

Clean Power Finance

Nationwide Analysis of Solar Permitting and the Implications for Soft Costs

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December 2012



This material is based upon work supported by the Department of Energy SunShot Initiative under Award Number DE-EE0005349.

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Notes

This presentation and the full report will be made available on www.solarpermit.org

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Summary of Research

Objectives

- Establish a measurement and evaluation protocol prior to deployment of the National Solar Permitting Database (NSPD) and determine baseline metrics.

Research Highlights

- Interviews with installers and Authorities Having Jurisdictions (AHJs).*
- Survey of **273 residential installers**, gathering data on **500+ installations** spanning **12 states** comprising over **90% of the residential solar market**.

Key Findings

- Permitting processes vary widely among locales and usually **involve 2 distinct agencies (and up to 5 agencies)**, each with different processes.
- **More than 1 in 3 installers** avoid selling in an average of 3.5 jurisdictions because of associated permitting difficulties.
- AHJs require, on average, **nearly 8 work weeks** to complete their tasks. The staff time of the installer, however, averages just **14.25 hours**.
- There are likely significant opportunities for installers to reduce costs by improving processes around customer acquisitions and operations.

* AHJs include city or county planning departments, fire departments, electrical utilities, and other agencies with approval authority over new solar installations.

The Problem from Both Perspectives

Installer's Perspective

- Varying requirements across AHJs create confusion, rework, and frictional costs
- Requirements within the same AHJ suffer from inconsistent application
- Requirements are not readily accessible and can be updated without notice
- Inconsistent processing and cycle times disrupt sales and operations flows (e.g. scheduling staff time, routing crews, and site visits to customers)

“I find myself having to educate the city staff on their own requirements.”

“AHJs can change their interpretation of existing codes and you only find out after you are about to submit your paperwork...”

AHJ's Perspective

- Installer errors and incomplete/inconsistent paperwork (e.g. design doesn't match documents) creates extra work and delays
- AHJs often operate in sub-optimal conditions - strained budgets, under-resourced, staff turnover
- No channel to communicate updates or simplification of processes to installers
- Solar installations are uncommon; AHJs are unaware of existing best practices or that a problem even exists

“Perhaps a fifth of submittal packages are poorly organized and may require hours of red-lining.”

“This is matter of safety, not red tape.”

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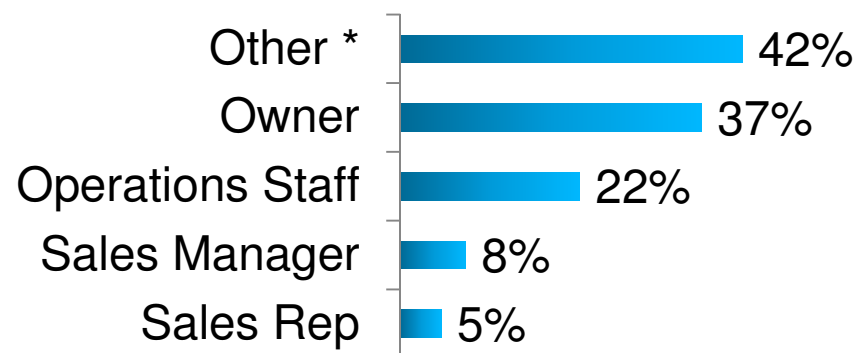
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Titles and Tenure in Residential Solar

All 273 study participants are involved with residential solar permitting processes.

Respondents' average tenure in the solar industry is **more than 6 ½ years**.

Job Title



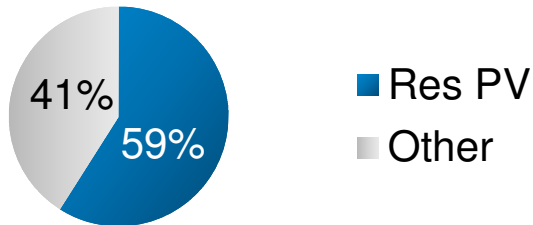
* Mixture of titles including General Manager, CEO, Designer, President, Project Manager

Industry Tenure



The Business of Residential Solar

Source of Business



Residential solar installations comprise, on average, 59% of a responding enterprise's business (i.e., revenues). 85% of these enterprises also are engaged in commercial installations.

