

# DOE Zero Energy Ready Home

U.S. DEPARTMENT OF  
**ENERGY** | Energy Efficiency &  
Renewable Energy



## Zero Energy Ready Homes Leading Builders

**Jay Epstein**

President

Health E Community Enterprise of  
Virginia Inc.



## Leading Builders Series

"I love the fact that I can bring people together, where families make memories and friends for a lifetime. I love building community."  
JAY EPSTEIN '76



Building the  
Future – *Today*



- My journey as a builder/developer started in the 90's with the Build America Program. I have built over a thousand homes during this time. Awards include Energy Value Housing Awards, DOE Innovation Awards at a regional level.
- The majority of builders in America today build a home based on the 2012 IECC building code. As you know this is 2017. Would we really want to buy a new home with concepts approved in 2012? That answer I leave to you the builder and the consumer to decide.
- There is a simple solution that I discovered in 2014 that I have showcased in my solar home development of 45 single family homes called **The Villas at Rocketts Landing** located in Richmond, Virginia.
- I'm in the process of finishing the ZERH builder's guide called ***The Simplicity of the Build™***
- This guide is based on a building design that has been around for years and incorporating a few new building products that make the home achieve ultra-energy efficiency with a HERS score in the 40's to low 50's before incorporating the Photovoltaic (PV) System to achieve a HERS score as low as ZERO.
- The "Simplicity of the Build™" allows for the builder, subcontractors, superintendents, sales staff and the homebuyer to understand the building concept of a Zero Energy Ready Home and build homes of the future today.

## The Villas at Rockett's Landing Progress and Awards

- In 2014 we had the most energy efficient home in Virginia certified by Earthcraft
- In 2015 seven of our homes were in the top ten showing consistency of the build.
- In 2016 we were awarded the Zero Energy Housing Award for our custom design “*Beyond Home*” that showcased different building systems within the home with cooperation from BASF HP+ systems & Topbuild.
- This year we were awarded the 2017 Housing Innovation Award for the “Simplicity of the Build™” for our design developed in 2014 that qualifies the homes tested in this community for Energy Star, Indoor Air plus and Zero Energy Ready Home Certification.

## Zero Energy Ready Homes open the market place to 100% of buyers – buyers have the choice to upgrade now or later

- Option 1: Purchasing an ultra-energy efficient home with enhanced indoor air quality that qualifies for energy star, indoor air plus and Zero Energy Ready certification today with solar panels.
- Option 2: Installing solar panels at a later date since the home has been prewired with a dedicated area on the roof.

## As a certified Topbuild, Energy Star, Indoor Air Plus and Zero Energy Ready Home you are assured the design of your home has:

- An integrated systems approach – **Advanced Technology/ Comfort Plus/ Durability**
- Environmentally conscious design and construction applications – **Healthful Environment**
- Efficient use of natural resources: water, energy and building materials- **Quality Built**
- Utility cost savings – **Ultra Efficient**
- Improved indoor air quality and a comfortable living environment- **Healthful Environment**
- Tighter building envelope and ductwork (confirmed by on-site inspections & performance testing)- **Quality Built**

# Housing Innovation Award Winning Homes at The Villas at Rocketts Landing



Energy Efficiency & Renewable Energy



## Consumer Education is Our Number One Goal!

- The solar panels on the roof grab the buyers attention as a beacon of energy efficiency and opens the door to the ZERH concept
- Our most effective way of marketing is through **touring** our Model ZERH
- Our Site Agent educates the buyer on the different building systems utilized as they tour the model since most of the building systems are behind the wall, under the house or in the attic.
- DOE Zero Energy Ready Home brochures and information handouts are provided in Model
- DOE ZERH Logo on Facebook and Website
- YouTube videos of each building system utilized are linked to our website
- *The Simplicity of the Build™*

## Homes to the Power of **ZERO**



### What is the DOE Zero Energy Ready Home™ Label?

It is a Symbol of Excellence for energy savings, comfort, health, quality, and durability met by a select group of leading builders meeting U.S. Department of Energy Guidelines.

