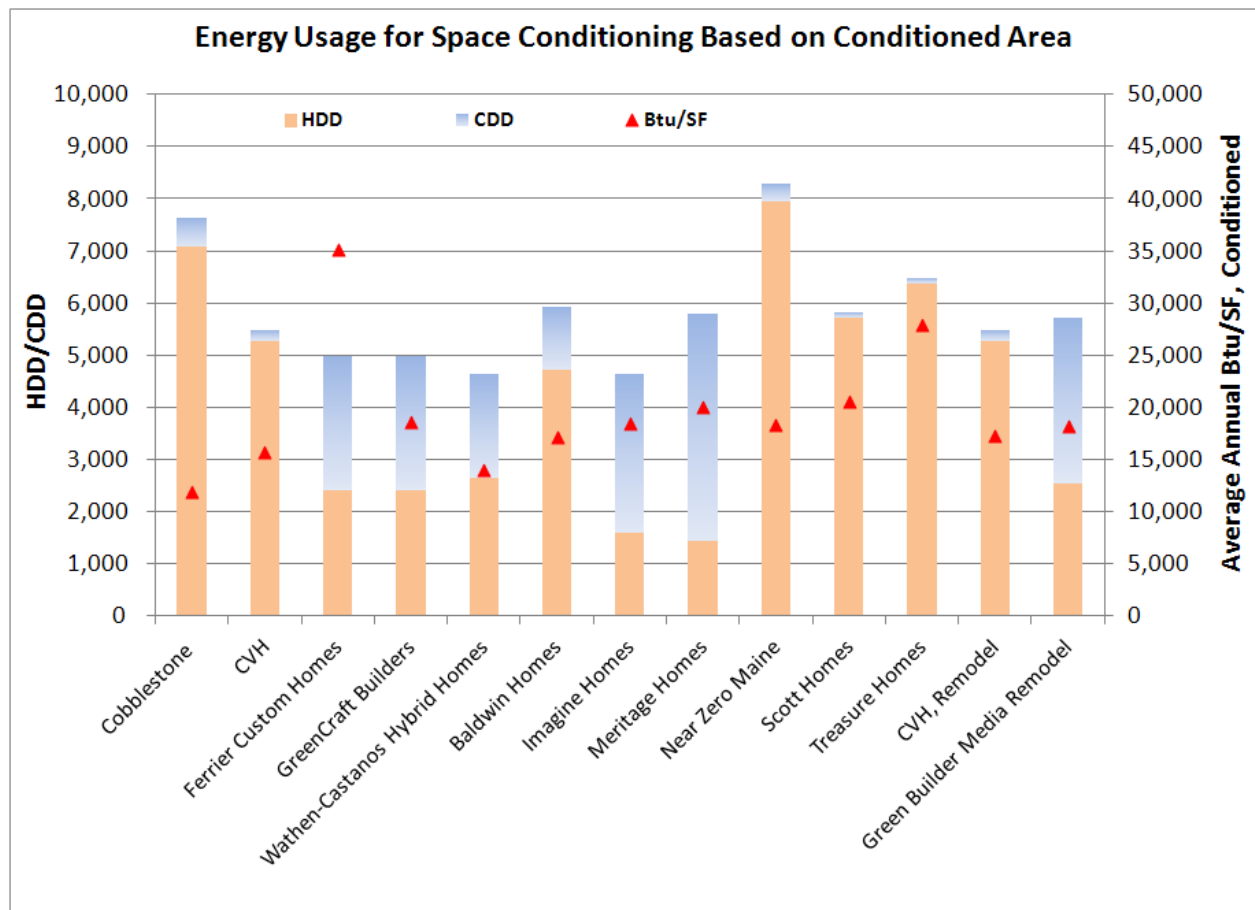
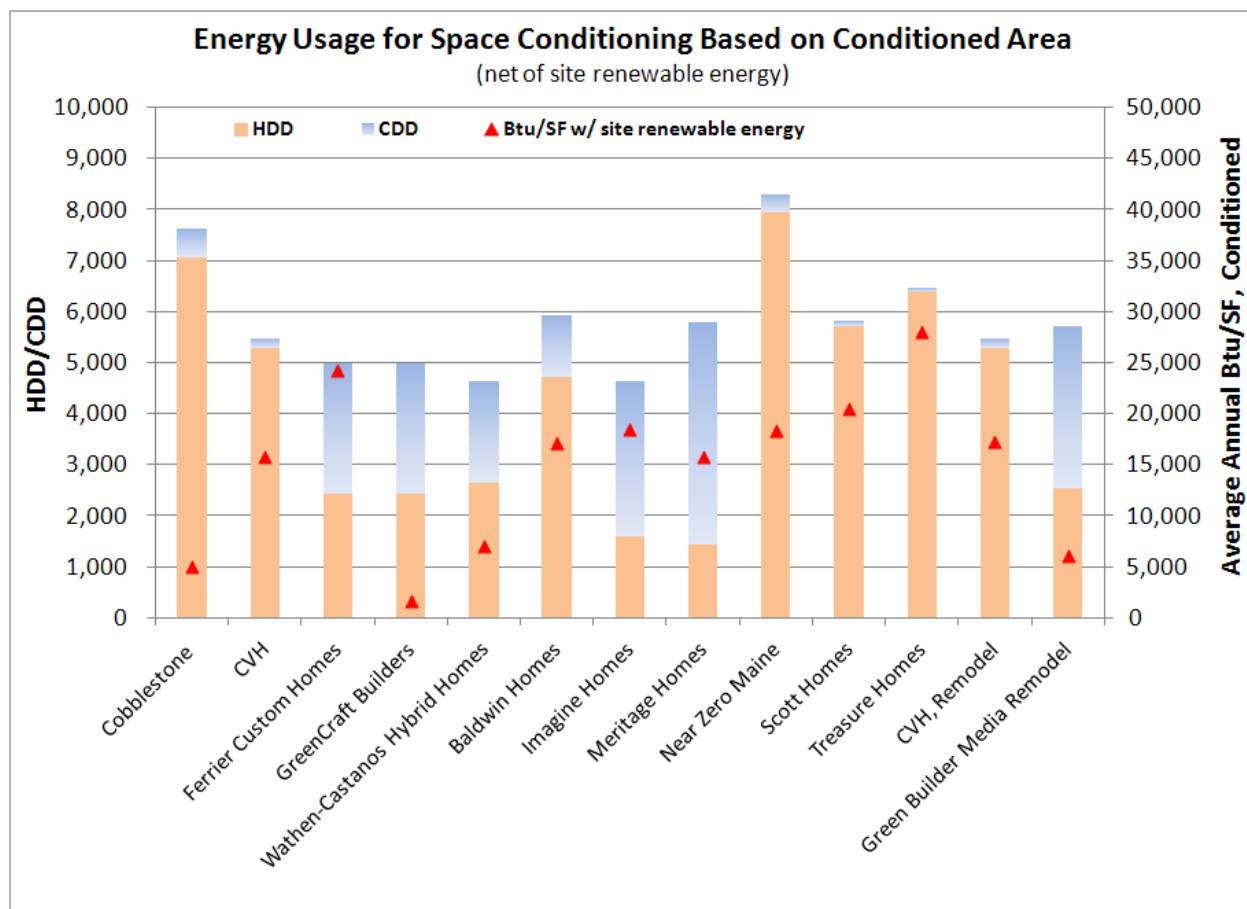


Figure 1. Normalized heating and cooling source energy (Btu/CFA)



**Figure 2. Normalized heating and cooling source energy (Btu/CFA)
net of site produced renewable energy**

5.3 Results: Source Energy Usage by Climate

A detailed look at the energy use of the homes by climate zone is shown in Figure 3, Figure 4, and Figure 5. Source energy usage by category (in MBtu/year) and house size is shown in each of the three graphs.

