

Beazer Homes

Hampton Hills
Ellicott City, MD



BUILDER PROFILE

Beazer Homes
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FEATURED HOME/DEVELOPMENT:

Project Data:

- **Project name:** Hampton Hills
- **Location:** Ellicott City, MD
- **Layout:** 6 bdrm, 5 bath, 2 fl + bsmt, 5,047 ft²
- **Climate:** IECC 4A, warm-humid
- **Completed:** August 2023
- **Category:** Production

Modeled Performance Data:

- **HERS Index:** without PV 36; with PV 4
- **Annual Energy Costs:** without PV \$2,300; with PV \$400
- **Annual Energy Cost Savings:** (vs typical new homes) without PV \$3,500; with PV \$5,450
- **Annual Energy Savings:** without PV 25,230 kWh; with PV 39,010 kWh
- **Savings in the First 30 Years:** without PV \$147,450; with PV \$228,000

Beazer Homes, who is steadily building a reputation as an industry-leading home builder in the United States, has come into the U.S. Department of Energy (DOE)'s Zero Energy Ready Home program in a big way. After building their first DOE Zero Energy Ready-certified home in September 2022, Beazer is already certifying 98% of their new home starts to the requirements of the Zero Energy Ready Home program, with more than 3,200 homes certified as of December 2024. The builder is on track to certify 100% of their new homes by the end of 2025. DOE recognized Beazer's efforts with a DOE Housing Innovation Grand Award for most homes certified in 2024.

Beazer's participation in the DOE Zero Energy Ready Home program has been a win-win: a win for Beazer, with the record-breaking number of certifications providing national recognition and third-party verification of their truly high-performance homes, and a win for DOE, confirming the feasibility of the program for large production builders. But, as Beazer makes good on its commitment "to provide home owners with extraordinary value at an affordable price," the American home buyer might be the biggest winner of all.

The builder, who constructs about 5,000 homes annually and is active in 13 states and 17 submarkets, is no stranger to above-code high-performance construction. Beazer built their first ENERGY STAR home in 1998 and made a national commitment to build 100% ENERGY STAR starting in 2011. As a natural evolution of their ahead-of-the-curve construction practices, they decided to partner with the nationally recognized DOE Zero Energy Ready Home Program. As soon as the DOE Zero Energy Ready Home Version 2 program requirements were released, Beazer voluntarily began certifying homes at that more stringent level. In 2020, Beazer became the first U.S. national home builder to publicly commit to ensuring that (by December 2025) every new home start will meet the requirements of the DOE Zero Energy Ready Home program.



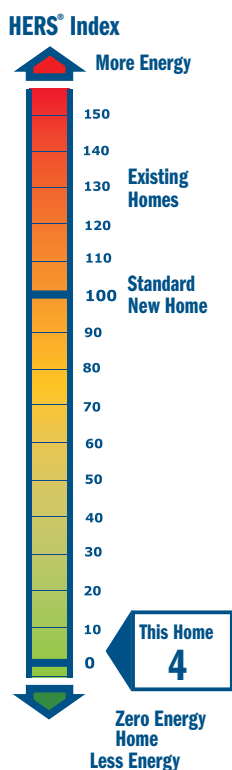
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.2 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.

Beazer Homes constructed this 5,047-ft² home in Ellicott City, MD, to the high performance criteria of the DOE Zero Energy Ready Home (ZERH) program. The home is expected to save its homeowners more than \$5,450 per year in energy costs compared to a similar sized home built to code.



What makes a home a DOE ZERO ENERGY READY HOME?

- 1 **BASELINE**
ENERGY STAR Certified Homes Version 3.0/3.1
- 2 **ENVELOPE**
meets or exceeds 2012 IECC levels
- 3 **DUCT SYSTEM**
located within the home's thermal boundary
- 4 **WATER EFFICIENCY**
meets or exceeds the EPA WaterSense Section 3.3 specs
- 5 **LIGHTING AND APPLIANCES**
ENERGY STAR qualified
- 6 **INDOOR AIR QUALITY**
meets or exceeds the EPA Indoor AirPlus Verification Checklist
- 7 **RENEWABLE READY**
meets EPA Renewable Energy-Ready Home.



