

## Tommy Williams Homes

### Zero Energy Home

### Longleaf

#### Performance Features

Home Energy Index (HERS)/ENERGYSMART<sup>SM</sup>  
Home Scale (E-Scale) = -2

#### Thermal Shell

- R-30 ceiling insulation (R-19 knee wall insulation), vented attic with radiant barrier
- 10" heel trusses for improved insulation coverage
- R-15 formaldehyde-free blown fiberglass wall insulation
- Double pane, Low-e vinyl frame windows (U=0.35, SHGC=0.25)
- ENERGY STAR<sup>®</sup> Certified including Thermal Bypass Checklist Compliance

#### Airtightness & Indoor Environment Quality

- Penetrations & openings sealed to achieve 2.3 air changes at 50 Pa
- Ducts (sealed with mastic) & air handler in conditioned space. Zero duct leakage to outside.
- Runtime, positive pressure, filtered fresh air ventilation system
- MERV 8 whole house filter

#### HVAC

- ACCA Manual D sized duct system, sealed with mastic at joints
- ACCA Manual J sized heating/cooling equipment
- 2.8 ton high efficiency, CFC/HCFC free refrigerant, heat pump (SEER 16, HSPF 9.5)

#### Hot Water

- Solar domestic hot water system (64 sq. ft. collector) 120 gallon storage with drain back tank

#### Efficient Appliances & Renewable Energy

- 100% Compact Fluorescent Bulbs
- 6.75kWp Sunpower 225 PV System (inverter avg. eff. = 0.97)
- ENERGYSTAR<sup>®</sup> rated dishwasher, clothes washer and refrigerator
- Very efficient ceiling fans



Photo: Stephanie Thomas Rees

Tommy Williams Homes, Zero Energy Home • Longleaf • Gainesville, FL  
2,250 square feet • 3 bedrooms, 2.5 bathrooms

# SOLD in 2 weeks!

#### Overview

Tommy Williams has 30 years of experience in the home building industry. Since 2004, they have responded to the new home market challenges by embracing the Building America high performance approach. From building minimum code homes, Tommy Williams has progressed to building over 61 Builders Challenge Homes (HERS below 70) since induction as a "Pioneering Builder" in 2008. In 2009, Tommy Williams Homes confirmed its plans to build a Zero Energy Home (ZEH) with a HERS index of 0. The home was the first ZEH for this production builder and the first true net zero energy home for a production builder in Florida. During the design, the team factored in a safety net and goal of a HERS Index of better than 0. The final inspection and testing of the home resulted in a HERS of -2, which means it is expected to produce more energy than it consumes.

Tommy Williams led a team meeting with several Building America Industrialized Housing Partnership (BAIHP) team members, including FSEC's expert solar and instrumentation team. In addition, the project's superintendent, sales and marketing personnel, HVAC contractor, plumber, electrician, framers and solar contractor attended and participated in a Q & A session at the ZEH site. BAIHP also filmed segments of construction for the "Achieving Net Zero Energy Green Homes" webinar highlighting measures related to the Builders Challenge Quality Criteria Checklist.

Using creative new building techniques and an impressive array of solar panels, this home takes advantage of the abundant Florida sun to create as much energy as it uses. By combining traditional styling with ultra-cutting edge building concepts – in a popular modern community – Tommy Williams hopes this home is a 'giant leap' toward the dream of building mainstream solar homes.



Continuous formaldehyde free fiberglass blown insulation



Sealed drywall at ceiling



Ducts within conditioned space with custom short boots



Foam gasket at ceiling/wall joints ensures airtightness



Outside air inlet with filter back grille delivers fresh air to return side of AHU

Photos: Ken Fonow

## Energy Efficiency

Tommy Williams Homes is a model of energy efficiency and innovation without compromising comfort or affordability. This home is designed to exceed requirements of the EPA's ENERGYSTAR® and the DOE's Builders Challenge certification. It's energy efficient strategies and optimized use of renewable energy can be used in homes in a hot-humid climate at any price point with similar energy savings.

To ensure energy efficiency and innovation, Tommy Williams Homes enlisted the team work of the BAIHP. This team includes researchers from the Florida Solar Energy Center® (FSEC), and energy consultant FL HERO. The team not only met several times during the design process, but they also provided systems engineering support, energy simulations with cost data and even hands on construction education. As a result, the home is expected to produce more energy than it uses over

an annual year. The table below shows the home's HERS Index with and without the renewable energy features.

HERS Index	
Electric water heater & no PV	57
Solar water heater & no PV	49
Solar water heater and 6.75 kWp PV	-2

### Energy Features & Unique Air Distribution Strategies

The Tommy Williams ZEH Longleaf offers many noteworthy, energy efficient features. Several features in particular are the home's thermal shell, air distribution and passive design strategies.

While the walls are typical 2x4 wood frame construction (for this region), the details include "ladders" for T-wall intersections and complete insulation coverage to avoid gaps in thermal resistance. All the windows have low-e coating to limit the solar heat gain.

The attic is vented with a radiant air barrier, the ceiling is insulated to R=30 and the knee walls to R=19. Simple installation of a foam gasket seal ensures air tightness. The trusses include 10" heels for uniform insulation coverage.