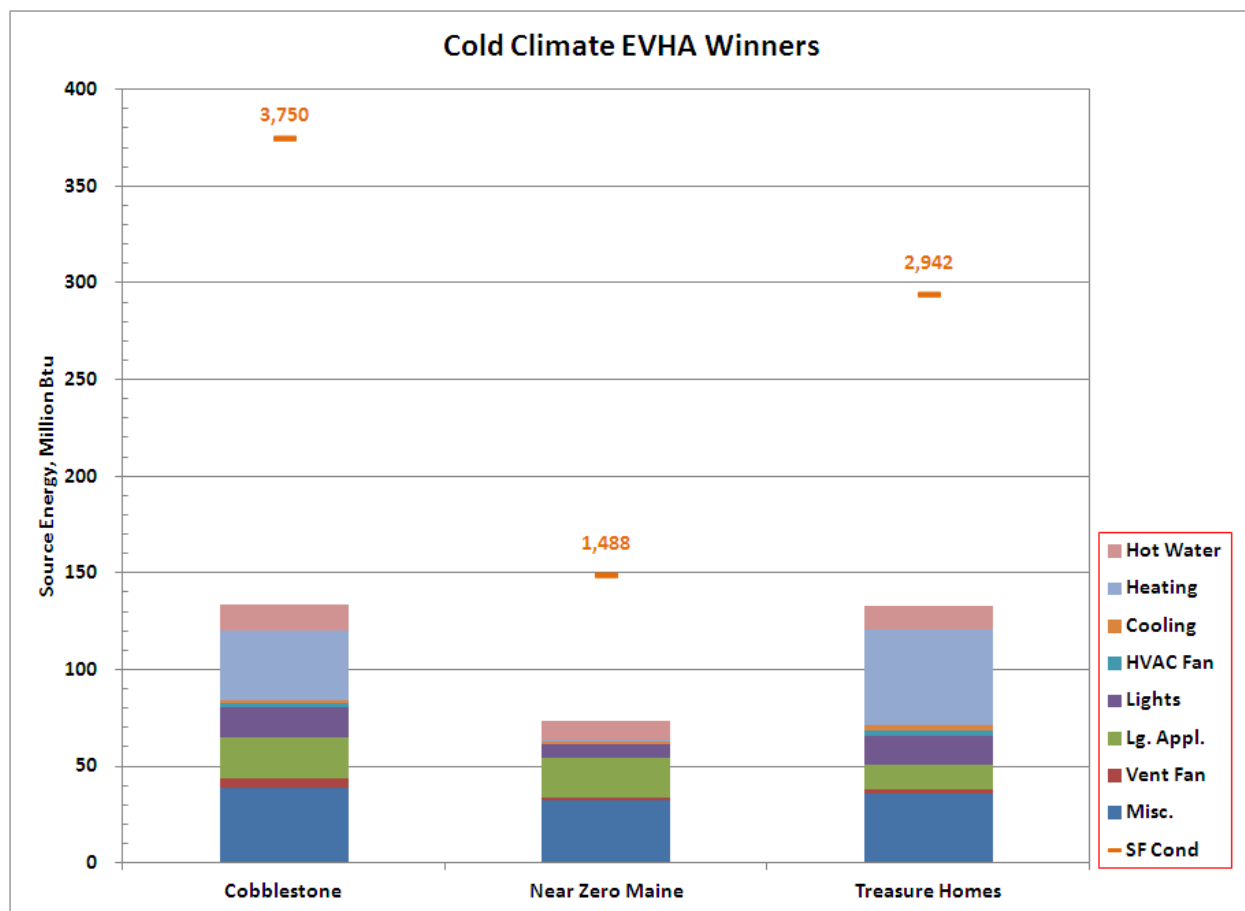


Figure 3. Source energy usage—cold climate

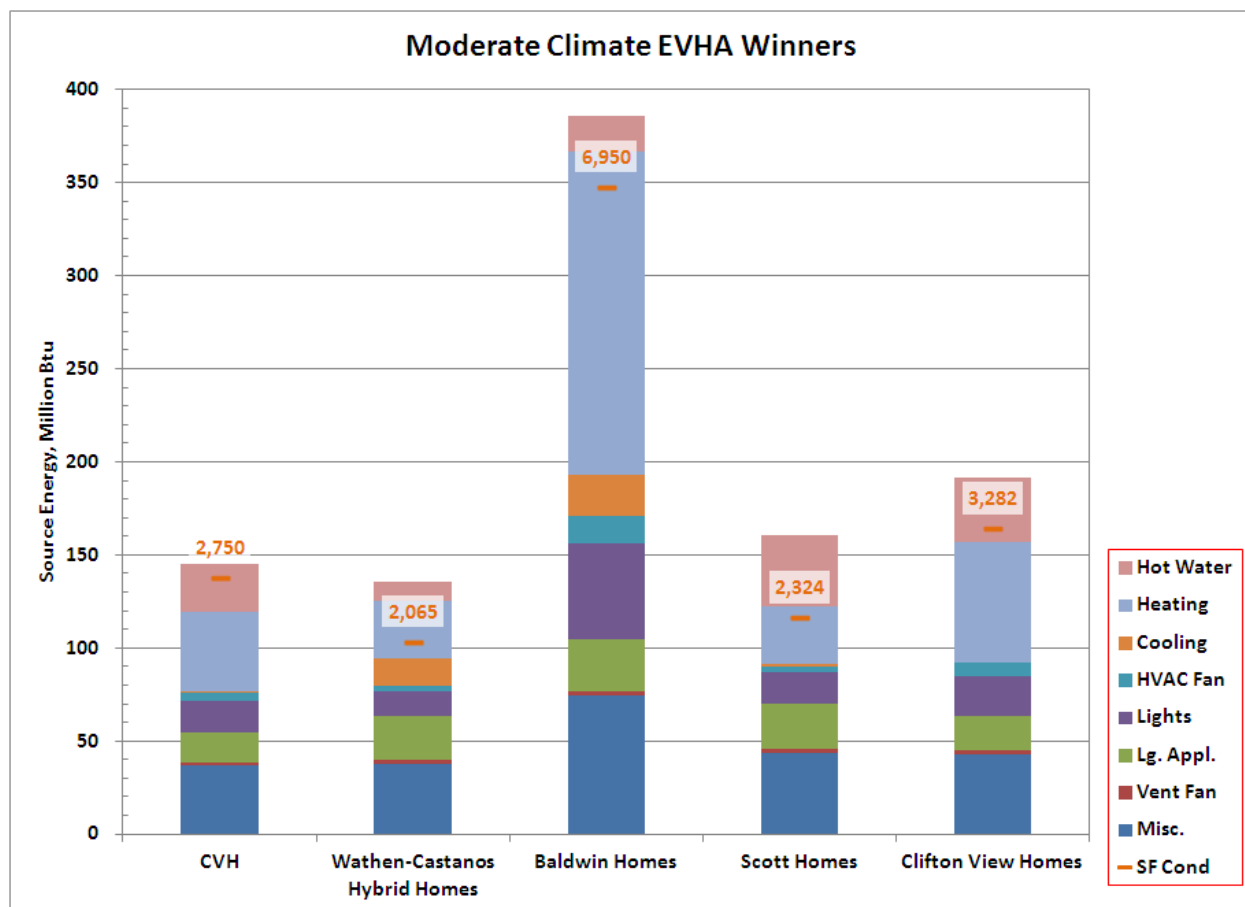


Figure 4. Source energy usage—moderate climate

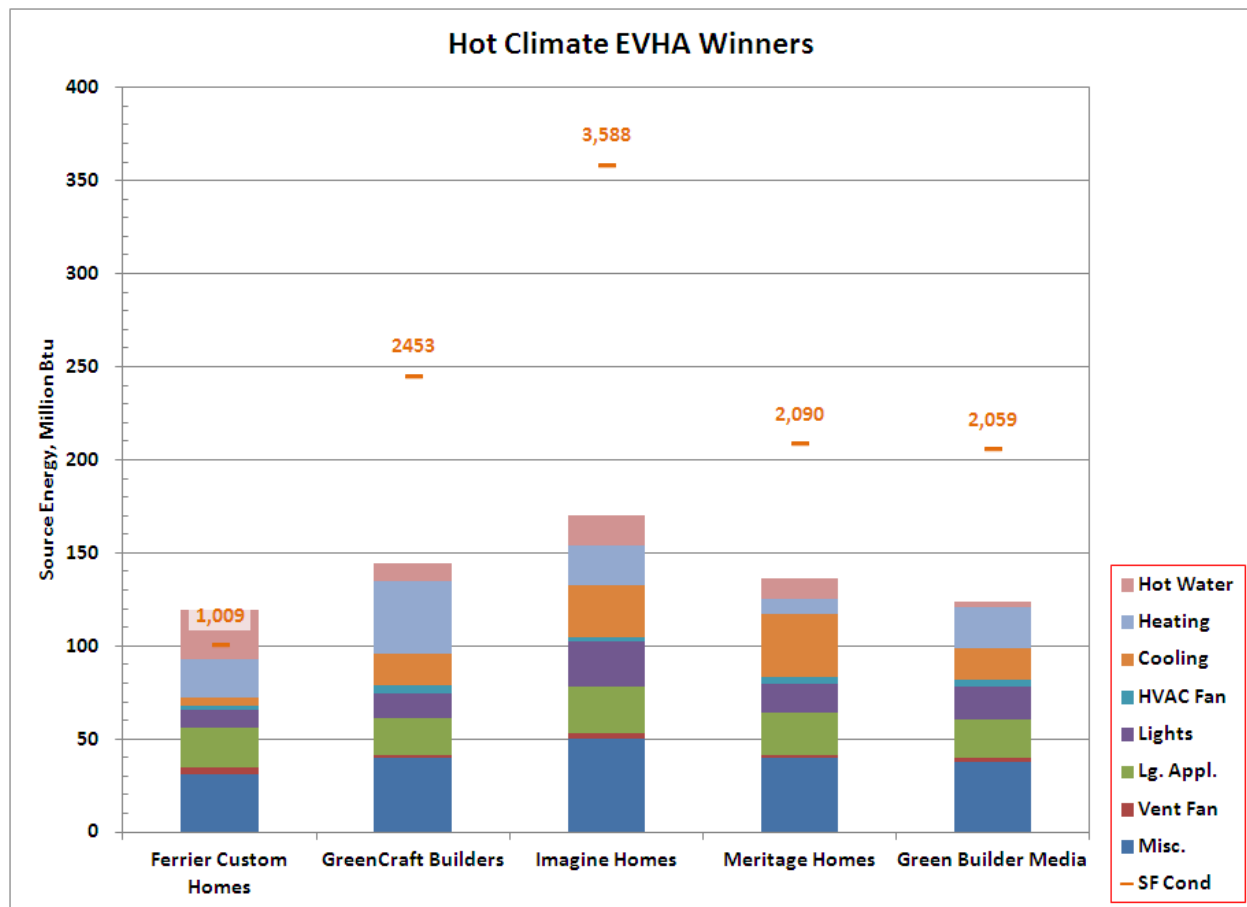


Figure 5. Source energy usage—hot climate

The chart in Figure 6 compares all homes using the source energy calculation and demonstrates the improved performance for energy efficient homes and the incorporation of renewable onsite generation.

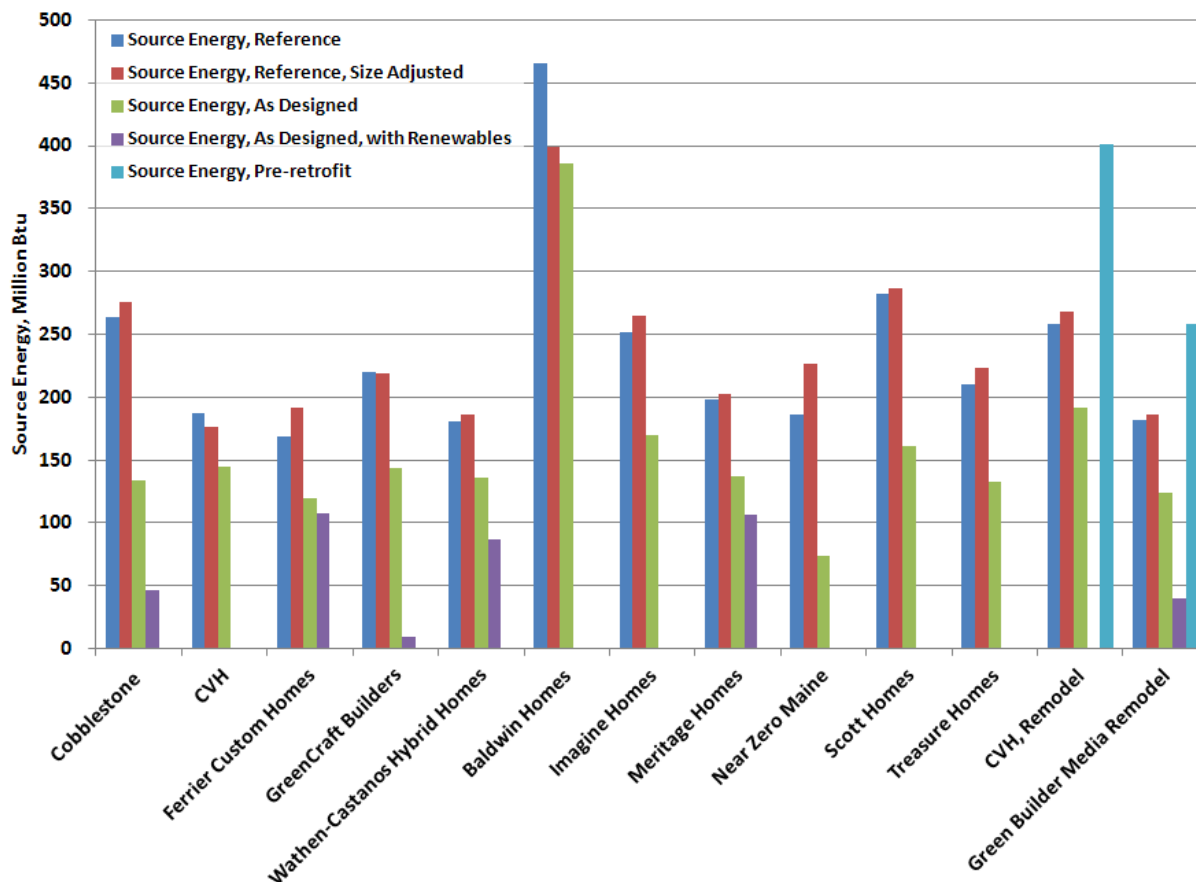


Figure 6. Source energy—hot climate

6 Results: Individual 2010 EVHA Winner Performance

The following section of this report details the annual energy usage of each 2011 EVHA winning home with and without site renewable energy (PV and wind). The simulated energy performance of each of the winning houses is compared to the new benchmark (B10) by energy usage category in units consumed (kWh for electricity, therms for natural gas, and gallons for liquid petroleum gas). The two existing houses also show a comparison to the *before* condition of that house as well as the BA Benchmark. A narrative summary of the key components of each house is also included with the energy usage graphs. All photos were provided by the builders and remodelers as part of the EVHA application process and are used with written permission (NAHB Research Center 2011).

6.1 Cobblestone Homes, Gold Winner

Cold Climate, Custom Category



What the Judges Said:

“Exceptional building envelope, HVAC, and water heating systems with a comprehensive construction management process to create a home marketed as ‘Michigan’s first affordable net-zero energy home.’”

