MASONRY & NET-ZERO

THE PERFECT MATCH

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AIA / CES Learning Objectives

* Understand how Net Zero is achieved in a residential home.
* Understand the relationship between energy use and PV panel size and number.

What the Heck is "Net Zero"?

In a nutshell – no energy bill for the life of your home --- Hurray! Your house generates all the energy you use. The concept is simple and pretty easy to understand. The general public has gotten "Net Zero" and other more exotic green technology pretty well mixed up in their minds.

Net Zero starts with an energy efficient house. Add an array of PV (photovoltaic) solar panels on the roof that turn sunlight directly into electricity, control the collection and distribution of that energy into your home electrical circuits and finally (and this is extremely important) sell your excess electricity back to the power company hopefully at the same retail rate you pay for it when you buy it from them!

During the sunny parts of a typical Florida day, when you are generating more energy than you are using in your home, "net metering" basically turns your power meter backwards and your PV panels become your private power generation station. There is no magic giant battery that has been developed to date that can store this excess energy. Consequently, the "extremely important" factor in making "net zero" work is that the power company is willing to purchase your home generated power at the same rate that they sell you power. See insert "Selling Excess Energy Back to the Power Company".

I thought that solar panels were too expensive for the typical home owner?

The price of solar panels, like all technical products, is becoming more affordable every year. With the current pricing of panels, energy rates, etc. the investment in PV or photovoltaic panels is about a break-even. It's like paying for 30 years of your home's electric bills with your initial mortgage. Also, if the price of energy continues to rise, you're protected from skyrocketing energy bills.

The cost of a typical "net zero" array of PV panels depends on a bunch of factors: size of your home, energy efficiency of your home, climate, personal use, type of panel, etc., etc., etc. Currently a very rough general range would be from $20,000 to $35,000[1] in the blazing Florida sunshine.

But, cost aside, the neat part that is making "net zero" so popular is how clean the energy is that you will be using for the life of your home. Sunlight to electricity is about as clean as it gets. This has a real attraction for those wishing to be more environmentally conscious. It also adds permanent value to your home as the warranted life of most panels is 25-30 years.

Why is the masonry industry interested in energy efficient "net zero" residential construction?

Concrete masonry walls are superior in every measurable way and give the best value for cost of any residential Florida building system. This is particularly true in the area of energy efficiency. Unfortunately, not everyone is aware of the benefits of concrete block homes. The exterior wall market is extremely competitive and energy efficiency is becoming a key factor in the home buyer's decision on what home to purchase. The "net zero" home is the logical extension of this widespread concern over energy costs and the effect of carbon based energy sources on the environment.

As we see in the article on the PNNL energy study (see pg. 13) masonry homes ARE energy efficient and, in addition, the exterior walls don't have a major impact on the overall energy usage of the typical residential home. This does not stop competitive wall sys-

[1] *Please see Florida PNNL Energy Report. Www.floridamasonry.com*

tems from making wildly exaggerated claims as to the energy benefit of their particular system.

In determining how to achieve a "net zero" home, the builder has a vested interest in understanding how much PV panel is going to be required to satisfy his energy usage. It is a perfect opportunity to showcase the cost effectiveness of concrete masonry in designing and building energy efficient homes.

We see builders across Florida regularly using, or considering the use of, unnecessary, overly expensive, highly insulated wall systems in the belief that it is the only way to conserve energy. It is the responsibility of the concrete masonry industry to get the truth out concerning exterior walls. The promotion of "net zero" homes provides a platform for an honest discussion of conserving energy using the information obtained in the PNNL study (currently the best information available on the influence of wall insulation).

Can I Do that With a Block Home?

In **Example 1** we calculated the upfront cost of PV panels required to power a typical block home with R4 insulation. This home energy analysis comes from the PNNL study and incorporates the current code requirements for energy efficient residential construction. We know that there are many areas of the house that can be improved on above the code minimums but the question becomes "which ones are a sound $$ investment".

The 40 panels at a cost of $32,400 (**see Example 1**) do the job for our energy code compliant block house with R4 insulation in the walls. As we improve the energy efficiency of the home, our electricity use will come down and we will be able to achieve "net zero" with fewer panels – at a cost savings of approximately $3/watt. For a 270 watt panel this works out to $810/panel - installed - wired – complete.