The DOE Zero Energy Ready Home program was a logical next step since it is based on ENERGY STAR certification, while bringing in the indoor air quality requirements of the U.S. Environmental Protection Agency’s Indoor AirPlus and the water conservation focus of EPA’s WaterSense program, along with the insulation targets of the 2021 International Energy Conservation Code. Other program requirements include use of ENERGY STAR-labeled appliances and lighting and incorporation of wiring, framing, and space requirements for future installation of heat pump water heaters, electric vehicle chargers, and photovoltaic panels. While installation of this equipment is not required, installing the infrastructure for it is a low lift during construction that offers homeowners more choices in the future.

“We’ve always been focused on doing more and offering a better product for our home buyers,” said Brian Shanks, Beazer’s manager of governmental affairs. “Comfort’s got to be number one, so we’ve focused on the building envelope first. The next step was determining how to deliver a zero-energy home. That includes looking toward renewables and battery storage opportunities.”

Although installation of photovoltaic panels is not required by the DOE program, on this home Beazer chose to install a 10-kW PV array and two batteries providing 27 kWh of storage capacity for 12 hours of resiliency running entirely off the battery. This home also has an electric vehicle charger.

Beazer worked with building scientists to develop a building assembly that uses common construction materials combined in uncommon ways to provide the highest performance possible. The 2x6 24-inch on-center wall panels are first sprayed with 2.5 inches (R-18.5) of closed-cell spray foam that helps to both insulate the walls and improve the air infiltration barrier for an air-tight outer layer. The wall cavities are further filled with R-12.5 of blown fiberglass and topped with half-inch drywall. “Combining spray polyurethane foam with the loose fiberglass enabled us to achieve a more robust wall assembly without increasing the wall cavity depth,” said Shanks.

Taped house wrap provides a weather-resistant barrier under the vinyl siding and masonry accents. Tape flashing around windows and doors and rubber flashing gaskets around piping provide air sealing and water control around any holes in the exterior walls.

The simple gable truss roof tops a vented attic insulated with 20 inches (R-60) of blown fiberglass. Raised heels lift the trusses 16 inches to provide more room for insulation above the top plates at the exterior walls. A synthetic underlayment protects



Beazer Homes focused on the building envelope, starting with a flash-and-batt approach to insulating walls which consists of spraying the 2x6, 24-inch on-center, advanced framed walls with 2.5 inches (R-18.5) of closed-cell spray foam then filling the remainder of the wall cavity with R-12.5 of blown fiberglass. The spray foam helps to both air seal and insulate the walls while the blown insulation adds R-value at reduced cost. The double-pane windows have low-emissivity coatings to help minimize unwanted winter heat loss and summer heat gains.

the OSB roof sheathing. The entire roof of this home is covered with inconspicuous photovoltaic roof tiles.

The 2x4 walls in the home's finished basement are filled with R-19 faced fiberglass batts. The 14-inch I-joist ceiling above the garage is dense packed with R-47 of blown fiberglass.

In addition to traditional air sealing measures, Beazer also used a whole-house aerosolized air sealing process which helped reduce air leakage to 1.09 air changes per hour at 50 Pascals pressure differential (ACH50), well below the 3.0 ACH 50 air leakage maximum required by the program.

To provide ventilation to the home, Beazer installed an energy recovery ventilator (ERV). "We put ERVs in our homes as a normal course of business. The program doesn't require it, but the program validates it and gives us the acknowledgement," said Shanks.

The ERV brings in outdoor air through a dampered fresh air intake and pulls that air through a heat exchanger before distributing it in the home. The intake fan is operated simultaneously with an exhaust fan that pulls stale inside air from the home and passes it through the heat exchanger on its way out. The heat exchanger transfers heat—warming incoming air in the winter and cooling incoming air in the summer. The ERV installed in the award-winning home is equipped with an electronically commutated motor (ECM) for efficient operation. The incoming air passes through a MERV 8 filter capable of trapping dust, pollen, pet hair, and smoke particles.

After passing through the ERV, the tempered fresh air is supplied to the return side of the air handler for the home's central air-source heat pump. The heat pump is equipped with a variable-speed compressor and a true variable-speed inverter. The system provides heating with an efficiency of 8.1 HSPF2 and cooling with an efficiency of 16.7 SEER2. Beazer has invested in a commercially available but uncommon duct distribution system that uses small-diameter ducts to quickly and efficiently distribute hot and cold air throughout the two-story home plus basement, while keeping the ducts within the home's conditioned space.