House Description:

Size: 1,875 ft² with a 1,875-ft² unfinished basement

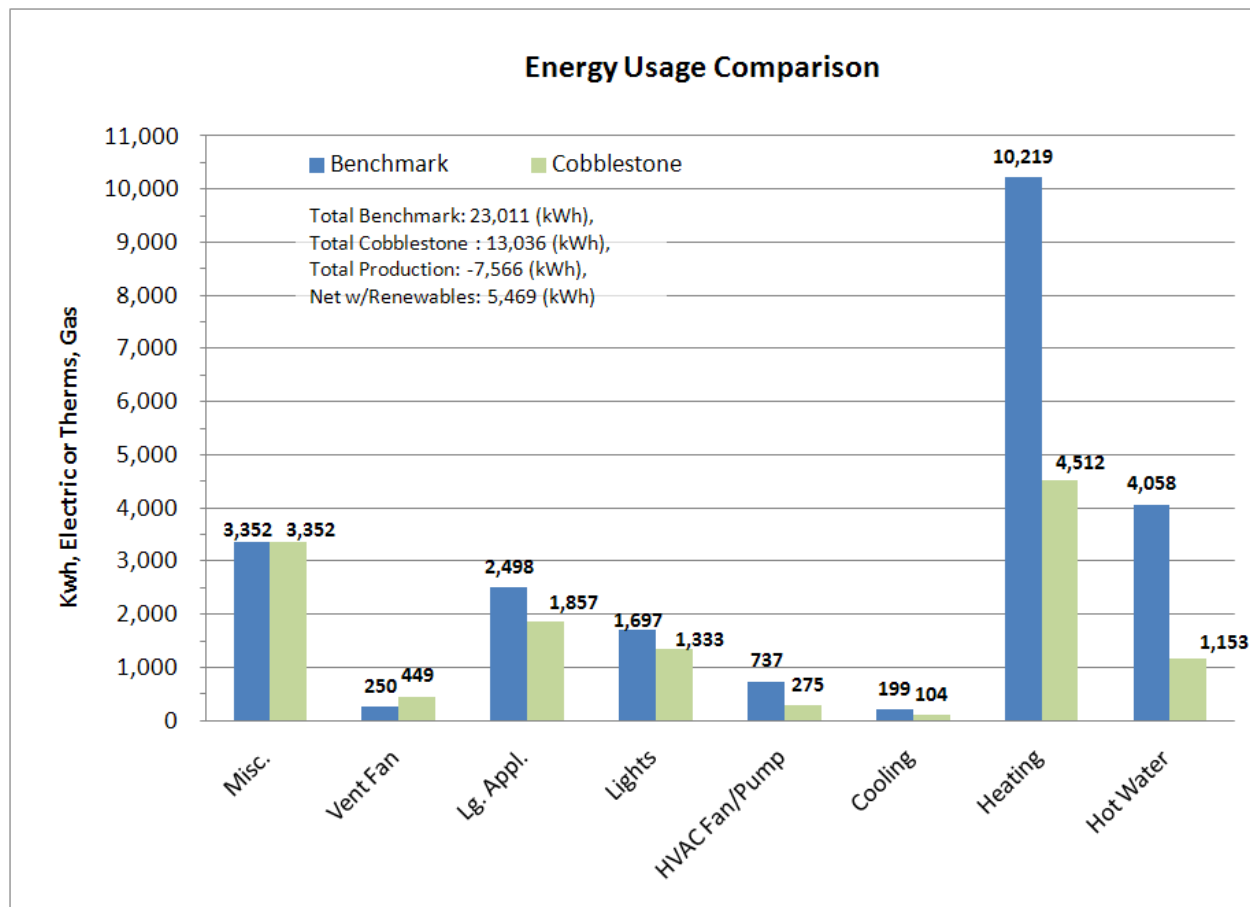
Location: Bay City, Michigan

Completion date: May 10, 2010

HERS Index:

Without renewables: 37

With PV: -4



Energy Features:

Foundation: Unfinished in-ground basement, R-10 insulated slab and wall exterior, and R-10 interior insulation

Wall Construction: 2 × 6 at 19.2 in. on center (o.c.)

Wall Insulation: R-35.6 polyurethane spray foam and structural insulated sheathing

Rim Joist Insulation: R-40 polyurethane spray foam and foam sheathing

Roof Construction: Trusses at 24 in. o.c.

Ceiling Insulation: R-62, 2-in.-spray polyurethane foam and blown cellulose

Windows: Low-e, gas-filled; U-0.20, solar heat-gain coefficient (SHGC) of 0.23

HVAC: Ground-source heat pump (GSHP) 3.0 COP, 15 EER, heat recovery ventilation

Ducts: All in conditioned space

Water Heating: Solar thermal 64 ft² closed loop, solar energy factor of 1.00, with 50 gal. electric storage and desuperheater for preheating

Lighting: All ENERGY STAR, fluorescents, and LEDs throughout

Appliances: ENERGY STAR

On-Site Energy Generation: 6.5 kW PV system and solar water heating

Duct Leakage Test: 5 cubic feet per minute (cfm) total at 25 Pa; 5 cfm to exterior

Blower Door Test: 0.56 air changes per hour at 50 Pascals pressure differential (ACH50)

Energy/Green Building Programs: ENERGY STAR

6.2 CVH, Inc. dba Clifton View Homes, Gold Winner

Moderate Climate, Custom Category



What the Judges Said:

“The systems, the team focus, and the depth of experience and passion, makes CVH, D.B.A. Clifton View Homes stand out.” By encouraging a culture of partnership and paying fanatic attention to detail, the company is able to create a high performance product for a reasonable price. The builder “gets the idea of a comprehensive approach to energy efficient building.”

House Description:

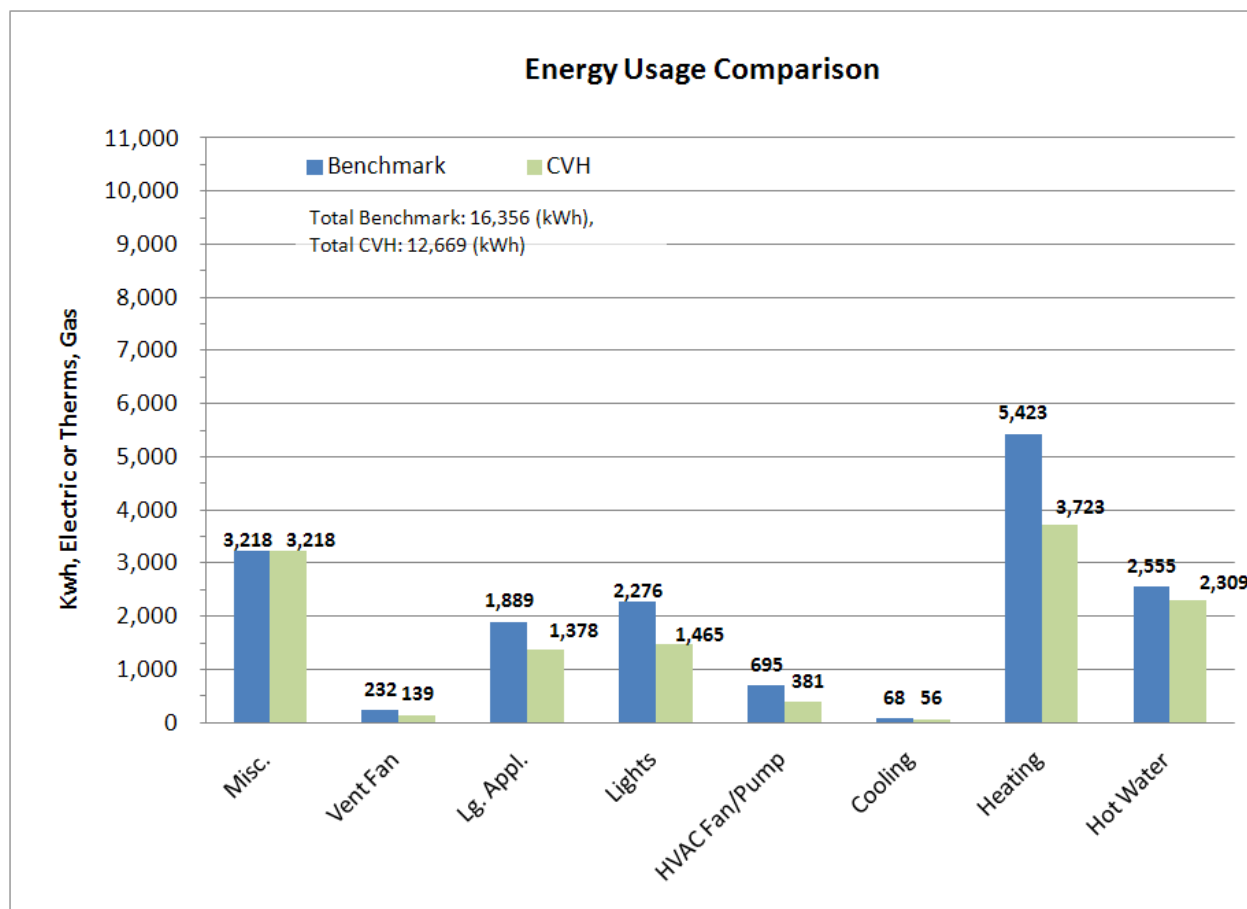
Size: 2,750 ft² (including loft)

Location: Greenbank (Whidbey Island), Washington

Completion date: January 2010

HERS Index:

Without renewables: 57



Energy Features:

Foundation: R-25 insulating concrete-formed finished basement and R-20 slab edge insulation

Wall Construction: Structural insulated panels (SIPs)

Wall Insulation: R-25

Rim Joist Insulation: 2-in.-polyurethane spray foam and R-38 batt; R-38 batt at cantilever

Roof Construction and Insulation: SIPs R-40

Windows: Low-e, gas-filled; U-0.28, SHGC 0.25

HVAC: Air to water heat pump; 10 heating seasonal performance factor (HSPF)

Ducts: None, hydronic heating inside conditioned space

Water Heating: 0.91 energy factor (EF)

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

Duct Leakage Test: n/a

Blower Door Test: 1.45 ACH50

Energy/Green Building Programs: ENERGY STAR, DOE Builders Challenge, and Built Green

6.3 Ferrier Custom Homes, Gold Winner Hot Climate, Custom Category



What the Judges Said:

The judges credited Ferrier Custom Home's "excellently crafted homes" and its meticulous construction management process. One judge even quipped, the company "could not improve on this process and still have the subcontractors show up." The judges liked how marketing practices, materials, and the company's website present a strong central theme of "Building Dreams. Saving Energy."