### What is a Zero Energy Ready Home?

It is a high-performance home so energy efficient, all or most annual energy consumption can be offset with renewable energy. In other words, it is the Home of the Future.

### A Symbol of Excellence



KEY  
■ DOE Zero Energy Ready Home  
■ ENERGY STAR® Certified Home  
■ Existing Home

This graphic comparison chart demonstrates relative performance of this DOE Zero Energy Ready Home to existing homes (built between 1990 and 2010) and ENERGY STAR Certified Homes. Actual performance may vary.



Health E Community Enterprise of Virginia

DOE Zero Energy Ready Home Partner

(757) 592-4855  
 www.vrhhomes.com  
 264H McLawns Circle, VA 23185

# 703 Admiral Gravelly Blvd. – Homeowner Testimonial & Certification



YOUR HOME WAS DESIGNED, ENGINEERED,  
AND CONSTRUCTED IN CONFORMANCE TO  
U.S. DEPARTMENT OF ENERGY (DOE)  
GUIDELINES FOR EXTRAORDINARY  
LEVELS OF EXCELLENCE AND QUALITY.

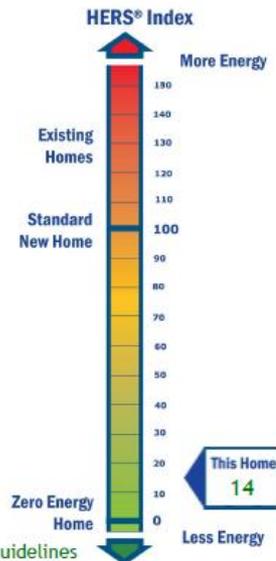
**This home built at** 703 Admiral Gravelly Blvd.  
**By** Health E Communities  
**Verified by** Eric Bjerre  
an independent professional  
organization, to meet or exceed  
strict home performance  
guidelines set by  
The U.S. Department of Energy  
on 6/12/2017

THIS HOME MEETS OR EXCEEDS THE MINIMUM  
CRITERIA FOR THE FOLLOWING:

DOE Zero Energy Ready Home Quality Management Guidelines

REM/Rate - Residential Energy Analysis and  
Rating Software v14.6.3

SAM RASHKIN, CHIEF ARCHITECT  
BUILDING TECHNOLOGIES  
U.S. DEPARTMENT OF ENERGY



June 13, 2017

My husband Jason and I built a home at The Villas at Rockett's Landing in late November, 2016. After living there for six months, I will say that I have been extremely pleased in the air system. I have terrible allergies and have been breathing better recently than I can remember in years! Also, I have been so happy having the solar panels. It has done wonders for our electric bill! The last couple of months it has been less than \$10. It truly is unbelievable. We can run our air conditioning on a hot day without worry of rising energy costs. We moved from a much smaller house, where our electric bill was often \$150 - \$250 during hot summer months. It has been a significant improvement for us. Overall, we are thrilled with these results since moving to The Villas at Rockett's Landing.

Sincerely,

Christiane Reeder

703 Admiral Gravelly Blvd.

# 703 Admiral Gravelly Blvd. – Certification Cont.

Energy Performance	
<b>House Type</b>	<b>DOE Zero Energy Ready Home Builder Partner ID#</b>
Single-family detached	1086
<b>Year built</b>	<b>Square footage of Conditioned Space including Basement</b>
2016	2213.0
<b>Number of Bedrooms</b>	<b>Square footage of Conditioned Space without Basement</b>
3	2213.0
<b>Site address (if not available, list the site Lot #)</b>	<b>Registered Builder</b>
703 Admiral Gravelly Blvd.	Health E Communities
Richmond	<b>Certified Rater</b>
VA, 23232	Eric Bjerre
<b>HERS Index without On-site Generation</b> ★	<b>Date of Rating</b>
47	05/05/2017
<b>HERS Index with On-site Generation</b> ★	<b>Rating Software</b>
14	REM/Rate - v14.6.3
<b>HERS Index of the Target Home using size adjustment factor</b>	<b>Estimated annual energy costs(\$)</b> ★★
56	428
<b>Estimated annual energy use</b>	<b>Estimated annual energy savings</b> ★
Electric: 3089 kWh	Electric: 18128 kWh
<b>Energy cost rates</b>	<b>Estimated annual emissions reductions</b> ★
Electric: 0.11 \$/kWh	CO2: 9.0 tons / SO2: 50.8 lbs / NOx: 16.7 lbs

