

Solar Basics for Homebuilders

REDUCING THE TOTAL COST OF OWNERSHIP



Solar photovoltaic (PV) energy systems are new in many residential real estate markets, and a growing number of homebuilders are integrating PV into new homes to attract customers and increase their bottom line. Solar PV is an attractive opportunity, but many homebuilders are unsure how to navigate the installation process and effectively market PV systems. As consumers increasingly choose PV to meet their energy needs, builders need to solve these challenges to remain competitive.

Benefits of Incorporating Solar in New Home Construction

Most homebuilders know PV options can increase their profits and attract new customers, but there are numerous other benefits that homebuilders can experience by offering solar products:

- **Increase Sale Price and Profit:** Adding PV to homes may result in higher home-sales prices, depending on PV system size and the housing market. In some cases, adding PV has increased the builder profit by \$1,000 to \$2,000 per house. ⁱ
- **Sell Homes Faster:** PV homes sell up to 20% faster than their conventional counterparts. ⁱⁱ
- **Meet a Growing Demand:** Customers increasingly recognize that solar offers monthly energy savings, is good for the environment, and is a wise investment decision. ⁱⁱⁱ
- **Attract More Customers:** Customers see savings in PV. In fact, energy efficiency and low operating costs are two of the top five influencers in a new-home purchase decision. ^{iv}

“Solar Ready” or Solar Home?

Many builders wonder whether to offer “solar ready” houses or fully-integrated home PV systems. While considering each option, builders should keep in mind a few principles:

- **Follow Existing Best Practices:** Many guides and best practices exist for builders of solar-ready homes. Be sure to use assess solar potential before determining optimal home layout. ^v

- **Check Codes and Standards:** Identify local codes and standards for solar-ready homes before beginning construction. These can vary substantially by jurisdiction. ^{vi}
- **Identify Local Requirements:** Some states and municipalities have solar-ready requirements. For example, California requires any new subdivision of 10 or more single-family residences to meet specific rooftop requirements to be solar ready. ^{vii}

Designing for Solar

Careful preparation and planning will mitigate many potential issues in the building process, including solar installation. Good design and careful planning can optimize both the PV system itself and the value added to the home. To reduce or eliminate problems during construction, consider the following:

- **Position the Home with Solar Gain in Mind:** A south-facing roof is usually ideal for creating the most direct sun access for the PV panels. However, east and west facing rooftops can still capture more than 80% of the sun’s energy.
- **Minimize Obstructions for Solar Panels:** Keep vents, pipes, etc., close together and away from the planned PV modules to maximize PV capacity and improved aesthetics.
- **Preserve Direct Access to the Sun:** Consider current and future landscaping (for potential shade) and roof protrusions to maximize energy production.
- **Incorporate Solar into the Home Design:** By designing from the beginning, homes that are more solar friendly (with more south-facing roof area, roof elevation, or roof covering), builders can maximize the value of a PV system while ensuring that the construction goes smoothly.



Choosing Solar Equipment

Builders should purchase quality equipment and clearly communicate the costs and benefits of PV systems to their customers. Partnering with a qualified solar installer can speed up decision making, but builders should keep in mind the following when selecting PV products:

- **Choose Technology that Meets the Need:** The latest solar technology is not necessarily the best for every build. ^{viii} Modules and inverters have different performance characteristics and warranty periods that reflect their useful lifetimes. Certain technologies will enable flexibility to increase system size over time to meet future homeowner needs.
- **Focus on Savings, not Cost:** Research has found that the value PV adds to home prices comes from energy savings, not from the cost of equipment. Potential for energy savings has a greater impact on home resale value than upfront equipment costs.
- **Choose Quality Products:** Know the reliability of the product before you install it. Look for financially stable manufacturers and for products backed with strong warranty terms.

Appraising Solar Systems

A competent local appraiser with experience appraising solar homes can help the builder understand the market value before setting the home sale price, and choose between solar and solar-ready. Spending hundreds of dollars up front for an appraisal may save the builder thousands later. PV Value[®], a tool developed by Energy Sense Finance and Sandia National Laboratories, can help develop the market value and fair market value for a home with an owned PV system. A good appraiser should be able to assist the homebuilder in the following ways:

- **Conveying the Home's Value to Key Parties:** The AI Residential Green and Energy Efficient Addendum ^{ix} (ARGEEA) can help homebuilders convey solar system features to lenders, seller's agents, and appraisers. Additionally, inserting ARGEEA into the MLS or other recognized data portal gives notice to the potential homebuyer that the property has special features, and gives appraisers more detail to assist them in choosing comparable sales.
- **Pricing the Home Accurately:** A properly priced home can help builders communicate the benefits of a PV system to potential buyers while maintaining profitability. Not all appraisers are familiar with solar, so hiring an experienced appraiser is essential. ^x

Financing Options for Solar Systems

Two of the most common financing options on new builds include rolling costs into a construction material loan, and building and financing solar separately through a mortgage. Both options have inherent benefits and drawbacks, so builders should carefully consider their financing options before building homes with solar.