(The actual savings in reducing a 40 panel array, by say 3 or 4 panels, is really less than $810/panel as this cost includes some electrical switching equipment required regardless of the number of panels and some fixed costs for mobilization of installation and electrical crews. The actual panel cost is around $1/watt or $270/panel. To be conservative in our comparison and for the sake of simplicity we will just stick with the $3/watt or $810/panel.)

An ICF salesperson would tell you that there are substantial savings in your PV panel requirements by changing from a block to an ICF wall system. It would just be common sense that making an igloo cooler out of your home would be worth every penny in achieving your "net zero" goal. But hold on one second. With the data from our PNNL study we can see EXACTLY how much you will save[2].

Calculating the reduction in panel requirements in going from an R4 masonry wall to an R20 ICF wall system (at an increased cost of $4000 plus[3]) we find that we reduced the 270 watt panel requirements from 40 panels to ...38 panels. A whopping 2 panel reduction at a conservative, maximum possible savings of $1620.

For $4000+[3] in extra wall insulation you achieve a maximum savings of $1620 in PV panels. This is not a bargain, nor would most people do this if they knew the facts. A slight increase in block wall insulation for $400 to $500 dollars would probably decrease your panel requirements to 39 panels. This is a potential trade off that might be worth your while. Turning the walls of your home into an igloo cooler is not.

Example 1 -Calculated cost of PV panels on a typical 2000 sf masonry home in Central Florida (built to PNNL listed prototype requirements, R4 insulation in masonry walls, single story, PNNL analysis #18737)

- Total yearly electric use – 15,498 KWh
- Required Daily PV panel output = 15,498/365=42.5 KWh/day
- Accepted standard daily output of 270 watt panel (panel produces 270 watts of energy in full sunlight, 4 hours of full sunlight per day used as standard in Florida) 270 X 4 / 1000= 1.08 KWh/day.
- Required PV panels to produce enough electricity to power the house – 42.5/1.08=39.3 panels or 40 panels.
- General panel cost – installed – wired - complete - is around $3/watt. (40) 270 watt panels would cost 40 X 270 X $3 = **$32,400** – POOF – No more electric bill!!

Example 2 -Calculated cost of PV panels on a typical 2000 sf ICF home in Central Florida (built to PNNL listed prototype requirements, R20 insulation in 6 inch concrete walls, single story, PNNL analysis #21401)

- Total yearly electric use – 14,779 KWh
- Required Daily PV panel output = 14,779/365=40.5 KWh/day
- Accepted standard daily output of 270 watt panel (panel produces 270 watts of energy in full sunlight, 4 hours of full sunlight per day used as standard in Florida) 270 X 4 / 1000= 1.08 KWh/day.
- Required PV panels to produce enough electricity to power the house – 40.5/1.08=37.5 panels or 38 panels.
- General panel cost – installed – wired - complete - is around $3/watt. (38) 270 watt panels would cost 38 X 270 X $3 = **$30,780** – a $1620 savings over R4 block construction.

Selling Excess Energy Back to the Power Company

Check With the Utility Company

First, contact your utility company to see if they will allow you to connect a solar system to their electrical grid. While there is a national law that requires investor owned utility companies to allow interconnection of a solar power system, rural electric cooperatives are exempt from this law.

Buy Back Rate?

If your utility company will allow you to connect your PV system to their grid, then ask is if they will buy the energy back at the retail or wholesale rate. Ideally you want the utility company to buy back any excess electricity at the retail rate.

Net Metering or Not?

This arrangement is called "net metering" and is the simplest way to setup a grid-tie PV system. In such a system you only have one utility kWh meter (kilowatt-hours) and it is allowed to spin in either direction depending on if you are buying or selling energy. In a non-net-metered system, the utility company will require that you install a second kWh meter. It records any excess energy that you sell back to them. They will only pay you the wholesale rate which is usually only a few cents per kWh.

Check Your State Regulations On-Line

To find out if your State offers "net metering" go to www.dsireusa.org . The "net metering" law for Florida doesn't apply to rural electric cooperatives so call your utility company.