# 703 Admiral Gravely Blvd. – Utility Bill for May & June 2017

May 05, 2017

## Customer Bill

703 ADMIRAL GRAVELY BLVD  
RICHMOND, VA 23231

### Billing and Payment Summary

Account # Due Date: May 30, 2017

Total Amount Due: \$ 8.40

To avoid a Late Payment Charge of 1.5% please pay by May 30, 2017.

Previous Amount Due: \$ 10.21  
Payments as of May 05: \$ 10.21CR

For service emergencies and power outages please call  
1-866-DOM-HELP (1-866-366-4357). Visit us at [www.dom.com](http://www.dom.com).

### Meter and Usage

Current Billing Days: 32

Billable Usage  
Schedule 1 03/31-05/02  
Total kWh 0

Measured Usage  
Meter: 0165370790 03/31-05/02  
Current Reading 2660  
Previous Reading 2660  
Total kWh 0

### Usage History

Mo	Yr	kWh
Feb	17	1182
Mar	17	152
Apr	17	21
May	17	0

Jun 06, 2017

## Customer Bill

703 ADMIRAL GRAVELY BLVD  
RICHMOND, VA 23231

### Billing and Payment Summary

Account # Due Date: Jun 29, 2017

Total Amount Due: \$ 8.40

To avoid a Late Payment Charge of 1.5% please pay by Jun 29, 2017.

Previous Amount Due: \$ 8.40  
Payments as of Jun 06: \$ 8.40CR

For service emergencies and power outages please call  
1-866-DOM-HELP (1-866-366-4357). Visit us at [www.dom.com](http://www.dom.com).

### Meter and Usage

Current Billing Days: 30

Billable Usage  
Schedule 1 05/02-06/01  
Total kWh 0

Measured Usage  
Meter: 0165370790 05/02-06/01  
Current Reading 2660  
Previous Reading 2660  
Total kWh 0

### Usage History

Mo	Yr	kWh
Feb	17	1182
Mar	17	152
Apr	17	21
May	17	0
Jun	17	0

### Work Closely With Your Rater!

- Walls: 2 by 6 walls which increases insulation values, improves air-tightness, increases R-Value, improves moisture management, and reduces lumber use without reducing strength or structural integrity. The homes are stronger than a home built with conventional 2 by 4 wall construction.
- HVAC: Due to the ultra-energy efficient design the HVAC system is a basic variable speed system that has been downsized due to the reduced loads. We always tell the HVAC duct installer we want a nickel finish on the mastic seal.
- Ventilation: Make sure the fresh air intake is well insulated to and from the ERV to the mixing box before the coils (in line with air handler). This will help to control humidity in the home, as well as, condensation in the line. Also, separate exhaust intake near the returns will help the ERV operate more efficiently, independent from the return side of the air handler.
- Foundation: Always add a damper to the 4" line from the air handler to adjust the airflow into the crawl. The crawl space is now conditioned and dry for winter and summer.
- Mechanical Room: The importance of a mechanical room in the conditioned area for the air handler and ERV was designed into all house plans.
- Comfort Grills: are located in each bedroom and the adjacent hall to help baffle sound transmission and balance the heating and cooling needs when doors are closed.