46% of installers say they use a Flat Rate per Watt arrayed to develop their homeowner bids.

	Average	Median
Flat Rate used for homeowner bids	\$4.60/W	\$4.90/W

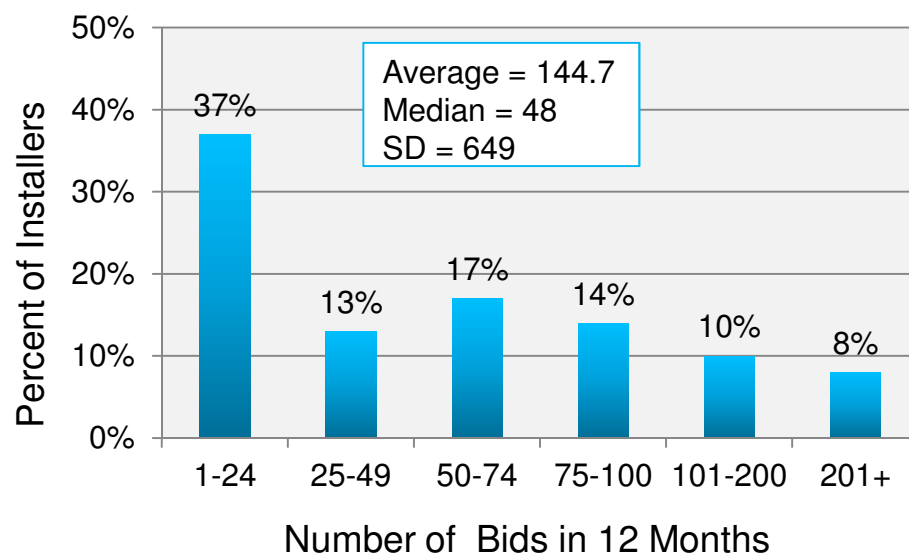
Given the level of customization required and the range of other factors that affect cost, a flat fee per watt would seem inefficient – potentially leading to lower sales conversions or unpredictable (and even lower) margins per installation.

Varying Scales of Operations

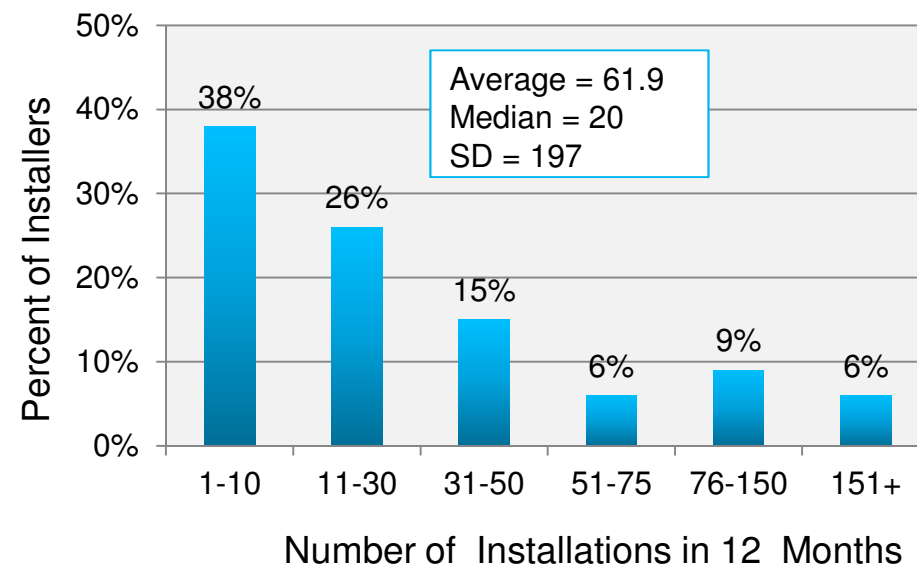
Installers vary tremendously in size of their installation operations and headcount.