"By pairing the efficient inverter heat pump system with the communicating Wifi-enabled thermostat, the homeowner is provided with infrastructure capable of monitoring IAQ and an ecosystem that could include HEPA filtration, UV purification, and whole house dehumidification, should they choose to add it in the future," said Shanks.

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program - 100% Commitment

ENERGY STAR Certified Homes Version 3.2

EPA Indoor AirPlus

"We knew we wanted to do a better envelope. With DOE Zero Energy Ready Home certification, we are ahead of code in many states by a wide margin. This helps us to keep it simple and offer a consistent product from coast to coast."

—Brian Shanks,
Manager of Governmental Affairs,
Beazer Homes



Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE's Building America research program.



The entire roof of the home is covered with photovoltaic panels. The panels provide 10 kW of solar power and, together with the 27 kWh of battery storage capacity, enable the energy-efficient home to yield near net-zero energy bills over the course of the year.

An 80-gallon heat pump water heater provides hot water with a coefficient of performance (COP) of 3.45, more than three times the efficiency of an electric resistance or gas water heater. The water heater is centrally located within the home to speed hot water to the kitchen, laundry, and bathrooms. The heat pump water heater's location in the basement in a utility closet off an unfinished storage area ensures that any noise or cold air will cause minimal discomfort to occupants.

Many of the products and technologies Beazer used in the award-winning home are featured in every home Beazer constructs. As a volume builder with a national scope, it was important to Beazer that those products be readily available through normal supply chain distribution partners. All of the construction techniques and methodologies Beazer utilizes during the build process are commonly known practices, although not often associated with home building at scale. "In some cases," said Shanks, "Beazer has worked with manufacturers to identify beneficial products for high-performance homes, helping to accelerate their development-to-delivery cycle." Shanks points to their work with a leading ventilation product manufacturer as an example of an instance where Beazer's buying power has bolstered the supply of balanced ventilation products, improving their marketplace availability for all builders.

It hasn't always been easy. "We had to take a deeper look at how our processes and components work together. We had to research which improvements to building materials or component specifications were impactful, and which weren't," said Shanks. For Beazer, in some cases, it meant searching for manufacturing and trade partners with the same passion for delivering efficient homes, or working to improve training for staff and partners." Sometimes "we've had to train the local workforce, but 'a rising tide lifts all boats,'" said Shanks, acknowledging that other builders have benefitted from Beazer's innovations.

Shanks sees the move to 100% DOE Zero Energy Ready Home certification as part of a corporate philosophy of continuous improvement and he credits Allan Merrill, Beazer's chairman and CEO, and Jim Moore, senior vice president of operations, with the vision to "keep doing better."

KEY FEATURES

- **Walls:** 2x6 24" o.c., R-31 total: Advanced framed, R-12.5 blown fiberglass, R-18.5 closed-cell spray foam, 7/16" OSB, house wrap, vinyl siding with masonry accents.
- **Roof:** Gable truss roof, 24" o.c., 7/16" OSB roof sheathing, synthetic roofing underlayment, integrated solar roof tiles.
- **Attic:** Vented, 20" R-60 blown-in fiberglass. 16" raised-heel trusses.
- **Foundation:** Insulated basement, poured concrete walls, interior framed wall with R-19 faced fiberglass batts, 1/2" sheetrock.
- **Windows:** Double-pane windows, U=0.28, SHGC=0.25.
- **Air Sealing:** 1.09 ACH50; traditional air-sealing practices and aerosolized acrylic whole house air sealant.
- **Ventilation:** ERV, integrated with HVAC system that monitors IAQ, ECM motors; MERV 8 filters.
- **HVAC:** Central Air-Source Heat Pump, 8.1 HSPF, 16.7 SEER; compact duct design, variable speed compressor and inverter system.
- **Hot Water:** Heat pump water heater, 80-gal, 3.45 COP. Central hot water distribution design with the water heater centrally located.
- **Lighting and Appliances:** ENERGY STAR appliances.
- **Solar:** 10.08 kW PV, 27 kWh of batteries.
- **Energy Management System:** Wifi-thermostat could control IAQ monitoring, HEPA filtration, UV purifier, and whole-house dehumidifier.
- **Other:** Electric vehicle charger.

Photos courtesy of Beazer Homes