The homes' HVAC system and distribution also contributes to energy savings. The ventilation system employs a "climatically responsive" and controlled amount of outdoor air to introduce fresh air. The ducts and variable speed air handler with accessible MERV 8 air filter is within the conditioned space.

The innovative interior ducts were designed and developed by FL HERO and R&R Planning and Design. This is achieved by first installing the sheetrock on the ceiling, before interior walls were constructed. Then the supply ductwork was installed using hard ducts whenever possible. Next the ductwork was framed in and the house was readied for the second and final visit of the drywall crew. A key to low costs is elimination of all return duct work in one story homes that use over the door transom returns from bedrooms. A series of Net-Zero Energy "ready made" home plans have been developed from this experience.

Among the numerous advantages of well designed and constructed interior duct systems are improved energy efficiency and indoor air quality from eliminating duct leakage to the outside and conductive heat gains and losses through the duct wall. These effects reduce the load on the mechanical system and improve comfort through faster pull down rates in hot summers due to elimination of hot air and cold air blows at equipment startup. Overall indoor air quality is improved due to elimination of duct leaks and “right sized” efficient HVAC. BAIHP partners have used interior duct chases to improve aesthetics through variation of ceiling heights and creation of alcoves. It is also a measure that can last the life of the dwelling.

Passive design strategies were also developed to maximize the energy efficiency of the structure. Twenty-four inch overhangs all around and a recessed alcove were designed to protect the large areas of glass against solar radiation.

## Systems-Engineering Approach

Building America’s systems-engineering approach unites segments of the building industry that have traditionally worked independently of one another. Building America forms teams of architects, engineers, building science researchers, equipment manufacturers, contractor trades and real estate professionals.

The concept is simple: systems-engineering can make America’s new homes cost effective to build and energy efficient to live in, without compromising human comfort, health or safety. To reach this goal, Building America teams work with their building partners to produce homes that incorporate energy and material-saving strategies from design through construction.

First, teams analyze and select cost-effective strategies for improving home performance. Next, teams evaluate



6.75kWp PV system with 64 sq. ft. solar hot water system

designs, business, and construction practices within individual builder partnerships to identify cost savings. Cost savings can be reinvested to improve energy performance and product quality. For example, a design that incorporates new techniques for tightening the building envelope may enable builders to install smaller, less expensive heating and cooling equipment. The savings generated from this design can then be reinvested in high performance windows to further reduce energy use and costs. The “pilot” or “test” home is the field application of solution design. Teams assist builders in constructing prototype homes according to strategic design. Then they test each system for efficiency and make any necessary changes to increase efficiency and cost effectiveness. Before additional homes are built, these changes are incorporated into the design. The process of analysis, field implementation, reanalysis, and design is ready for use in production or community-scale housing.

Tommy Williams Homes has been exercising this system-engineering approach since induction. From the beginning, recommendations of properly sizing the HVAC equipment and distribution systems to monitoring the performance of the zero energy home at Longleaf, this transformation has led to a potential future of zero energy home communities. The monitored data of the zero energy home at Longleaf can be viewed at: <http://infomonitors.com/tw1/>

Tommy Williams embarked on their second zero energy home and their first



120 gallon storage hot water tank with drain back tank above

“entry-level” zero energy home. This home is in the Belmont neighborhood. It will have many of the same specifications at the ZEH Longleaf but just slightly smaller. This home will also include monitoring equipment and the construction progress can be viewed on the Web at [www3.infomonitors.com/tw2/hourly/](http://www3.infomonitors.com/tw2/hourly/)

## Additional Green Features

### Water Efficiency

- Dual flush toilets
- Low flow fixtures
- Florida-Friendly Landscape

### Resource Efficiency

- Reuse of form boards over headers
- FGBC (Florida Green Building Coalition) Gold Certified Green Home

Visit our Web sites at:

- www.buildingamerica.gov
- www.buildingamerica.gov/challenge
- www.energystar.gov
- www.baihp.org
- www.fsec.ucf.edu
- www.floridahero.com
- www.tommywilliamshomes.com
- www.randrpd.com



R&R PLANNING AND DESIGN



www.baihp.org Florida Solar Energy Center\*



## Builders Challenge

Recognizing Energy Leadership in Homebuilding

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Photo: Stephanie Thomas Rees

## Department of Energy Builders Challenge

To learn more about the Builders Challenge and find tools to help market your homes, visit [www.buildingamerica.gov/challenge](http://www.buildingamerica.gov/challenge).

U.S. Department of Energy  
**EnergySmart Home Scale<sup>SM</sup>**

<b>Estimated annual energy usage:</b> Electric (kWh) -365	<b>Estimated annual energy bill:</b> \$-42	8137 SW 73rd Lane, Gainesville, FL 32608 Rated by Florida H.E.R.O., Inc. Rating Conducted January 27, 2010
<b>Conditioned floor area (sq. ft.):</b> 2250		<a href="http://www.buildingamerica.gov/challenge">www.buildingamerica.gov/challenge</a>

**Meets The Builders Challenge**  
*Recognizing the best energy performance, quality, comfort, health and safety in the market.*

**This Home is better than Net Zero!**

**-2**

**Best Energy Performance**

**Net Zero Energy Home**

10FL-200000002234

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

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[www.eere.energy.gov/informationcenter](http://www.eere.energy.gov/informationcenter)