House Description:

Size: 1,009 ft²

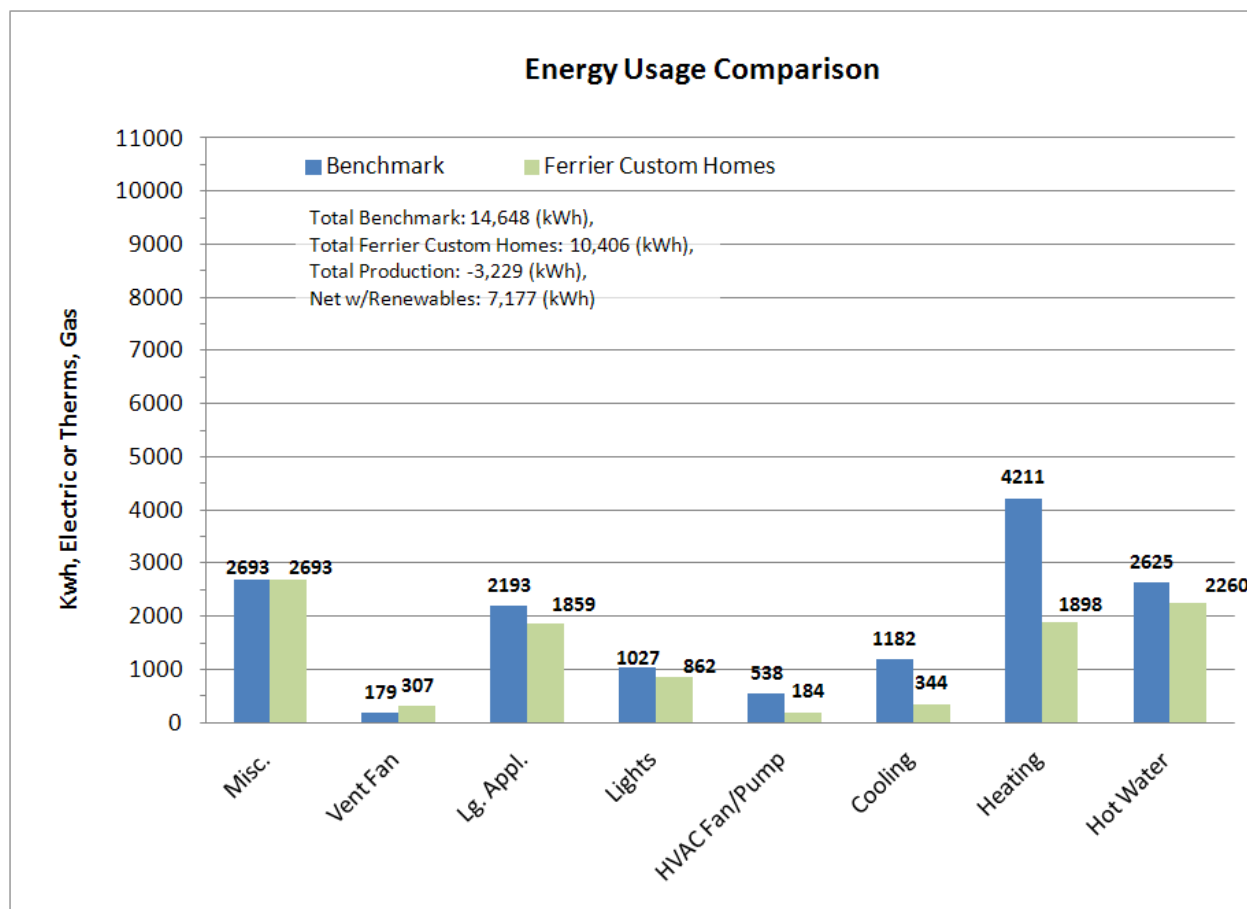
Location: Fort Worth, Texas

Completion date: April 2010

HERS Index:

Without renewables: 56

With wind energy: 30



Energy Features:

Foundation: Uninsulated slab on grade

Wall Construction: SIPs

Wall Insulation: R-25

Roof Construction and Insulation: SIPs R-40

Windows: Low-e, gas-filled, wood-framed; U-0.29, SHGC 0.19

HVAC: 18 SEER, 9 HSPF heat pump; energy recovery ventilation system

Ducts: All in conditioned space, minimized duct runs

Water Heating: 0.99 EF electric tankless with PEX distribution

Lighting: 100% LED and CFL

Appliances: ENERGY STAR refrigerator and dishwasher

On-Site Energy Generation: 4 kW wind turbine

Duct Leakage Test: 12 cfm at 25 Pa total; 0 cfm to exterior

Blower Door Test: 2.12 ACH50

Energy/Green Building Programs: ENERGY STAR, Green Built Texas, LEED for Homes, and DOE Builders Challenge

6.4 GreenCraft Builders, LLC, Gold Winner

Hot Climate, Custom Category



What the Judges Said:

GreenCraft Builders turned the jobsite into a learning center for other builders and completed this show home that was toured extensively. Impressed by “an exceptional outreach effort,” the judges applauded the builder’s balance of efficiency and cost effectiveness and further praised the project for “raising the bar for expectations of high performance homes.”

House Description:

Size: 2,453 ft²

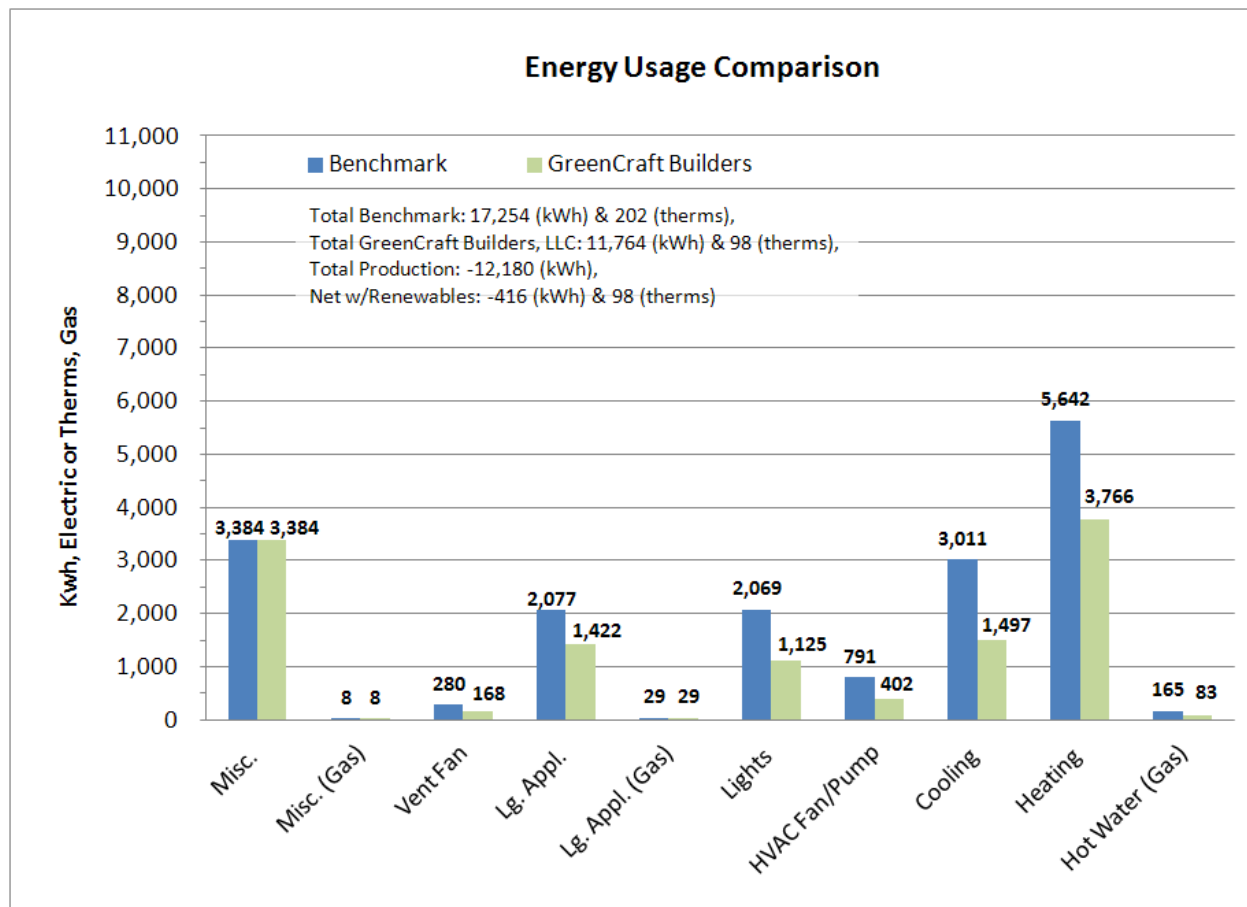
Location: Lewisville (Fort Worth), Texas

Completion date: December 2009

HERS Index:

Without renewables: 56

With PV: -1



Energy Features:

Foundation: Uninsulated slab on grade

Wall Construction: 2 × 6 at 24 in. o.c. and advanced framing techniques

Wall Insulation: R-21 open cell spray foam and R-5 exterior foam sheathing

Roof Construction: Unvented

Roof Insulation: R-30 open cell spray foam

Windows: Low-e, gas-filled; U-0.29, SHGC 0.20

HVAC: 16.0 SEER, 9.0 HSPF heat pump with stand-alone dehumidification

Ducts: In conditioned space

Water Heating: Two centrally located 0.91 EF gas tankless heaters

Lighting: 100% LED and CFL

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

On-Site Energy Generation: 9 kW PV system

Duct Leakage Test: 166 cfm at 25 Pa

Blower Door Test: 1.1 ACH50

Energy/Green Building Programs: DOE Builders Challenge and Building America Test Home, Green Built Texas, and LEED for Homes

6.5 Wathen-Castanos Hybrid Homes, Gold Winner & Builder of the Year Moderate Climate, Production Category



What the Judges Said:

The judges said that Wathen-Castanos Hybrid Homes had “found a niche in a difficult market” with their competitively priced high-efficiency homes. The production builder was applauded for a “well thought out product with features that adhere closely to the company’s vision.”

House Description:

Size: 2,065 ft²

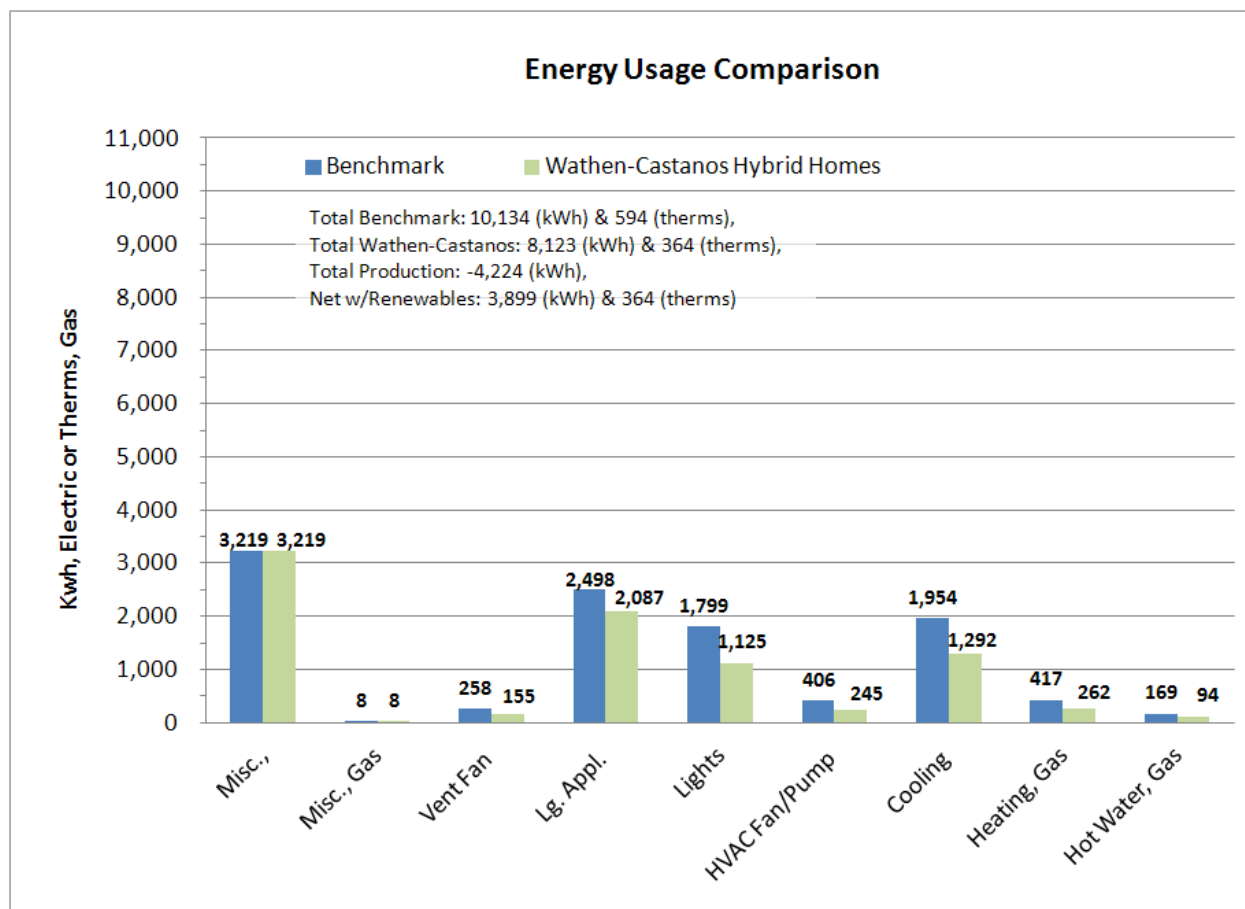
Location: Clovis (Fresno), California

Completion date: June 2009

HERS Index:

Without renewables: 59

With PV: 29



Energy Features:

Foundation: Uninsulated slab on grade

Wall Construction: 2 × 4 at 16 in. o.c.