### Energy Recovery Ventilator (ERV)

- If ERV is located outside of the mechanical room at pre-sheetrock inspection mark lines for fresh air intake to the Air Handler and mark exhaust air to house vent inside. At install, this can be easily reversed.
- Make sure fresh air intake from the ERV is "in line" with air handler to allow the air to pass thru the air conditioning coils to help with dehumidification and cooling of the outside air.
- Make sure the fresh air intake to the ERV and air handler is insulated to limit condensation in the winter and summer months.
- On the very hot and very cold days with high humidity (Spike in the weather for those few days of year) lower the run time on the ERV. Advise your homeowner so they can regulate the ERV during those times.
- Run your fresh air intake high and the exhaust low to filter out contaminants at ground level to prevent the intake of sprays and fertilizers added to the yard and shrubs.
- MERV requirements of an ERV – MERV 8, MERV 12, At each MERV level and how that interacts with the homebuyers needs (EX. Allergies, Asthma and COPD)



# Technical Strategies - *Simplicity of the Build*<sup>™</sup> Tips

## Framing Stage:

When the 2 by 6 walls are stood, we utilize a foam gasket 3.5" in width, the remaining 2" space under the bottom plate is sealed with a caulk. The wall system on the exterior of the wall has OSB sheathing with 1/8 inch joints nailed to 2 by 4 blocking on the inside. This allows the OSB to expand without buckling since the studs are on 24" center. Once framed take a moment to look at how the exterior walls are setting on the subfloor, make sure the floor trusses fit properly without any bows and the wall plates are flat and sealed.

Advanced Framing Techniques are displayed below:



A. Blocking



B. California Corners



C. Ladder T-Walls



D. Stacking Effect

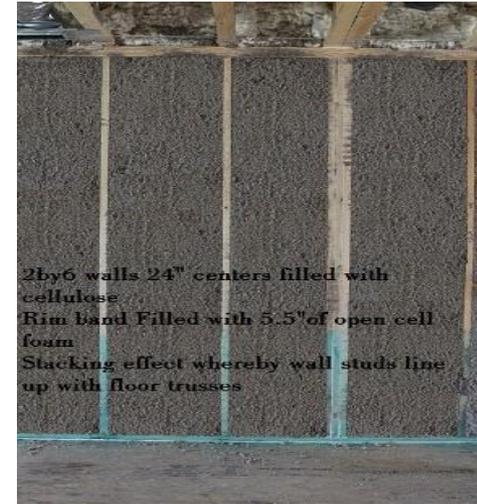
## Air Sealing (air changes per hour at 50 Pa):

Blower Door at 2.08 at ACH 50

**After Rough In:** Make sure the exterior penetrations are sealed and all electrical fixtures on the exterior walls are sealed at wire inlets on box. Put the cable in a blue box, not just mounted loose. Your insulation contractor will caulk and seal around the windows, studs and wall plates, which will be reviewed by the rater prior to insulation being installed. We know air moves, you just need to locate it. The rim bands are sealed with 5.5 inches of open cell foam. What you missed will show up in the blower door test.

**Mechanical Supply Duct:** The duct work is between the floors. As the registers are installed, ceiling caulk bead is used to seal the register to the ceiling before the register cover is attached .

**Blower Door:** Once the rater has tested the home with the blower door test, asks the rater to increase the Pascals then walk through your home and feel for leaks. You will find leakage around the electrical, cable boxes, etc. Check the windows and mechanical room. For future improvement simply pay attention to detail. Don't be in a hurry. Your subcontractors will also find this informative.



### Windows:

1. Limiting the number of windows in a home will help your HERS score, especially limiting the windows facing south and east. Work closely with your rater to minimize the number of windows while still supplying natural light throughout your home. For example, a bedroom window located across from the bedroom door brings natural light to the hallway. The use of one foot by three-foot fixed windows add natural light when located above the showers in the bathrooms, in stairwells and laundry room.
2. Windows are essentially holes in a well-insulated home. The windows R value of R3 and at best R5 is much lower than the R22 exterior wall that surrounds the window. The difference between and R3 and an R5 window is truly the holy grail of the window industry. R5 triple pane windows in the past have been very expensive however today; window manufacturers have brought the price down drastically. This allows builders to provide buyers the option to upgrade to R5 triple pane windows. You can expect to pay 50% more for the triple pane window with an R5 insulation value.
3. The standard Energy Star window works. Argon filled windows are the standard in the industry with a small upcharge of \$25 dollars per window. Well worth the added expense in building your energy star home. An energy star certified window of a SHGL .20 and U factor .30 is necessary to achieve a HERS score lower than 54. Lower number may not be cost effective and the best way to bring your HERS score down.
4. Roof overhang of one foot helps to shade the windows. This roof overhang also adds more roof area for future solar panels. This added benefit too is well worth the nominal expense

