

# How Much Do Local Regulations Matter?

## Exploring the Impact of Permitting and Local Regulatory Processes on PV Prices in the United States

### Overview

Global solar photovoltaic (PV) deployment has soared in recent years. Government policies and PV price reductions have driven this growth, but additional price cuts likely are needed to continue the rapid expansion. In the United States, the primary price-reduction targets are now “soft” costs: non-hardware costs such as those related to permitting, inspection and interconnection; installation labor; customer acquisition; and financing. Because the cost of PV modules has dropped dramatically, soft costs now account for around two thirds of total prices for U.S. residential PV systems. High soft costs have kept the price of U.S. PV systems well above the prices in many other countries, and understanding and cutting these costs is critical to reducing U.S. PV system prices and driving continued robust market growth.

To estimate the potential for one type of soft-cost reduction, Lawrence Berkeley National Laboratory (LBNL) and collaborators at Yale University, the University of Texas at Austin, and the U.S. Department of Energy (DOE) analyzed the impact of local regulatory processes – including permitting procedures – on the price of residential PV systems in the United States. A typical local regulatory process for PV might involve multiple local government departmental reviews (building, electrical, plumbing, fire, structural, etc.), a permitting fee, a site inspection, and interconnection-based reviews by the local utility. The wide variety of process requirements across different cities and other jurisdictions complicates the U.S. PV market and can discourage the participation of PV installers and customers in particularly cumbersome jurisdictions. Other elements of local regulation, from zoning and permitting, to financing options, to state-level net-metering policies can also impact the PV market development.

Uncertainty remains about the size of the impact of these local procedures on PV prices and, more significantly, the differences in impacts across jurisdictions. The LBNL study illuminates the jurisdictional differences by statistically isolating the price impacts of city-level permitting and other local regulatory processes using data from two mechanisms for “scoring” regulatory process efficiency, along with a dataset of installed PV prices. The results—the difference between residential PV prices in cities where regulatory processes are onerous and where they are favorable—suggest the scale of price reductions that might be obtained by streamlining local procedures.

### Data and Methods

The study leverages the dataset of PV system prices used in LBNL’s annual *Tracking the Sun* report series. The data were cleaned, and include residential rooftop systems between 1 and 10 kW in size.

Two different sets of scores representing PV regulatory process efficiency were used in the analysis: one from Vote Solar’s *Project Permit* campaign and one from DOE’s *Rooftop Solar Challenge* (RSC) program. Vote Solar developed seven best practices for permitting to be used for scoring local jurisdictions, with data obtained from Clean Power Finance’s National Permitting Database. The teams participating in the RSC program, meanwhile, completed initial questionnaires regarding the local regulatory environment in each jurisdiction, and the responses were converted into numerical scores. After the participants enacted their strategies for enhancing local solar markets for one year, they were scored again. The RSC scores encompass an array of local and state-level policy and financing processes, whereas the Vote Solar scores focus solely on city solar-permitting best practices (Table 1).

This fact sheet summarizes the full report: Burkhardt, J.; Wiser, R.; Darghouth, N.; Dong, C.G.; Huneycutt, J. 2014. How Much Do Local Regulations Matter? Exploring the Impact of Permitting and Local Regulatory Processes on PV Prices in the United States. Berkeley Lab. The report is available at <http://emp.lbl.gov/publications/how-much-do-local-regulations-matter-exploring-impact-permitting-and-local-regulatory-p>. This work was funded by the Solar Energy Technologies Office of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

**Table 1.** Scope and score allocation for Vote Solar’s Project Permit campaign (local permitting only) and DOE’s Rooftop Solar Challenge program (permitting plus other local/state regulatory and financing processes)

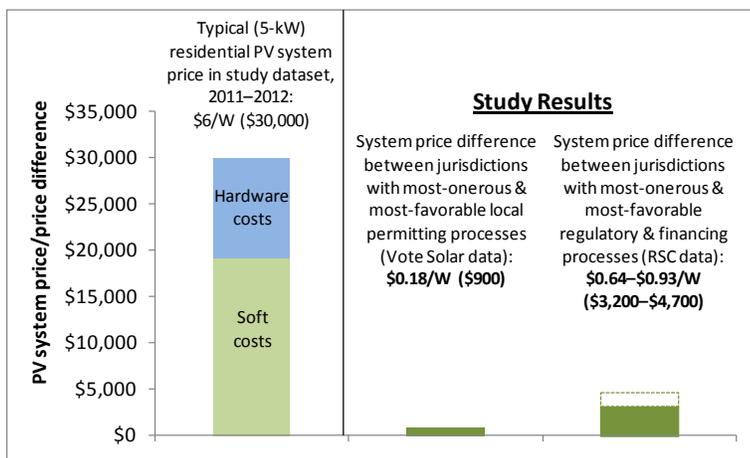
Vote Solar Project Permit		DOE Rooftop Solar Challenge	
Scorecard Field	Points	Action Area	Points
Posts requirements online?	0.5	Permitting process	460
Allows online processing?	0.5	Interconnection process	110
Fast turn-around time?	4	Interconnection standard	100
Reasonable permitting fees?	2.5	Net-metering standard	100
No community specific licenses needed?	0.5	Financing options	150
Offers a narrow inspection appointment window?	1	Planning and zoning	80
Eliminates excessive inspections?	1		
<b>Total</b>	<b>10</b>	<b>Total</b>	<b>1,000</b>

The Vote Solar and RSC scoring data were matched with the PV price data. The final Vote Solar dataset includes 43,551 residential PV systems installed in 2012 in 603 cities and 11 states, representing more than 50% of the market for U.S. residential PV in 2012. The final RSC dataset includes 13,904 residential PV systems in 73 cities and 6 states over the 2011 to 2012 period. For each scoring dataset, the study related the prices of PV in each jurisdiction to the jurisdiction’s score using regression analysis, which enables the effect of the scores to be isolated by accounting for the effects of other control variables (such as PV system size, technology type, customer characteristics, installer experience, and many others).

## Results and Conclusions

The results show that variations among and improvements in local regulatory processes can have meaningful effects on residential PV prices (Figure 1):

- Based on the Vote Solar data, variations in local permitting processes alone drove differences in average residential PV prices of approximately \$0.18/W between the jurisdictions with the most-onerous and most-favorable permitting procedures. For a typical 5-kW residential PV system, this equates to a \$900 difference in system prices (3% of the typical total system price), or \$700 (2.2%) when focusing on the inner 90 percent of jurisdiction scores.
- Based on the RSC data, local permitting and a broader array of processes (interconnection, planning and zoning, financing, and net metering) drove price differences of \$0.64–0.93/W (depending on the regression model) between the most-onerous and most-favorable jurisdictions. This is equivalent to \$3,200–\$4,700 (10%–15%) for a typical residential PV system, or \$2,500–3,700 (8%–12%) when focusing on the inner 90 percent of jurisdiction scores.



**Figure 1.** Comparison of typical price of a 5-kW PV system in study dataset (left side of figure) with study results (right side of figure)

These results suggest that the Vote Solar and Rooftop Solar Challenge scores capture meaningful variations in permitting and other local regulatory processes. More importantly, the findings highlight the magnitude of price reductions that might be possible through streamlining burdensome local regulatory procedures, and can be used to help gauge the potential importance and impact of the many initiatives underway seeking to facilitate PV deployment by reforming regulatory processes.

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