	<u>Average</u>	<u>Median</u>
Number of installation crews	2.5	2.0
Number of employees	63	8

Distribution of Installers by Annual Bids



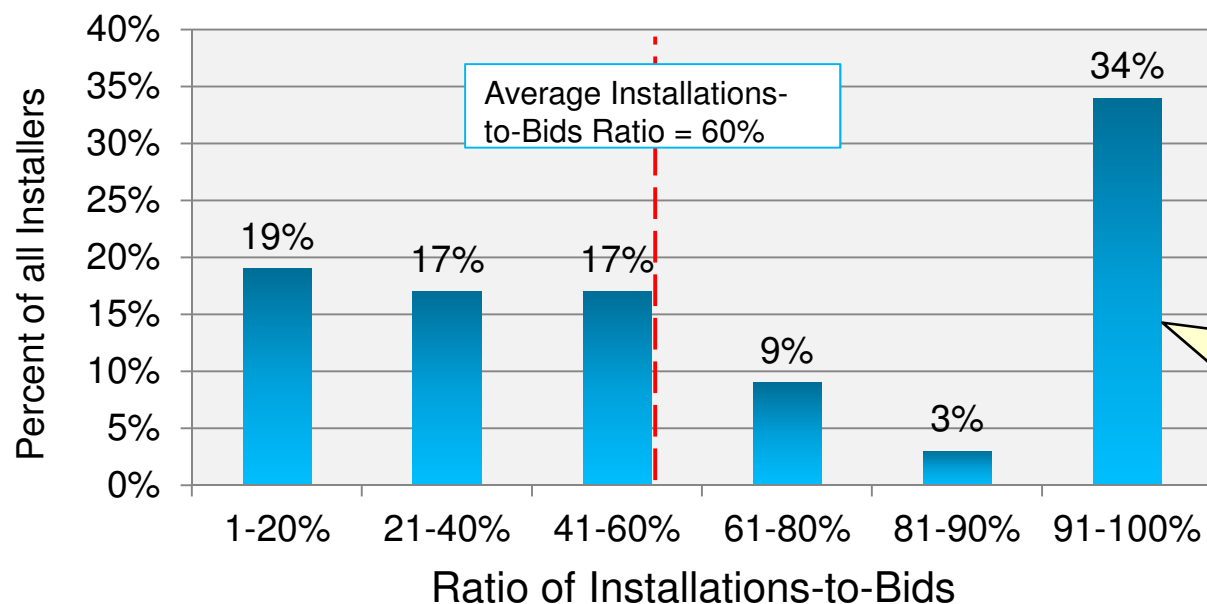
Distribution of Installers by Installations



Divergent Installer Performance

The average installer had 6 installations for every 10 bids submitted to end consumers.*

Distribution of Installers by Installations-to-Bids (N=273)



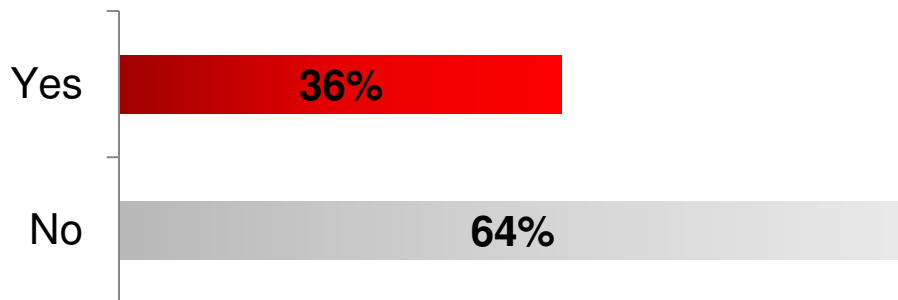
The distribution shows significant variance, perhaps reflecting various approaches of how sales are generated and who is generating them. Increasingly, installers are completing projects that were sold by another organization. This would increase installations-to-bids ratios.

* Respondents were asked how many bids were prepared and how many installations were completed in the last 12 months. While it's tempting to use the ratio of installations-to-bids as a metric for sales conversion rates, two important conditions complicate this analysis: 1) many bids and installation being counted in the 12-month timeframe will not correspond to each other, and 2) solar projects can be sold by one company and installed by a separate one.