Wall Insulation: R-15 spray fiberglass

Roof Construction: Trusses at 24 in. o.c.

Ceiling Insulation: R-49 blown fiberglass

Windows: Low-e, gas-filled; U-0.25, SHGC 0.31

HVAC: 94 annual fuel utilization efficiency (AFUE) gas furnace; 19 SEER air conditioner

Ducts: Attic; Minimized insulated duct design with supply registers at interior walls

Water Heating: 0.98 EF gas tankless heater

Lighting: 90% ENERGY STAR fixtures and compact fluorescent lamps

Appliances: ENERGY STAR refrigerator and dishwasher

On-Site Energy Generation: 3.7 kW PV system

Duct Leakage Test: 44 cfm total at 25 Pa; 42 cfm to exterior at 25 Pa

Blower Door Test: 2.5 ACH50

Energy/Green Building Programs: California Build It Green, Water Sense, Builders Challenge, ENERGY STAR, and City of Clovis

6.6 Baldwin Homes, Silver Winner

Moderate Climate, Production Category



What the Judges Said:

Baldwin Homes is educating the prospective buyers and the community at large with its model home that highlights the unseen features of energy efficiency. The homeowner's manual provides operation, maintenance, and performance information in an aesthetically pleasing package.

House Overview:

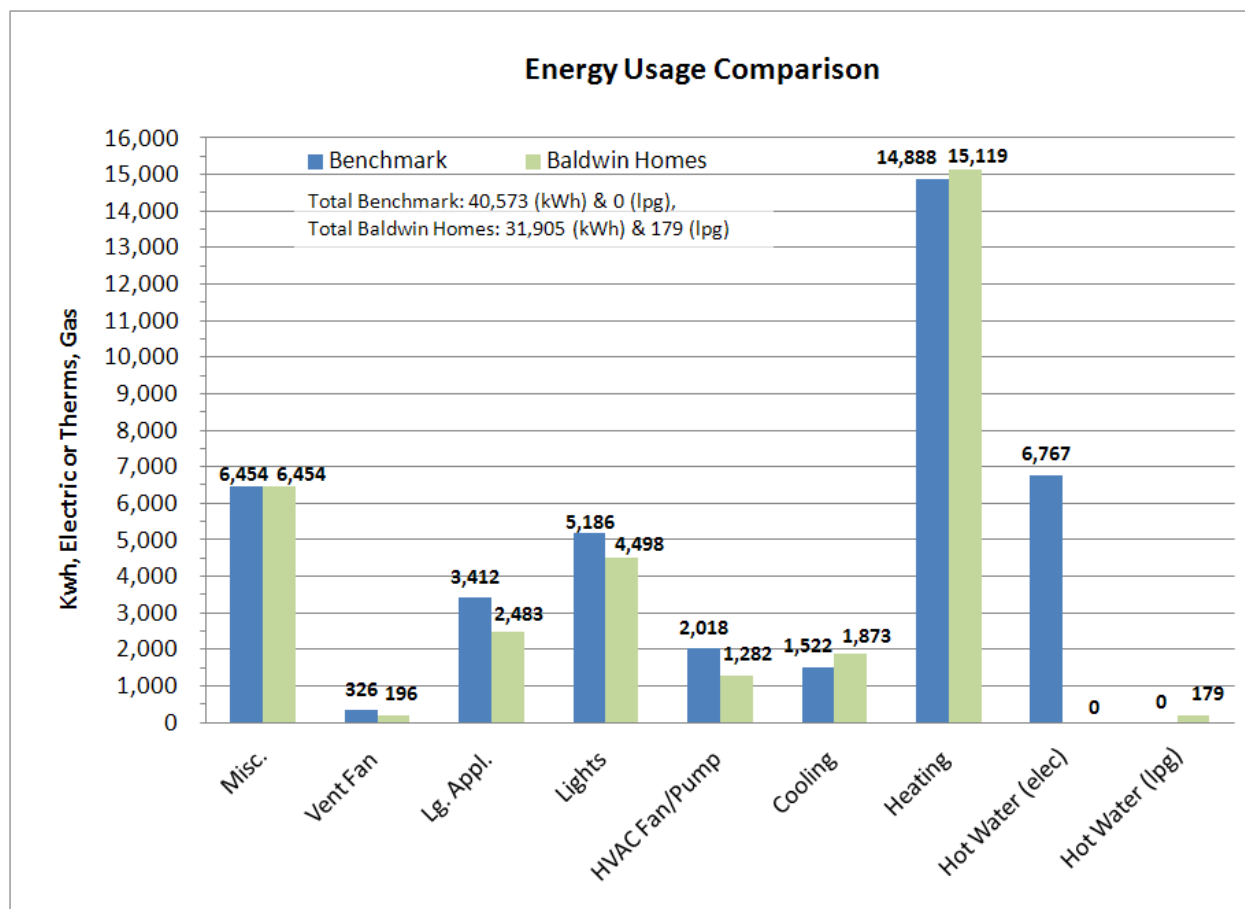
Size: 6,950 ft²

Location: Gambrills (Baltimore), Maryland

Completion date: February 2010

HERS Index:

Without renewables: 55



Energy Features:

Foundation: Precast concrete and foam walls, R-12.5

Wall Construction: 2 × 4 at 16 in. o.c.

Wall Insulation: R-13 spray foam insulation with R-3 sheathing

Rim Joist Insulation: R-18 spray foam and R-3 sheathing

Roof Construction: Trusses at 24 in. o.c.

Ceiling Insulation: R-42, spray foam seal and blown cellulose

Windows: Low-e, gas-filled vinyl-framed; U-0.30, SHGC 0.29

HVAC: Solar-assisted heat pumps; SEER 17; HSPF 8.5

Ducts: In conditioned space

Water Heating: 0.82 EF tankless liquefied petroleum gas

Lighting: 43% ENERGY STAR fixtures; LED and CFL balance of fixtures

Appliances: ENERGY STAR refrigerator, freezer, dishwasher, and clothes washer

Duct Leakage Test: 135 cfm total at 25 Pa

Blower Door Test: 5.4 ACH50

Energy/Green Building Programs: ENERGY STAR, National Green Building Standard (ANSI ICC 700-2008), LEED for Homes, DOE Builders Challenge, and Environments for Living

6.7 Imagine Homes, Silver Winner Hot Climate, Production Category



What the Judges Said:

Imagine Home's "total commitment to market differentiation" is making a difference in the San Antonio region's new home market. By creating a sealed, conditioned attic and controlling air leakage throughout the envelope the company accomplishes good control in a production environment.

House Overview:

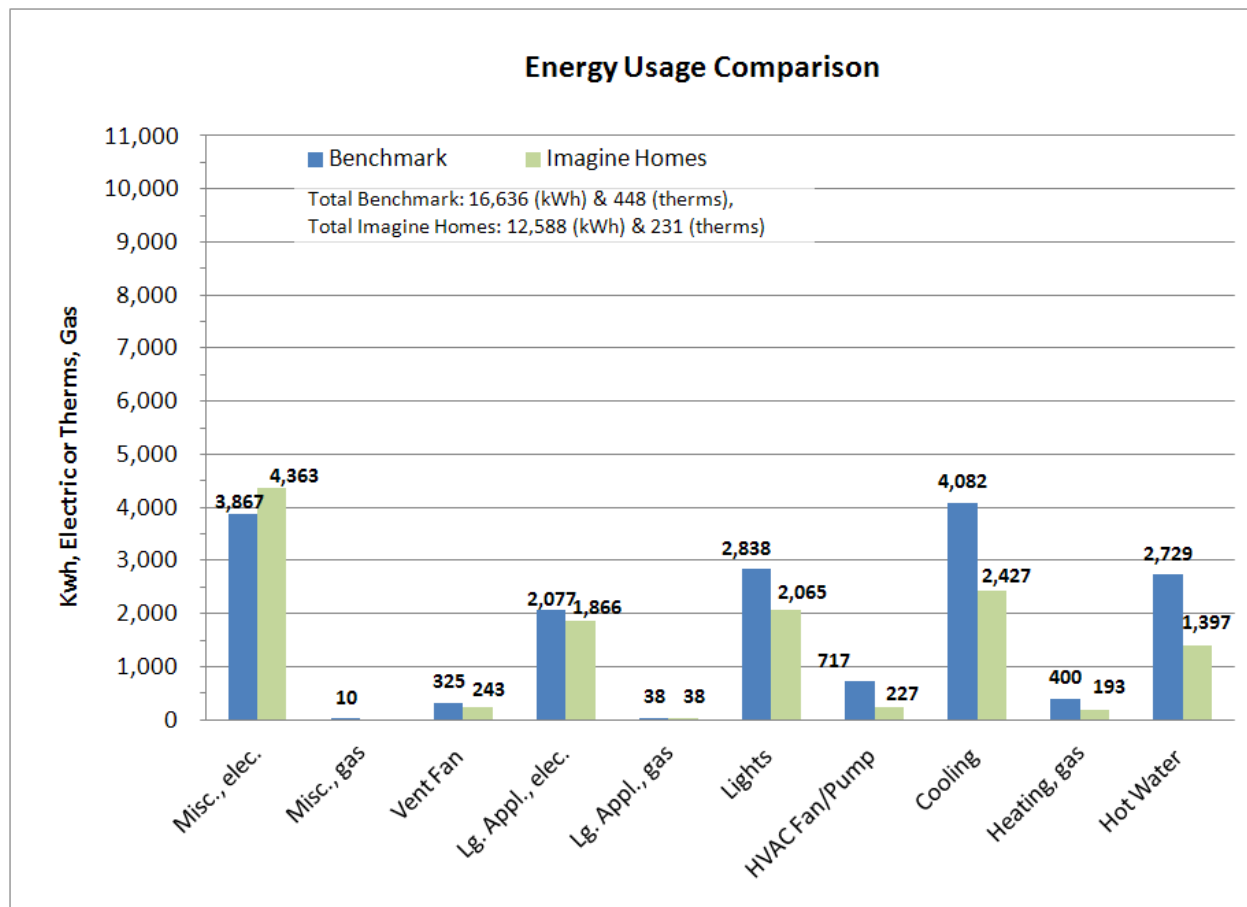
Size: 3,588 ft²

Location: San Antonio, Texas

Completion date: June 2010

HERS Index:

Without renewables: 48



Energy Features:

Foundation: Uninsulated slab

Wall Construction: 2 × 6 at 24 in. o.c. and efficient framing details (2 stud corners and ladder blocking)

Wall Insulation: R-20 cellulose and R-3 sheathing

Rim Joist Insulation: R-22 open cell spray foam and R-3 sheathing

Roof Construction: Trusses at 24 in. o.c. unvented attic

Ceiling Insulation: R-22 spray foam at roof deck

Windows: Low-e, vinyl-framed; U-0.35, SHGC 0.22

HVAC: 17 SEER electric air conditioner; 93% AFUE gas furnace

Ducts: in conditioned space

Water Heating: Solar thermal with 0.85 EF 120 gal. electric storage tank

Lighting: 100% CFL fixtures and lamps

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

Duct Leakage Test: 98 cfm total at 25 Pa

Blower Door Test: 1.2 ACH50

Energy/Green Building Programs: ENERGY STAR, National Green Building Standard (ANSI ICC 700-2008), LEED for Homes, DOE Builders Challenge, and Environments for Living

6.8 Meritage Homes, Silver Winner

Hot Climate, Production Category



What the Judges Said:

Meritage Homes combined energy efficiency techniques that aren't typical of a high volume production builder with renewable power generation. The company says that its solar power and thermal homes are selling three times faster than the competition's. Judges applauded this winner for the "great building envelope" and strong marketing and educational efforts.