## Solar panels- Roof Pitch/Shading/Community Design

- **Array Orientation** - System orientation describes the cardinal (North, East, South, West) or intermediate direction a PV array faces. Because the sun traces a path through the southern sky as the day progresses in the northern hemisphere, the optimal orientation for a solar energy system is typically due south. In some cases, optimizing system orientation means placing the array on the front, side or rear roof slope of a residence. **Due to the Lot location the array orientation of the PV Panels are located on the Front of Newport Model facing South.**
- **Array Tilt**-All solar modules will be mounted flush with the roof and will have a fixed tilt angle. The Latitude for Richmond is 37.5 degrees whereby the best fixed roof pitch would be 31.6 degrees. To achieve the most energy over the whole year we utilize a 7:12 roof pitch with a roof angel of 30 degrees to lessen the impact on system production. **Due to the lot location the array tilt of 30 degrees for the PV Panels are located on the side of the Newport Model facing the South.**
- **System Shading**- Shading can also negatively impact solar production and can come from a variety of sources. Villas at Rocketts Landing realizes the biggest shading threats are vegetation and structures. House location is based on whether you choose to buy a one or two story home. **Due to the Lot location the PV Panels are located on the rear of the Newport Model facing the South clear of shading by structures and vegetation.**



## Achieving Value for Your ZERH – When Comps Aren’t Available

When working with the appraiser and comps are not available, be prepared to justify the cost of the ultra- energy efficient home and the cost of solar at the time of sale.

Request an informed appraiser! Health E Community utilizes a High Performance Home appraisal addendum whereby both buyer and seller request a **Green Appraiser** that is knowledgeable.

Mark your descriptions of materials to reflect **upgrades** and make this form available to the appraiser.

For example:

- upgrade Conditioned Crawl
- upgrade 2 by 6 Walls
- upgrade ERV
- upgrade Heat Pump Hot Water Heater
- upgrade Insulation Values
- upgrade Design Costs for Rater
- upgrade PV System

### HEALTH E COMMUNITY

264 Mclaws Circle • Suite H • Williamsburg, VA 23185  
(757)928-3434 • Fax (757) 928-0233

#### High Performance Home Appraisal Addendum

This High Performance Home Appraisal Addendum (“AA”) to the Health E Community LLC Purchase Agreement to which this AA is made part, dated \_\_\_\_\_, 20\_\_\_\_ between Health E Community LLC (“Seller”) and \_\_\_\_\_ and \_\_\_\_\_ (Collectively or individually, “Purchaser”), makes it known to all parties that the Home to be purchased by purchaser is built to standards above prevailing codes and to accurately assess its true market value, requires an appraisal be performed by an appraiser educated, knowledgeable and certified in this type of valuation.

Purchaser agrees, therefore:

Due to the unique features and materials, high energy efficiency standards and equipment, and complexity of building techniques and design used in the construction of this “high performance home,” the appraiser must be certified to appraise such a home. Purchaser agrees to inform lender that appraiser must be qualified to appraise a “high performance,” “certified green,” or home with other similar distinction, and this qualification must come from an independent 3<sup>rd</sup> party institution, e.g. The Appraisal Institute. If appraiser does not possess the necessary credentials, knowledge and experience to appraise such a home in this market, Purchaser understands that appraiser will not be permitted to conduct the appraisal and Purchaser will remain obligated to work with their lender to identify a qualified appraiser who is. All other terms and conditions of contract remain in full effect.