Option 1: PV Rolled into Construction Material Loan

Pros – This option tends to create lower overall out-of-pocket costs for the builder, as costs and resources are allocated more efficiently. Additionally, the materials required to make a home solar-ready are often easy to roll into a construction loan. The builder may potentially profit from the installation if it is done during the construction period.

Cons – Builders may have difficulty recovering costs in some markets, as the market value of solar is not a direct reflection of construction costs.

Financing Options – Both FHA and Fannie Mae offer take-out financing to allow for the inclusion of owned PV in the home value. Construction material loans are based on appraised loan to value (LTV) calculation. With this option, builders are required to give the construction lender an itemized list of equipment associated with the PV system or solar-ready option.

Option 2: PV built and financed separately through primary mortgage or 2nd mortgage

Pros – With this arrangement, homeowners are able to choose the size, type, and cost of the solar system. Generally the cost of capital is lower through a mortgage which creates a lower lifetime system cost for the homeowner. If solar is tied to the primary mortgage, there is no separate line item for paying off the PV system.

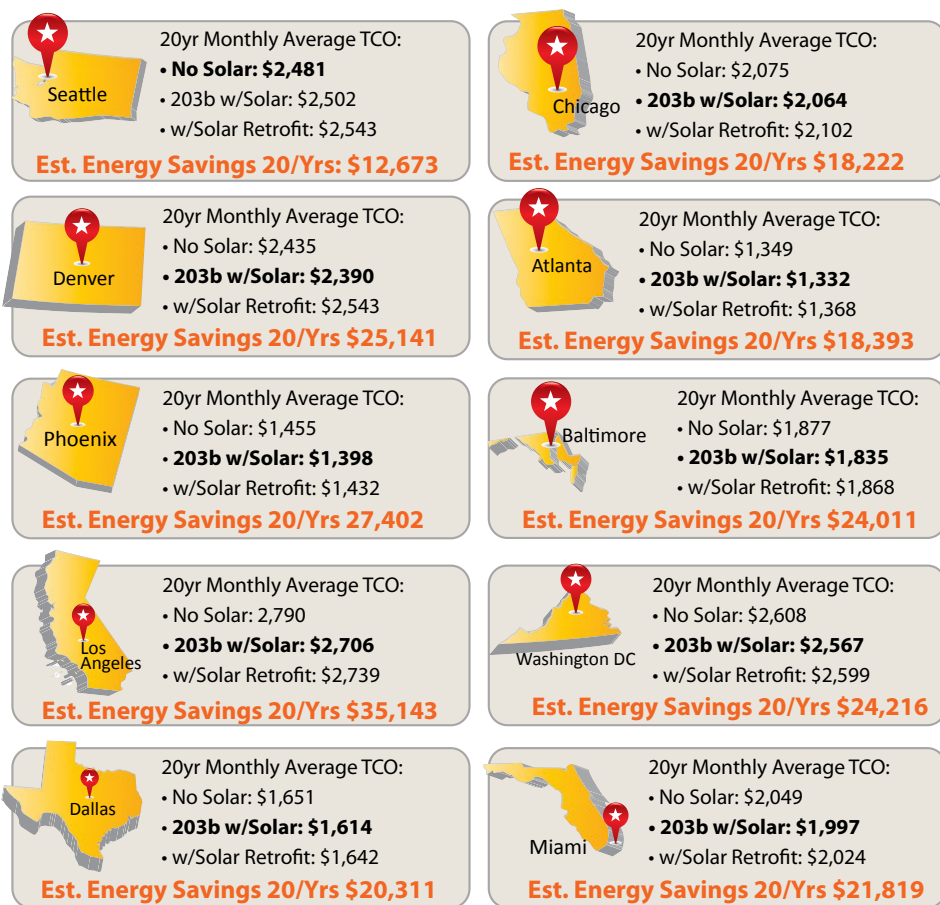
Cons – This option may increase out-of-pocket costs for the builder if solar is added before the time of sale. Additionally, if PV is added before the home is sold, the homebuyer may need more cash at closing to cover an additional down payment percentage of the PV system's value.

Financing Options – FHA guidelines permit PV to be rolled into a mortgage as long as the installation meets certain parameters.

