

New Solar Home Premiums: Calculating the Value Rooftop PV Adds to a Multi-State Sample of New U.S. Homes

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Overview

Homes with solar photovoltaic (PV) systems have proliferated in the United States recently, reaching more than half a million in 2014, in part due to plummeting PV costs and innovative financing options. The U.S. Department of Energy estimates that achieving its SunShot PV price-reduction targets could result in 108 gigawatts of residential rooftop PV installed by 2050—equivalent to 30 million U.S. PV homes. As PV systems become an increasingly common feature of U.S. homes, the ability to value these homes appropriately will become increasingly important, and will facilitate a robust residential PV market.

Appraisers, real estate agents, and other property valuers have made strides toward valuing PV homes, and several limited studies have suggested the presence of PV home premiums, but gaps remain in understanding these premiums for housing markets nationwide. To help fill these gaps, researchers from Lawrence Berkeley National Laboratory (LBNL) and their collaborators from other institutions conducted the most comprehensive PV home premium analysis to date. The study more than doubles the number of PV home sales previously analyzed, examines transactions in eight states, and spans the years 2002–2013. The results impart confidence that PV consistently adds value across a variety of states, housing and PV markets, and home types. This study summary focuses on premiums for newly built homes with PV (“new homes”) versus homes that were not new when PV was installed (“existing homes”).

Data and Methods

The study used data on PV homes from LBNL’s *Tracking the Sun* report series with corresponding real estate information and information on similar non-PV homes. These data span the years 2002–2013 and eight states: California, Connecticut, Florida, Massachusetts, Maryland, North Carolina, New York, and Pennsylvania. The PV and non-PV homes were matched, resulting in a dataset of 18,871 non-PV homes (including 6,036 newly built homes) and 3,951 PV homes (including 1,444 newly built homes). All PV systems in this dataset were homeowner owned rather than leased. The sample included homes no more expensive than \$900,000.

These data were analyzed using hedonic (regression) pricing models to account for various home/site, neighborhood, and market characteristics. A number of models were estimated and compared, ensuring the results were robust to data and model specification. Contributory-value estimates also were generated for comparison based on net cost (PV cost after federal, state, and utility incentives), gross cost (PV cost before incentives), and income (value of energy savings from PV systems).

This fact sheet summarizes the full report: Hoen, B., S. Adomatis, T. Jackson, J. Graff-Zivin, M. Thayer, G.T. Klise, and R. Wiser. 2014. *Selling into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes*. Berkeley, CA: Lawrence Berkeley National Laboratory. The full report, along with a summary slide deck and data file, is available [here](#) or via emp.lbl.gov/reports.

The research was supported by funding from the U.S. Department of Energy SunShot Initiative. The SunShot Initiative is a collaborative national effort that aggressively drives innovation to make solar energy fully cost-competitive with traditional energy sources before the end of the decade. Through SunShot, DOE supports efforts by private companies, universities, and national laboratories to drive down the cost of solar electricity to \$0.06 per kilowatt-hour. Learn more at www.energy.gov/sunshot

PV Premium Results for New and Existing Homes

Overall, this study finds that home buyers consistently have been willing to pay more for a property with PV across a variety of states, housing and PV markets, and home types. The study finds only a small and non-statistically significant difference between PV premiums for new and existing homes.

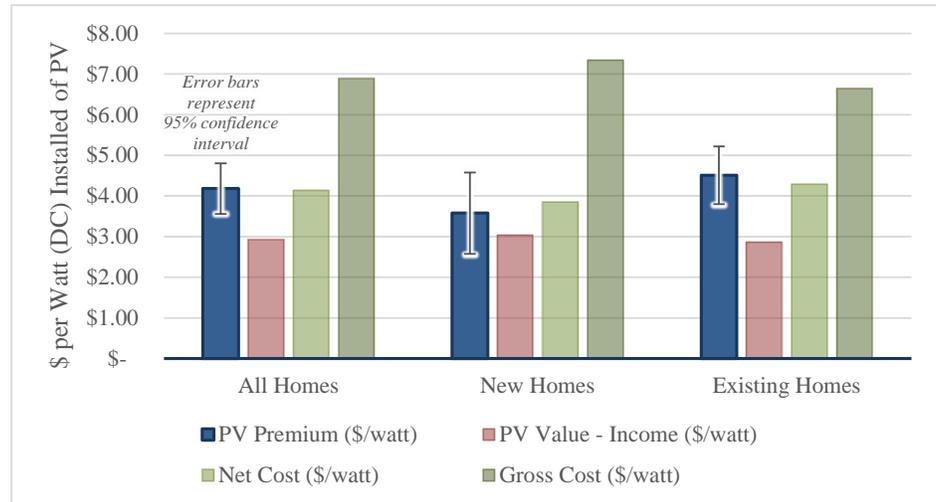


Figure 1: PV premium results for all homes, new homes, and existing homes compared with contributory-value estimates

As Figure 1 shows, the average new home premium is estimated at \$3.58/watt

(W) and the existing home premium at \$4.51/W. Both estimates are highly statistically significant, implying that the market for both new and existing homes clearly values PV in addition to the other features of the home. Although a difference of approximately \$1/W exists between the two estimates, this disparity is not statistically significant, thus the authors are unable to claim that one PV home type garners more in the market than the other. That notwithstanding, there appears to be a net PV cost difference of \$0.44/W between the home types, which might partially explain why the new home premium estimate is lower.

One nuance to the findings involves the new home premium and the net cost estimate, which includes reductions for the federal 25D credit and state and utility incentives. The 25D incentive can be claimed only by the home buyer, not by the home builder. The new home buyer, therefore, not only receives the PV system on the home, but also a tax credit estimated at approximately \$1.26/W on average. However, this incentive is not reflected in the study's estimate of new home premiums. If the incentive were reflected, the premium would be approximately \$1.26/W higher, or \$4.84/W, instead of \$3.58/W. This suggests that some discounting of the PV systems might exist for these new homes. Several plausible reasons for this finding are presented in the report, including home builder discounting to sell the home more rapidly, buyer discounting because of risk related to the uncertainty of receiving the full tax claim, and lack of certainty about IRS rules for taking the federal tax credit, which only recently have been clarified.

Note that this study focuses only on homes with host-owned PV systems, not those with leased PV systems. Future studies focusing on leased systems, a growing portion of the PV home market, would be valuable.

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