By signing below, Seller and Purchaser agree that the above terms shall be made a part of Purchase Agreement dated \_\_\_\_\_

\_\_\_\_\_  
Purchaser Date

\_\_\_\_\_  
Purchaser Date

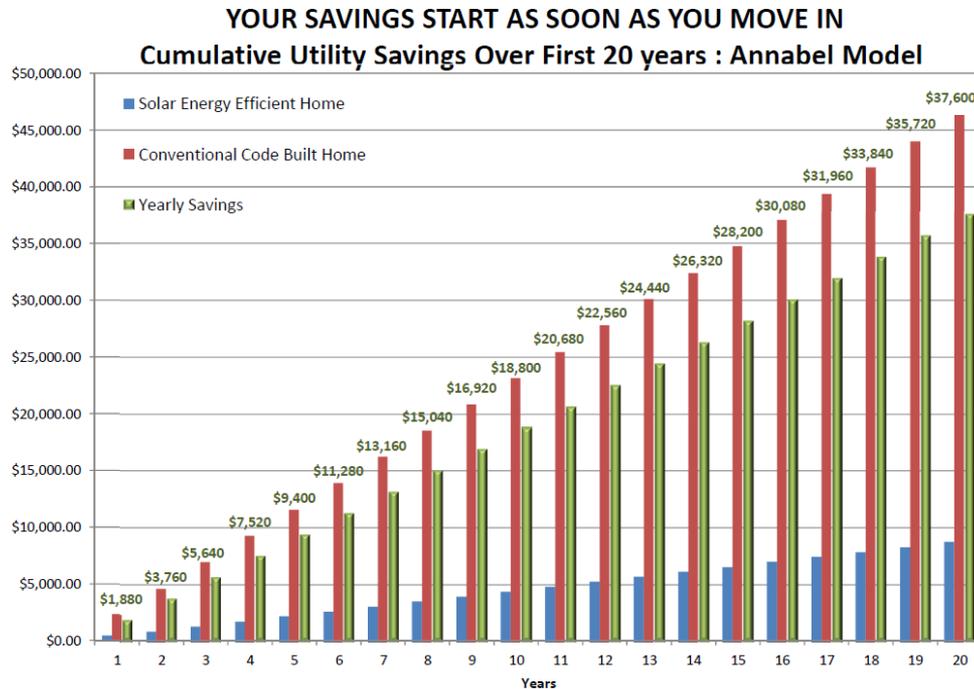
\_\_\_\_\_  
Seller Date  
Health E Community LLC

- The key is to build the homes cost effectively, at appraised value that offset your cost of improvements
- Work closely with your subcontractors and rater to prevent/overcome problems in a timely fashion
- Replicate the process
- ZERH open the market place to 100% of buyers – they have the choice to upgrade now or later
  - Option 1: Purchasing an ultra-energy efficient home with enhanced indoor air quality that qualifies for energy star, indoor air plus and Zero Energy Ready certification today with solar.
  - Option 2: Installing solar at a later date since the home has been prewired with a dedicated area on the roof for future solar panels.

Now let's look at the upgrade estimate of energy improvement cost vs. present worth of energy improvements  
House Value at Point of Sale is \$330,000 with Solar

