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 (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR for Homes Version 3 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.
The company has committed to DOE Zero Energy Ready Home certification on all of its new homes. The company builds about two new homes per year, which are either custom homes built for a buyer or built and sold on speculation. The company also does two or three home renovations each year, incorporating as much energy efficiency as is possible given the parameters of the job. “Whatever we do, we try to do as efficiently as we can,” said Kakerbeck.

“Overall it’s just the right thing to do and we think we’ve hit it at the right time,” said Ferguson. “People are finally paying attention to this sort of thing—even for political reasons, if not from personal conviction. We have friends who are builders who used to make fun of us. Our website says ‘build better, build green.’ Now we’re seeing them put green features in their homes.”

Ferguson notes that the town of Southampton now encourages energy-efficient construction with a very progressive building code. “They are hard core about achieving low HERS ratings, although LEED still goes further,” said Ferguson.

Fortunately, the company gained experience achieving low Home Energy Rating System (HERS) scores when they built their first ENERGY STAR home in Vermont. Kakerbeck said they achieved a HERS of 55 without added photovoltaics (although the house is prepared for this in the future when incentives are re-instated in Vermont). The project gave them the knowledge base for their current DOE Zero Energy Ready Home. On the DOE Zero Energy Ready Home they achieved a much lower HERS score of 43, still without photovoltaics, although the house has been made solar-ready for an 8.6-kW PV system once a buyer moves in.

The 5,088 ft² two-story home, which is considered modest for a new home by Hamptons standards, features six bedrooms, including two in the finished basement, and five bathrooms. Although it’s not small, the home’s highly insulated building shell and advanced heating system ensure that utility bills will be modest.

The home is constructed of double walls consisting of two sets of 2x4s with the studs at 16 inches on center. The studs are staggered so that heat cannot transfer directly through the studs. Together the two walls form a 7-inch wall cavity that is filled with blown-in fiberglass insulation for an R value of R-25. The exterior wall is covered with OSB that has a proprietary coating on it. When taped at the seams with the sheathing manufacturer’s specified tape, the coated sheathing forms an airtight, weather-resistant barrier and drainage plane that does not need housewrap. The walls are covered with clapboard and cedar shake siding.
The roof has a 2x12 vaulted ceiling with 11.25 inches of blown cellulose filling the ceiling cavities for an R-40 insulation value. The roof decking consists of the same coated sheathing with proprietary taped seams. A 3-foot border of ice and water shield protects the edges and valleys of the roof. Over the sheathing is laid a “cedar breather” product consisting of thick mesh that allows ventilation under the cedar shakes. Some builders prefer it for more even ventilation than installing horizontal lathes under the shakes.

The poured-in-place concrete basement walls are insulated on the interior and under the slab with two inches (R-10) of XPS rigid insulation. Because the basement is occupied space, the foam must be covered with drywall as an ignition barrier, or in this case with framed 2x4 walls and drywall. In addition, all interior walls and floors are insulated with R-13 batts to provide sound proofing.

The windows are double-pane, low-e, argon-filled, fiberglass-framed, high-performance windows with an insulation U factor of 0.29 and a solar heat gain coefficient (SHGC) of 0.28. The south- and west-facing windows have a lower SHGC than the east- and north-facing windows to minimize summer heat gain.

The heating system is an air handler hydronic system that uses hot water coils as the heat source. The hot water for these coils comes from a 91% AFUE propane tankless boiler that also provides hot water for the radiant floor heat in the basement as well as domestic hot water.

The air conditioner consists of one 2.5-ton condenser that provides cooling for two zones—one upstairs and one downstairs. Cool air is directed to the two zones by dampers that are controlled by two thermostats. Because there are less penetrations, there is less air leakage and the home’s high insulation levels have enabled the small tonnage system to provide adequate cooling for the house.

Ventilation is provided with a heat recovery ventilator (HRV) that is located in a basement utility room along with the air handler. The HRV brings in fresh air that is passed through a heat exchanger where it is warmed or cooled by outgoing air before it is directed through a filter and into the home’s air handling unit for distribution through the HVAC ducts.

The home is equipped with remote controlled thermostats. The home has an in-ground swimming pool. The pool pump and filtration system are the highest efficiency equipment available, beyond what even the strict local code requires.
The builders also insulated all of the hot and cold plumbing pipes inside the home, another above-code measure.

All of the lighting in the home is LED lighting. The dishwasher, clothes washer, and refrigerator are all ENERGY STAR rated. All of the showers, faucets, and toilets are EPA WaterSense labeled. The landscaping includes 100% drought-tolerant plants and only 30% of the yard is covered with grass, which is also a drought-tolerant variety.

To improve the indoor air quality, the builders specified only low- and no-VOC interior finishes. They were careful to cover the ducts with plastic during construction and to replace the furnace filter once the home was completed. All of the cabinets are made with recycled barn wood. Some furniture in the home is made with trees salvaged during construction and scraps of the posts that were used for interior supports.

The home is in a coastal environment prone to hurricanes so every stud was tied to the foundation and every roof rafter was tied to a stud using hurricane strapping and clips. Firestopping caulk was used to caulk throughout the house. Fireblocking was installed in the basement, and all walls were sheetrocked, including the utility room.

Building to these higher levels of energy efficiency and environmental sensibility has been a natural progression for Ferguson and Kakerbeck. They have learned to take a systems approach, which has paid off in terms of higher quality. With the DOE Zero Energy Ready Home, they organized weekly project team meetings and met prior to construction to address issues regarding the building enclosure and durability. The home also underwent regular and thorough inspections by their HERS rater, Karla Donnelly of Steven Winter Associates. As a result, the project experienced minimal defects and 82% of construction waste was diverted.

The challenging part has been educating the trades, real estate agents, and home buyers on the value of what they are doing. They have spent a lot of time working to educate them on the technical aspects of the energy-efficiency measures they’ve installed.

But for Ferguson and Kakerbeck, being able to build environmentally responsible and beautiful homes in their adopted hometown has been worth the effort.

**KEY FEATURES**

- **Path:** performance
- **Walls:** clapboard and cedar shake siding over a mesh air spacer; above-grade walls have R-25 blown-in fiberglass in a double wall of two 2x4 16 in. o.c. walls. Coated sheathing with proprietary tape for air sealing
- **Roof:** 2x12 vaulted ceiling with 11.25 in. blown cellulose (R-40). Coated sheathing with proprietary tape for air sealing
- **Foundation:** below-grade walls are R-10 rigid foam insulated on interior; 2 inches (R-10) XPS under slab
- **Windows:** double-pane, low-e, argon-filled, fiberglass-framed, U=0.29, SHGC=0.28
- **Air Sealing:** 1.2 ACH 50
- **Ventilation:** HRV with MERV 16 filter
- **HVAC:** 91% efficient boiler for hydro air system, SEER 16 AC. Total duct leakage of 4 cfm/100 ft² of conditioned space. Radiant heating for basement in slab.
- **Hot Water:** 91% AFUE propane boiler
- **Lighting:** 100% LED
- **Appliances:** ENERGY STAR-rated dishwasher, clothes washer, refrigerator
- **Solar:** solar ready with brackets and wire connections installed for a future 8.6-kW solar PV system
- **Water Conservation:** EPA WaterSense low-flow showers, sinks, and toilets; drought-tolerant plants
- **eMonitor Management System:** remotely controlled thermostats
- **Other:** low- and no-VOC finishes; reclaimed wood cabinets and furniture; recycled-content counter tops

A high-efficiency propane boiler provides hot water for the hydro coil central air heating system, radiant floor heat in the basement, and domestic hot water.