House Overview:

Size: 2,090 ft²

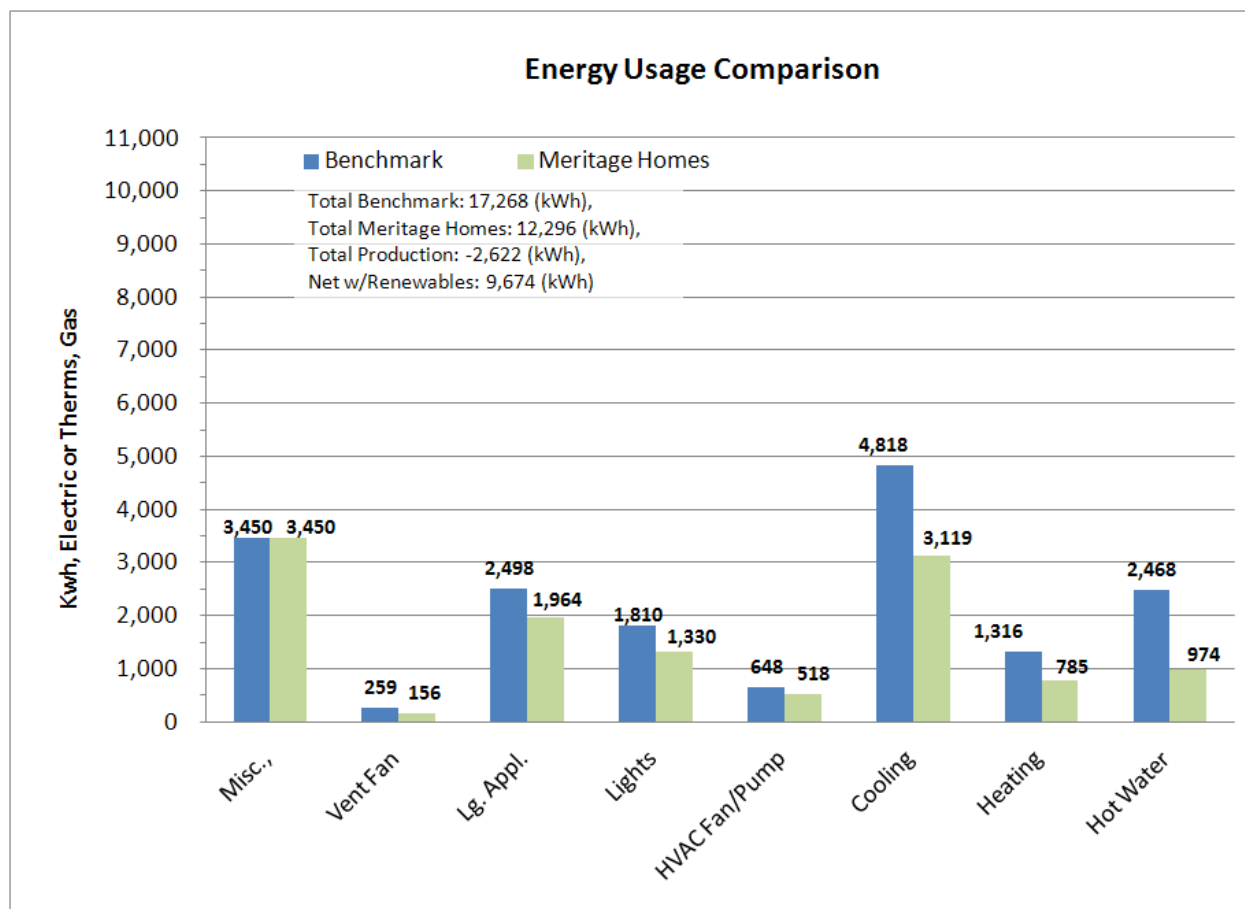
Location: Gilbert (Phoenix), Arizona

Completion date: June 2010

HERS Index:

Without renewables: 61

With PV: 39



Energy Features:

Foundation: Uninsulated slab

Wall Construction: Double 2 × 4 at 24 in. o.c., staggered

Wall Insulation: R-19 spray foam insulation with R-4 sheathing

Roof Construction: Trusses at 24 in. o.c., unvented attic

Attic Insulation: R-19 spray foam at roof deck

Windows: Low-e, gas-filled vinyl-framed; U-0.34, SHGC 0.20

HVAC: SEER 14 heat pump

Ducts: In conditioned space

Water Heating: Integrated solar thermal and PV hybrid system with ventilation air preheat and nighttime cooling capability

Lighting: 80% CFL fixtures and lamps

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

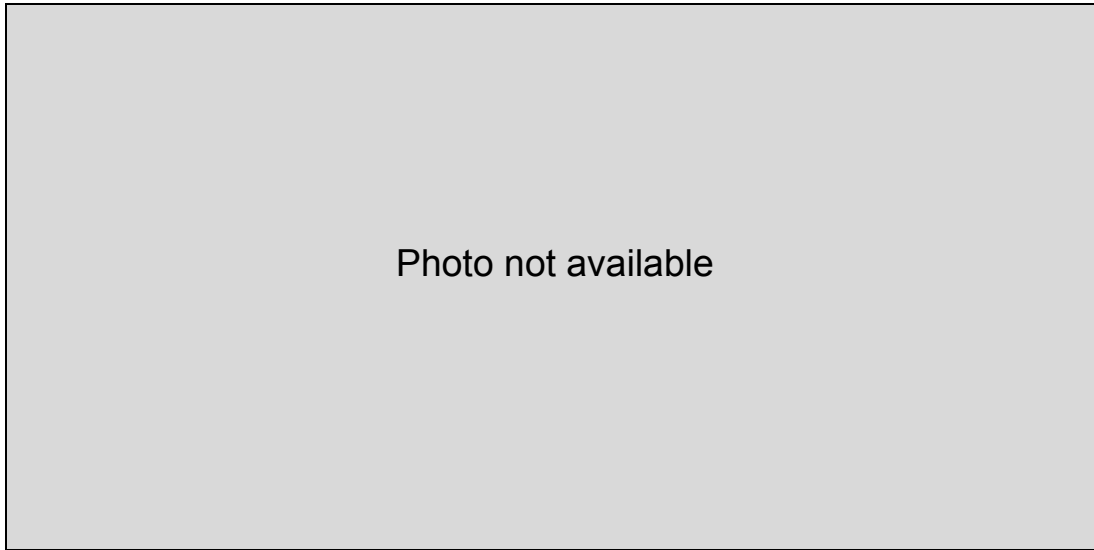
Duct Leakage Test: 15 cfm at 25 Pa

Blower Door Test: 2.0 ACH50

Energy/Green Building Programs: ENERGY STAR and Water Sense

6.9 Near Zero Maine, Silver Winner

Cold Climate, Custom Category



What the Judges Said:

The judges applauded Near Zero Maine's mission of energy efficiency education and construction. Because of the carefully sealed and highly insulated thermal envelope of the builder's house, the evacuated tube solar thermal collectors should supply 75% of the building's annual heating load of 15,000 Btu/h.

House Overview:

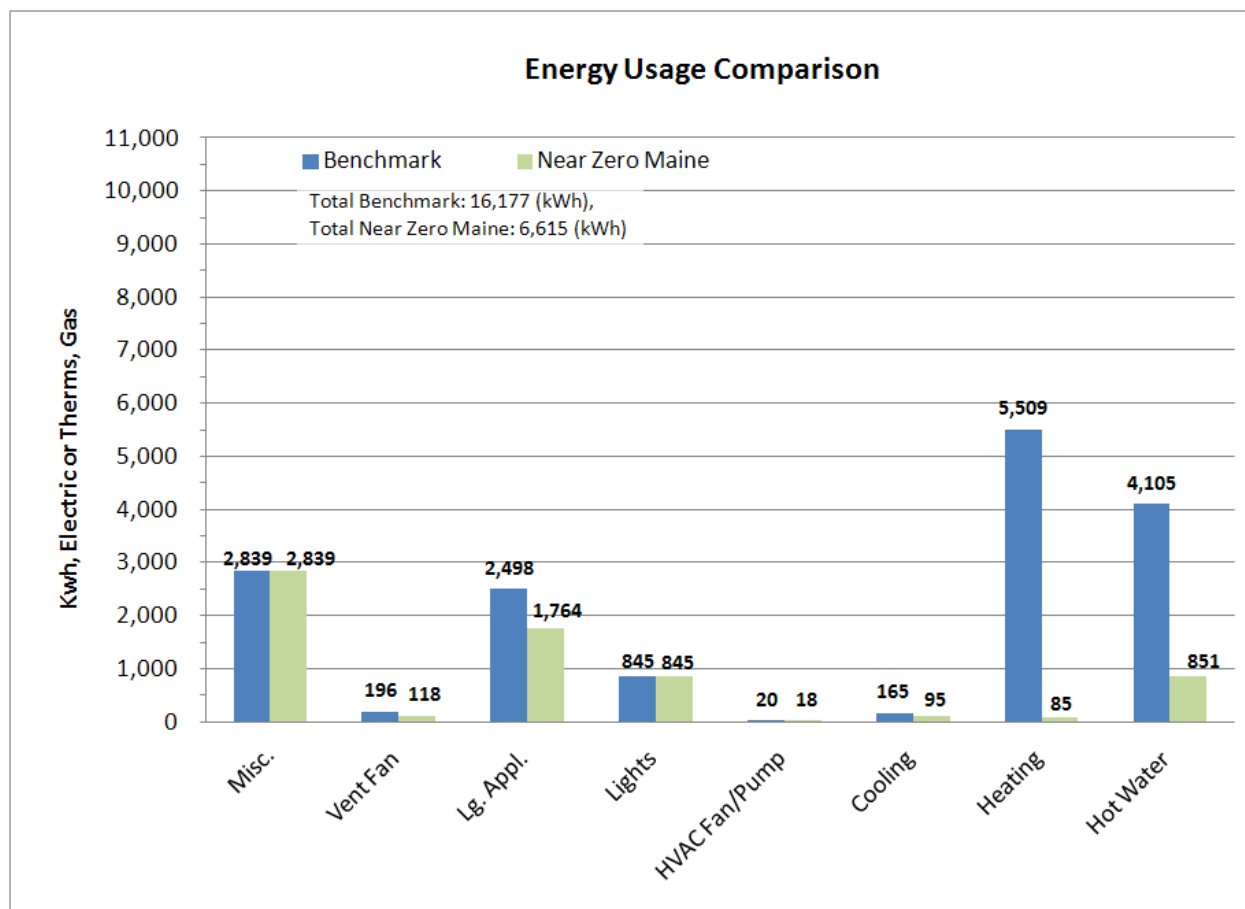
Size: 1,488 ft²

Location: Gilbert (Phoenix), Arizona

Completion date: June 2010

HERS Index:

Without renewables: 38



Energy Features:

Foundation: Masonry basement with R-5 exterior and R-19 interior insulation

Wall Construction: Double 2 × 4 at 24 in. o.c., staggered

Wall Insulation: R-40; 12 in. space filled with fiberglass and cellulose

Roof Construction: Trusses at 24 in. o.c.