| Financing Options | Details | | |
|---|--|---|---|
| Conventional Mortgage Subject To Loan to Value (LTV) Limits | <p>FHA Mortgages – Cost and Income approach for developing value is allowed. PV Value® can be used to develop both values.</p> <p>*FHA 203B – 100% of cost up to 20% of mortgage amount. This new loan option within an FHA first mortgage potentially has the lowest cost of capital available to homeowner.</p> | <p>Fannie Mae – Cost and Income approach for developing value is allowed. PV Value® can be used to develop both values. Freddie Mac typically follows Fannie Mae guidelines.</p> | <p>Portfolio Take Out – Depending on individual portfolio requirements. Check with lender.</p> |
| In-House Financing (Community Bank / Credit Union) | <ul style="list-style-type: none"> • Check with lender. • Good option for off-grid homes. • Many will underwrite Fannie and or Freddie products and/or portfolio loans, though they typically offer 2nd mortgage or equity products. | | |
| Veteran’s Administration Loan | At the time of this publication, no guidance has been offered by the VA. | | |
| USDA Loan | These provide financing for solar PV in rural locations. Check with USDA lenders. | | |
| Property Assessed Clean Energy (PACE) Loan | This has not been widely used due to issues with lien position and Fannie Mae guidelines. However, PACE financing when the loan is in the second lien position may prove to be more successful. | | |

Conveying Benefits—Total Cost of Ownership

The financial value of a solar system can be expressed in many ways. For example, because homeowners are familiar with mortgage payments, homebuilders can convey loan options for the total cost of a PV system as adjacent to or rolled into a mortgage payment. The figure to the right illustrates the lifetime energy savings of a new 4 kW PV system. Each metropolitan area has different housing expenses, PV installation costs, energy consumption patterns, and electricity costs. The 20-year monthly average “total cost of ownership” (TCO) is calculated using these costs for each area. The “No Solar” category represents the monthly cost of a traditional FHA mortgage payment (PITI) plus an estimated monthly energy cost. The “203b with Solar” designation includes the same assumptions, but also factors in the energy savings from PV and the small increase in the mortgage payment associated with including the cost of the PV in lower interest rate FHA mortgage loans (203b–Title II). “Solar Retrofit” includes the same base assumptions as the “No Solar” scenario, and also factors in the energy savings and financing costs associated with adding a PV system to the home after the purchase using a higher interest rate, non-mortgage loan for funding.



Value in bold text shows the lowest TCO based on assumptions detailed on the next page.

This analysis shows that the TCO (as a monthly payment over 20 years) for a 4 kW PV system is lowest in all cities except Seattle (due to low energy costs and lower solar resource) when financed with an FHA first mortgage. On average, the Solar with Retrofit option costs \$33.00 more per month across all cities. Based on this scenario, if a homebuilder develops a solar-ready home and the homeowner chooses an FHA first mortgage product, the PV system can be installed after construction with no risk to the homebuilder of recovering the PV costs upon home sale, allowing the homebuyer to install a PV system with arguably the lowest cost of capital currently available.

Notes:

The TCO calculations are derived from a proprietary homeownership optimization software program, “High Performance Lending®,” and are based on first mortgage loans underwritten to meet the guidelines of FHA 203b Title II loans as published in the FHA Policy Handbook 4000.1. All loans based on maximum available financing equal to 96.5% of the purchase price shown for the sample home for each city. The monthly payment is based on an annual interest rate of 4.00%, a loan term of 30 years, and statutory Mortgage Insurance Premiums. “Solar Loan” calculations are based on a loan term of 240 months, an interest rate of 5.90%, and an average loan fee/dealer fee of 8.68%.

Solar PV system prices were provided by EnergySage for Q3 2015. Estimated electricity generated by the proposed PV Systems shown in these estimates is calculated using PVWatts.

Housing expense calculations are based on the median prices of homes sold in the second quarter of 2015, as reported by the National Association of Realtors; property tax and homeowners insurance data from the 2011 Census for specific metropolitan areas are noted above.

Baseline energy costs for representative homes are based on homes built to meet current building codes, as calculated by the Energy Assessment Tool for Home Professionals hosted on the [Home Energy Saver Pro website](#). Estimated household energy expenses were calculated using an energy inflation estimate based on data obtained from the “USA Energy Inflation Forecast” [website](#).

References:

- i. [Selling Into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes.](#)
- ii. [A New Market Paradigm for Zero-Energy Homes: The Comparative San Diego Case Study; A Homebuilders Guide to Going Solar; CleanTechnica.com Article.](#)
- iii. [Green Multifamily and Single Family Homes: Growth in a Recovering Market](#)
- iv. [NAHB Study Reveals What “Green” Means to Home Buyers](#)
- v. [Renewable Energy Ready Homes \(RERH\); Solar Ready Buildings Planning Guide; Confirming the Strength of Residential Roof Structures for Solar Installations; 2013 Residential Compliance Manual](#)
- vi. [Confirming the Strength of Residential Roof Structures for Solar Installations; “PV Loads vs. Rooftop Integrity: Confirming residential roof strength for solar installations: Solarbuildermag.com;](#)
- vii. [California Energy Commission, Blueprint; State of California Compliance Form](#)
- viii. [Evaluating solar panel quality for your home or commercial solar installations; Incentive Eligible Photovoltaic Modules in Compliance with SB1 Guidelines; List of Eligible Inverters per SB1 Guidelines](#)
- ix. [Appraisal Institute: Green Building Resources](#)
- x. See: [www.pvvalue.com](#) or background on [how market value is developed](#)