<b>Annabel Model Cost of Improvements to Achieve Net Zero Ready Certification is \$9073.00 with PV is \$25,003.00</b>			
Type of Improvement to achieve a HERS Rating of 18	Description of improvements	Building Feature Type	Model Annabel 2213 2/story
Conditioned Crawl	verses conventional crawl	Upgrade	\$ 1,050.00
2 by 6 exterior walls	verses 2by 4 walls	Cost Savings	\$ (850.00)
Attic Access	Attic Zipper	Upgrade	\$ 350.00
R-21.5 Cellulose insulation in exterior walls/ R-49 in attic	verses Fiberglass	Upgrade- Higher R value	\$ 3,448.00
Windows/ Fiberglass Doors	Low E Argon U-.20/SHGC	Upgrade	\$ 775.00
50 gal Heat pump hot water heater	GE GEH50DEEDSR GeoSpring Hybrid Water heater	Upgrade	\$ 850.00
Carrier 15 Seer variable speed heat pump	ASHP HTG: 35.1 kBtuh, 8.5 HSPF. Clg: 18.0 kBtuh, 15.0 SEER	Upgrade	\$ 1,900.00
Balanced: ERV, 45CFM 24 watts	Energy recovery Ventilation- Renewaire 90	Added Feature	\$ 950.00
Earthcraft Design and Inspection Cost	Third Party Inspection and Design	Added Feature	\$ 600.00
Total Cost of Construction Upgrades	To Reduce Utility Demands	Upgrade to Home	\$ 9,073.00
PV system Cost Installed	5.4 Kw	Added Feature	\$ 15,930.00
<b>Total Cost of Building Construction Upgrades with PV System Installed</b>	To achieve a HERS Rating of 18- Generate Electricity		<b>\$ 25,003.00</b>

- The homes are designed to continue saving and producing electricity for the life of the 30 year loan.
- This Energy saving starts the first month the buyer moves in!
- In year one the savings is \$1,991. This represents the difference between the energy cost of a conventional code built home and the energy cost for the Upgraded ZERH with PV panels to generate power.



The cost of power consumed or purchased is assumed to be 11 cents per Kwh. The consumption of electricity is based on the HERS rating of the home which is achieved by the home's energy features . Savings may fluctuate due to increased cost of electricity or your consumption demands.

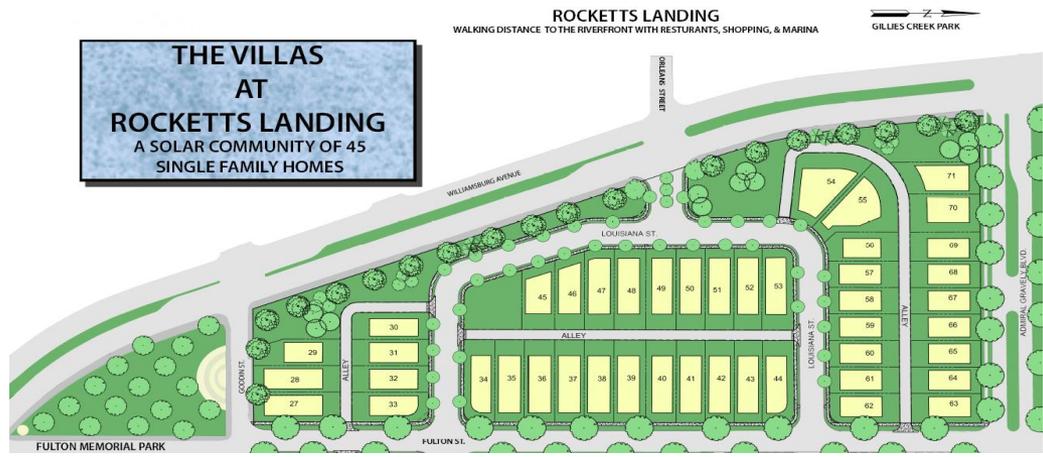
- The next graph shows the present value of the utility savings over 15, 20, 25 and 30 years. The present value represents today's value discounted utilizing a periodic rate of 4.5%.
- The savings in utility cost continues. The present value for year 25 would be \$29,522 and to year 30 would be \$32,431

<b>Annabell Model - Present Value of Utility Savings based on 15 years, 20 years, 25 years and 30 years</b>											
Model Annabel											
Year		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Savings	\$ 19,910.00	1991	1991	1991	1991	1991	1991	1991	1991	1991	1991
Periodic Rate		0	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Present Value											
15 years	(\$21,382.44)										
20 years	(\$25,898.80)										
25 years	(\$29,522.96)										
30 years	(\$32,431.18)										

In Summary, the upgrade Estimate of Energy Improvement costs is \$25,003. The present worth of the Utility Savings over 30 years is \$32,431. This energy savings starts the first month the buyer moves in. In year one the energy savings over a conventional built home is \$1991.