Attic Insulation: R-60 cellulose

Windows: Low-e, gas-filled vinyl-framed; U-0.20, SHGC 0.20

HVAC: 174 ft² solar thermal collector; 120 gal. storage tank with electric back-up

Water and Space Heating: Integrated solar thermal and tank radiant system

Lighting: 90% CFL fixtures and lamps

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

Duct Leakage Test: n/a

Blower Door Test: 1.3 ACH50

Energy/Green Building Programs: None

6.10 Scott Homes, Silver Winner

Marine Climate, Custom Category



What the Judges Said:

The judges liked the way Scott Homes teams with their clients and subcontractors to provide energy efficiency motivation and education. The builder's good team approach and attention to air sealing details results in a simple house that is well done.

House Overview:

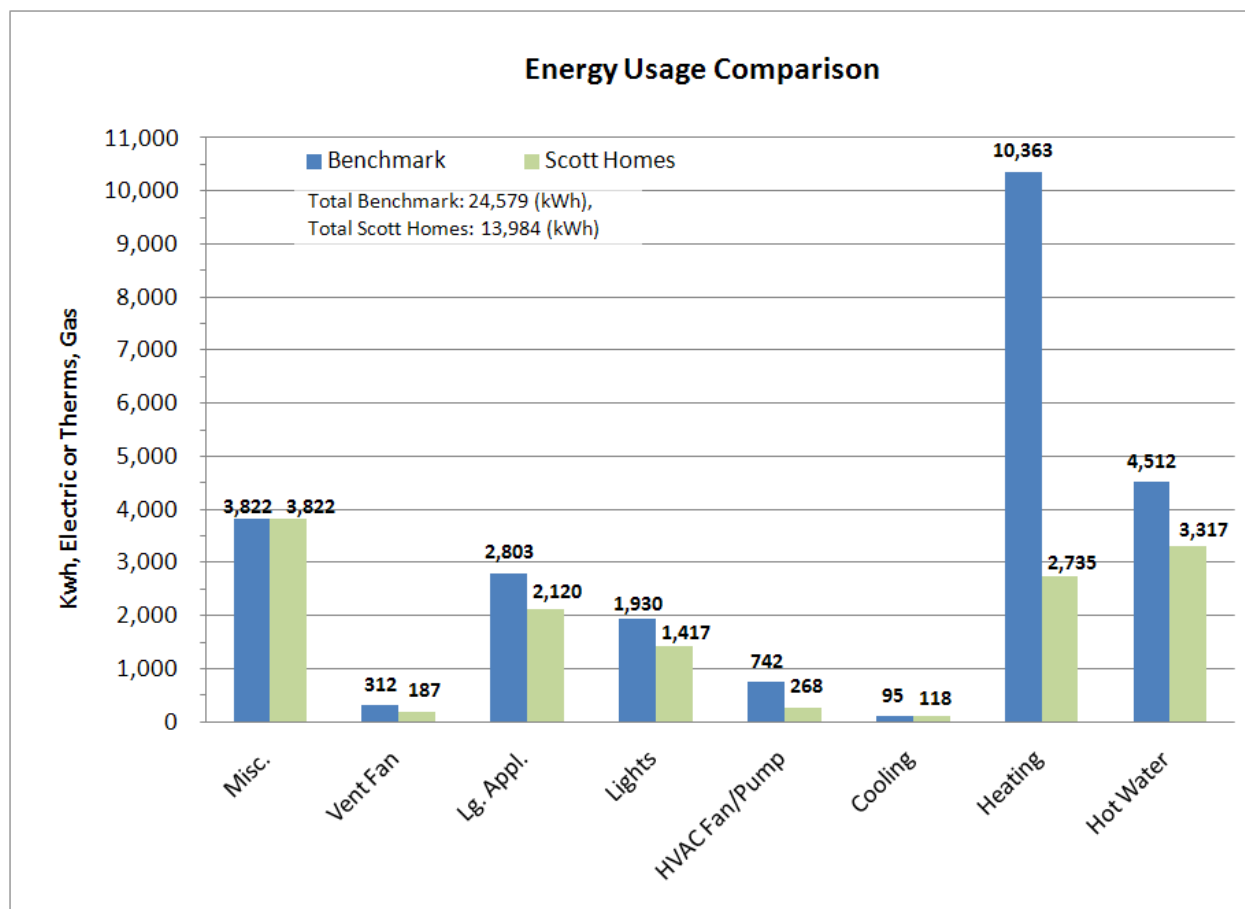
Size: 2,324 ft²

Location: Olympia, Washington

Completion date: May 2010

HERS Index:

Without renewables: 51



Energy Features:

Foundation: Insulated slab, R-10

Wall Construction: 6 ½-in.-SIPs

Wall Insulation: R-24

Roof Construction: Trusses at 24 in. o.c.

Attic Insulation: R-50 spray foam and blown fiberglass

Windows: Low-e, gas-filled vinyl-framed; U-0.30, SHGC 0.30

HVAC: GSHP, 3.3 COP, and radiant heat; desuperheater to heat water

Ducts: n/a

Water Heating: 60 gal. high efficiency storage tank and GSHP

Lighting: 75% CFL fixtures and lamps

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

Duct Leakage Test: n/a

Blower Door Test: 2.4 ACH50

Energy/Green Building Programs: ENERGY STAR, DOE Builders Challenge, and Olympia Built Green

6.11 Treasure Homes, Silver Winner

Cold Climate, Custom Category



What the Judges Said:

This first-time EVHA applicant is also the first house in Indiana certified to the highest (Emerald) level of the National Green Building Standard (ANSI ICC 700-2008). Treasure Homes is boosting regional awareness about the art and affordability of green building.

House Overview:

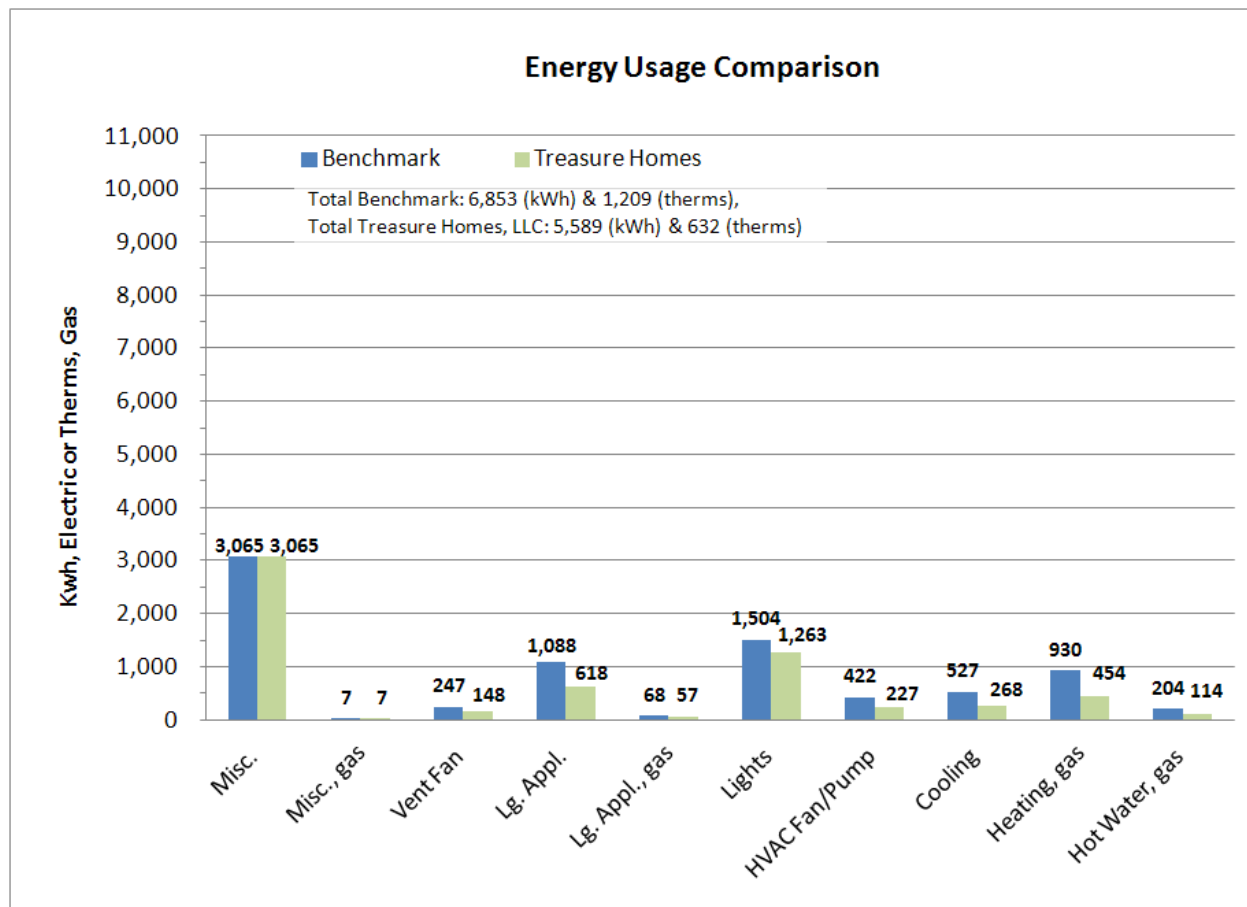
Size: 2,942 ft²

Location: Burns Harbor (South Bend), Indiana

Completion date: April 2010

HERS Index:

Without renewables: 46



Energy Features:

Foundation: Insulating concrete form (ICF) in-ground basement; conditioned, unfinished

Wall Construction: 2 × 4 SIPs with polyurethane foam core

Wall Insulation: R-24

Roof Construction: Trusses at 24 in. o.c.

Ceiling Insulation: R-30, spray polyurethane at roof deck

Windows: All windows low-e, vinyl; U-0.28, SHGC 0.25

HVAC: 0.95 AFUE furnace, 17 SEER air conditioner

Ducts: In conditioned space

Water Heating: Tankless water heater, gas condensing, 0.93 EF

Lighting: Mix of ENERGY STAR fixtures and compact fluorescent lamps

Appliances: ENERGY STAR dishwasher

Duct Leakage: 0 cfm at 25 Pa to exterior

Blower Door Test: 0.8 ACH50

Energy/Green Building Programs: Emerald National Green Building Standard Certification (ANSI ICC 700-2008), ENERGY STAR, and DOE Builders Challenge

6.12 CVH dba Clifton View Homes, Gold Winner and Remodeler of the Year Cold Climate, Existing Remodel Category



What the Judges Said:

In this first entry by Clifton View Homes in the Existing Remodel category, the builder has demonstrated its ability to translate the sound building science techniques and quality control mechanisms that is used for new construction into this remodeled home design.

