

# Zero Energy and Zero Energy Ready Homes

*Prepared by John F. Slater, Ph.D., Energy Vision Homes, LLC., Hollis, NH, December, 2017*

## What is a Zero Energy Home?

A Zero Energy home is built airtight, super insulated, and with high-performance windows, doors, and mechanical systems. They use as much energy for cooling, heating, hot water, and other electrical loads on an annual basis as is produced from on-site photovoltaic panels or other renewable energy sources.

*Zero net energy is achieved through energy reduction, as well as energy production.*

*“A Zero Energy home is not just a “green home” or a home with solar panels. A zero energy home combines advanced design and superior building systems with energy efficiency and on-site solar panels to produce a better home. Zero energy homes are ultra-comfortable, healthy, quiet, sustainable homes that are affordable to live in” (Zero Energy Project, 2017\*).*

## Components of a Zero Energy Home:

- High R-value foundations, walls, and ceilings
- High-performance windows and doors
- Airtight construction details
- Fresh, filtered air 24/7
- Air-source heat pump heating/cooling and domestic hot water
- Solar photovoltaic system sized to offset home’s annual energy use

## What is a Zero Energy Ready Home?

If you would like all the benefits of a Zero Energy home without the initial cost of solar collectors, consider a Zero Energy *Ready* home. These homes are designed and built to the same high standards as Zero Energy homes. The only difference is that Zero Energy Ready homes are designed and wired for solar panels that have not yet been installed, making them even more affordable, and allowing them to become Zero Energy homes when you are ready.

## Zero Energy and Zero Energy Ready Homes Use Less Energy

Given the unpredictable nature of energy prices and the uncertain future of energy sources, it is wise to live in a home that uses less energy. Compared to a code-built home, a Zero Energy Ready home can consume as little as 1/3 of the energy. You would also be doing your part in curbing greenhouse gas emissions that contribute to climate change and are associated with major air pollutants.

**Table 1. Comparison of a Code Built Home to a Zero Energy Ready Home in Southern NH<sup>1</sup>.**

Source	Energy Used (kWh/yr)	
	CODE BUILT <sup>2</sup>	ZERO ENERGY READY
Heat <sup>3</sup>	22,725	3,826
Hot Water <sup>4</sup>	5,178	2,354
Cooling <sup>5</sup>	1,876	767
Lighting	498	498
Other Electrical <sup>6</sup>	1,756	1,756
TOTAL	32,003	9,201
<b>ANNUAL ENERGY SAVINGS OF 70%!</b>		

<sup>1</sup> House Specifications: 2-story, 3 bedroom, 2 baths, 1292 square foot, southern exposure, constructed in 2016

<sup>2</sup>2012 International Energy Conservation Code, Climate Zone 5

<sup>3</sup> Propane heat in Code Built Home (converted to kWh); air source heat pump heat in Zero Energy Ready Home

<sup>4</sup> Propane-fired hot water heating in Code Built Home; air source heat pump hot water in Zero Energy Ready Home

<sup>5</sup>Central air conditioner Code Built Home; air source heat pump cooling in Zero Energy Ready Home

<sup>6</sup>Can be highly variable and is dependent on occupants behavior

## **What are the additional costs of a Zero Energy Ready Home compared to a Code-Built Home?**

Additional **costs** associated with a Zero Energy Ready Home include added insulation, airtight construction details, high-performance windows and doors, and continuous whole-house ventilation. Major **benefits** include *significant decrease in cost of heating and cooling system* and much improved indoor air quality.

**EXAMPLE:** A two story, three bedroom, two bathroom, 1292 square foot house built in 2016 in Southern New Hampshire costs an additional **\$13 per square foot** to upgrade from a Code Built Home to a Net Zero Energy Ready Home.

## **What are the additional costs of a Zero Energy Home?**

Adding solar photovoltaic panels to a Zero Energy Ready home creates a Zero Energy home. In 2017, most U.S. homeowners are paying between \$2.87 and \$3.85 per watt to install solar panels. Using the U.S. average for system size at 5 kW (5000 watts), solar panel cost will range from \$10,045 to \$13,475 (after tax credits). That's nine percent lower than it was in 2016, and solar panel system costs are continuing to fall! The installed cost of solar panels can be \$9 - \$11 per square feet of living space. Add this amount to the \$13 per square foot for energy efficiency upgrades, and the **total estimated added cost for a Zero Energy home is between \$22-\$24 per square foot.**

## **How much does it cost to own a Net Zero or Net Zero Ready Home?**

Although it costs more to build a Net Zero or a Net Zero Ready Home compared to a code-built home, it cost *less* than a conventional home to own. This is because your energy bill will be very small compared to a "code-built" house, leaving more money to pay the small increase in your mortgage payment that result from energy efficiency and/or solar photovoltaic upgrades.

## **Zero Energy Homes Save You Money from Day One**

*"From move-in day and for as long as you own the home, the total cost of living in a zero energy home is lower than that of a comparable standard home. A zero energy home will protect you from a rapid rise in energy prices. Ten years from now, you'll pay the same price you pay today to keep your lights on and your family warm. That price will be zero or next to zero" (Zero Energy Project, 2017\*).*

\*Zero Energy Project, <https://zeroenergyproject.org/>, accessed December 2017