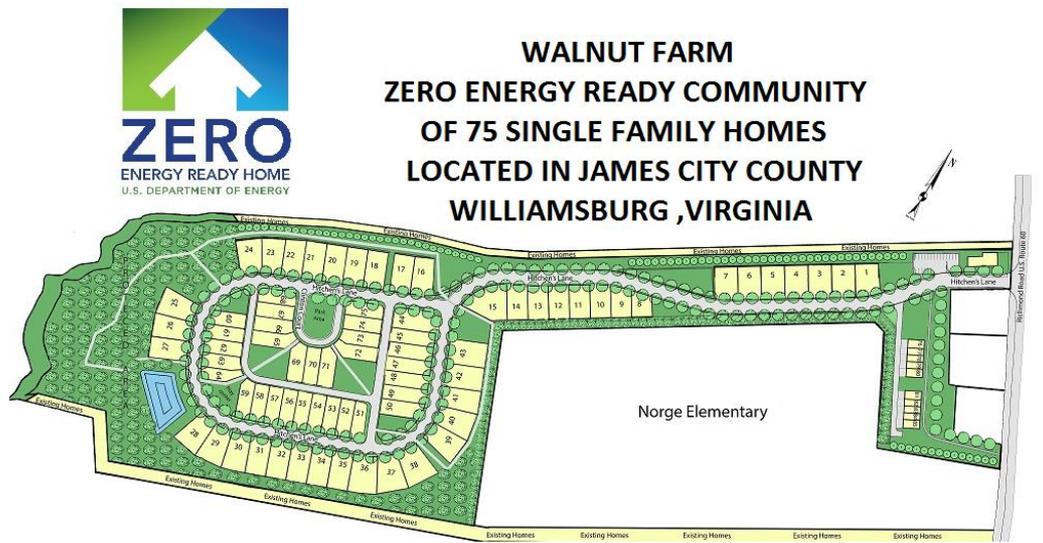
# What's Happening Now, What's Next?

- ❖ We have 1 home site left at **The Villas at Rocketts Landing!**
- ❖ Our Solar Home Community of 45 Single Family Homes –The Widget Works !!!
- ❖ Located in Richmond, Virginia
- ❖ 2017 DOE Innovation Award Winner in Production



## What's Next?

- ❖ Opening our new ZERH Community **Walnut Farm** in Williamsburg, Virginia!
- ❖ 75 Single Family Homes
- ❖ Prices Starting in the 340's
- ❖ Homes will be built Zero Energy Ready, the buyer now has the choice to purchase solar panels now... or later!
- ❖ Pre-Sales start October 1, 2017 with delivery in late spring early summer 2018





### [Links](#)

For More Information About *Simplicity of the Build*™ or For Consulting Services Contact:

Jay Epstein – President  
Health E Community Enterprise of Virginia Inc.  
264 H Mclaws Circle, Williamsburg VA 23185  
Cell: 757-592-4855  
Fax: 757-928-0233  
Email: Jay@HEC-VA.COM

Website:

- [www.vrlhomes.com](http://www.vrlhomes.com)

The Villas at Rocketts Landing - ZERH Video Tour:

- <https://youtu.be/m48KJiqPxac>

Facebook:

- <https://www.facebook.com/villasatrockettslanding/>

Builder's Story:

- <https://www.youtube.com/watch?v=4AUCKI6MJ8s&feature=youtu.be&list=UUWlpICaVtXIro5esO2IF0Wg>

# Thank You!



## Resources:

[www.buildings.energy.gov/zero/](http://www.buildings.energy.gov/zero/)

- Take the Tour of Zero
- Become a Partner
- Review ZERH Specs
- Access Tech Training Webinars
- Use the Marketing Toolkit

## Contact:

[zero@newportpartnersllc.com](mailto:zero@newportpartnersllc.com)

301-889-0017