House Overview:

Size: 3,282 ft²

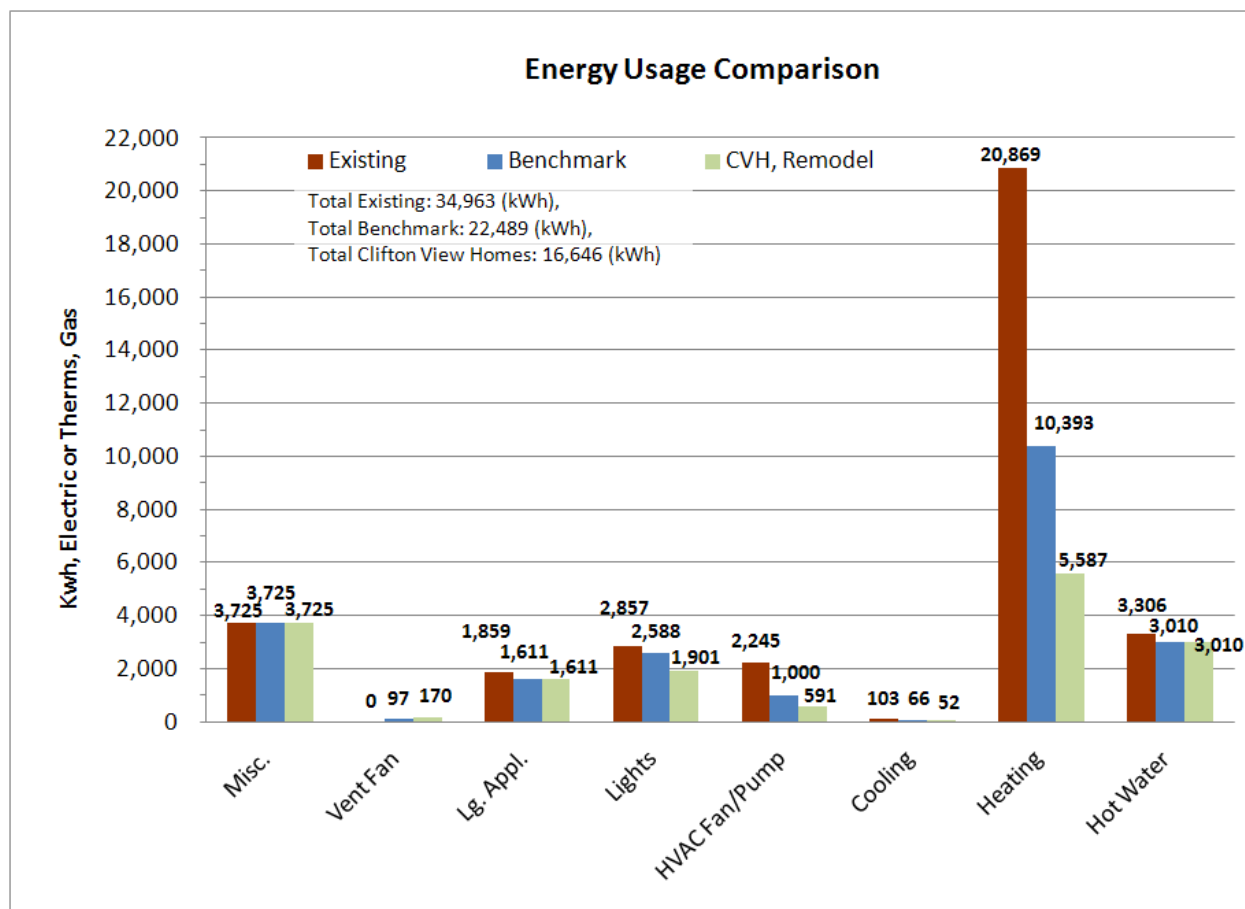
Location: Oak Harbor (Whidbey Island), Washington

Year Built: 1962, 1983

Remodel completion date: March 2010

Hers Index:

Without renewables: 74



Energy Features:

Foundation: Vented crawlspace with R-38 floor insulation

Wall Construction: 2 × 4 studs and insulspan retrofit panels (3.5-in.-SIPs)

Wall Insulation: R-15 fiberglass batts with R-15 exterior applied foam

Roof Construction: Trusses at 24 in. o.c.

Ceiling Insulation: R-49

Windows: All windows low-e, gas-filled vinyl; U-0.28, SHGC 0.21- 0.43 orientation specific

HVAC: 15 SEER, 9.0 HSPF ductless mini-split heat pump

Ducts: n/a

Water Heating: 2 0.91 EF 50 gallon electric tanks; solar thermal rough-in

Lighting: Mix of ENERGY STAR fixtures and compact fluorescent lamps

Appliances: ENERGY STAR refrigerator, dishwasher and clothes washer

On-Site Electric Generation: Rough-in for future PV only

Blower Door Test: 5.3 ACH 50

Energy/Green Building Programs: ENERGY STAR, DOE Builders Challenge, and Built Green

6.13 Green Builder Media et al., Silver Winner Hot Climate, Existing Remodel Category



What the Judges Said:

The project is a unique and synergistic partnership between media, training, and Building America to create a net-zero energy home from an existing building and to document the process.

House Overview:

Size: 2,059 ft²

Location: Las Vegas, Nevada

Year Built: 1960

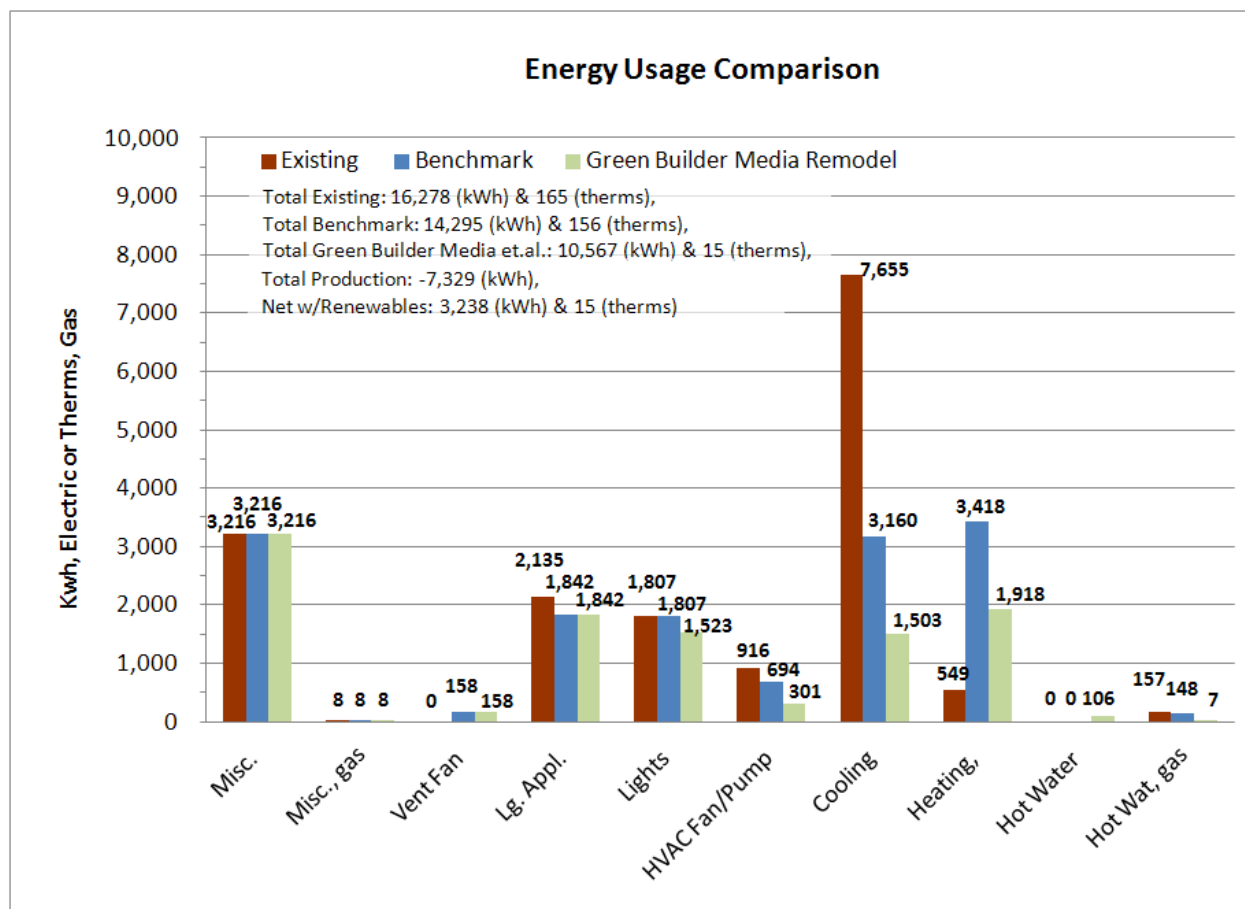
Remodel completion date: January 2010

Hers Index:

Prior to Remodel: 123

Post Remodel without renewables: 44

Post Remodel with PV: -1



Energy Features:

Foundation: Uninsulated slab

Wall Construction: 2 × 4

Wall Insulation: R-13 open cell spray polyurethane foam (SPF) applied from the outside and R-7.5 foam sheathing

Roof Construction: Joists

Ceiling Insulation: R-54 polyurethane spray foam

Windows: All windows low-e, U-0.22, SHGC 0.19

HVAC: 18.6 SEER, 9.0 HSPF heat pump

Duct: In conditioned space

Water Heating: 0.87 EF tankless gas supplements solar thermal water heating

Lighting: Mix of ENERGY STAR fixtures and compact fluorescent lamps

Appliances: ENERGY STAR refrigerator, dishwasher, and clothes washer

On-Site Electric Generation: 5.67 kW PV

Duct Leakage: <50 cfm to exterior at 25 Pa

Blower Door Test: 2.1 ACH50

Energy/Green Building Programs: DOE Builders Challenge, National Green Building Standard (ANSI ICC 700-2008), LEED for Homes, and ENERGY STAR

7 Summary

The energy performance of thirteen 2010 EVHA winning homes was simulated against the 2010 Building America Benchmark using the HSPs for calculating source energy for both the reference home and the EVHA home. The results show average improvement in whole-house source energy savings (excluding onsite renewables) of 35%. The range of energy savings was between 3% and 68%, including the newly implemented size adjustment factor in the benchmark protocols. The range of energy savings was 17%–61% when the size factor was not included. When evaluating these homes relative to the Building America performance goals, the three homes in the cold climate met the 2011 new home goal of 30% over the BA Benchmark and two of the three homes met the 2014 BA goal of 50% whole-house energy savings. In the moderate climate, three of the five homes (including one remodel) met the 2011 BA new home goal of 20% above the BA Benchmark. One home in the moderate climate easily met the 2012 BA goal of over 30% SES. In the hot climate, all of the homes, including one remodel, met the 2011 BA goal of 30% energy savings.

When including onsite renewables, the average energy savings for the 2011 winners was an average of 52%, an increase of 50% over the savings without renewables. The range of energy savings was 3%–96% (including the size adjustment factor). Two homes realized more than 95% SES with solar electric systems, nearly achieving net-zero energy consumption estimates. Onsite renewables provided a minimum of 25% additional energy savings and as much as 62% additional energy savings when included.

The two remodeled home winners, a new category to the 2011 EVHA awards, were simulated to show improvement over the BA Benchmark of 26% and 34% (78% with renewables) and each home showed a 52% energy improvement over the existing condition. The energy savings over the existing condition allowed these homes to meet 2015 (hot climate) and 2016 (moderate climate) BA goals.

Across all of the homes, the average heating and cooling energy savings was 49%. This indicates the improvement in the building envelope, including air sealing, and the equipment efficiency.

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