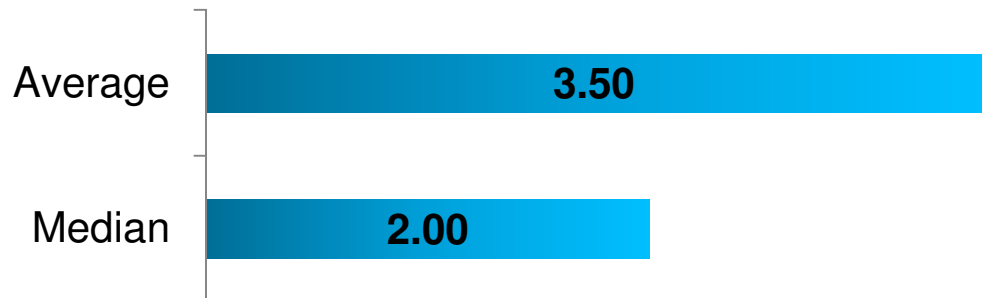
“Permitting Walls” around Communities

More than 1 in 3 installers said they “limit or avoid sales efforts in jurisdictions because their permitting processes are difficult.”

Avoid jurisdiction due to permitting?



Number of jurisdictions avoided



Difficult permitting processes may be shutting out communities from going solar and stifling the diffusion of solar.*

* See “Business Implications” for details

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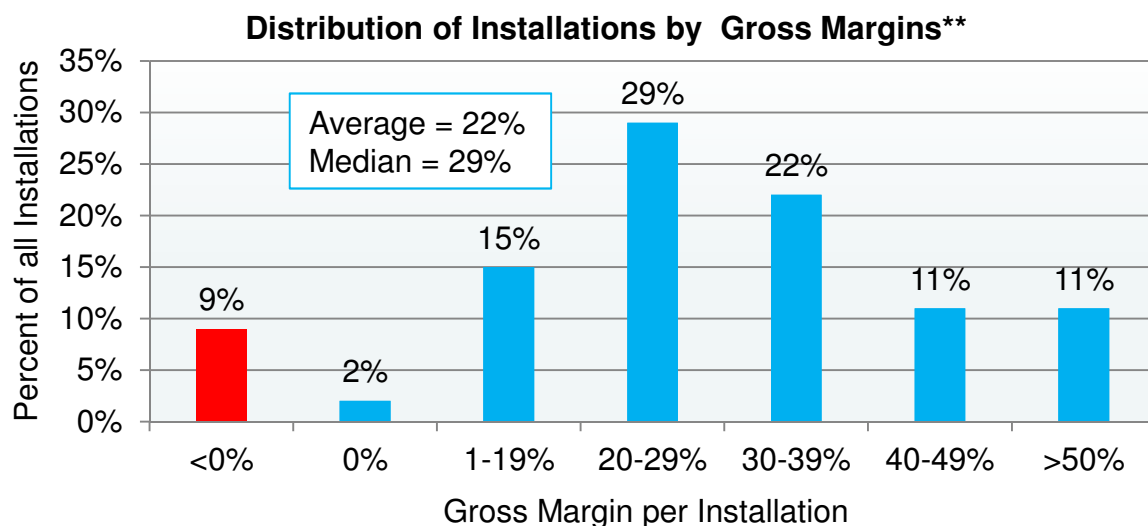
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Residential Solar Projects – Overview

The survey gathered data from 546 installations from 273 installers in 12 states: CA, NJ, HI, PA, CO, NY, MA, AZ, TX, OR, MD, and NM, accounting for over 90% of the US residential solar market.

	<u>Average</u>	<u>Median</u>
Size of system installers (kW)	7.2	6.0
Cost per watt for Homeowner	\$4.90	\$5.00
Cost per watt for Installer	\$3.30	\$3.40



9% of installations have negative gross margins.

Negative gross margins exceeding 100% (or over \$20K, on average) occur in about 5% of all installations. Since most installers are small enterprises, these unprofitable installations likely impose severe business stress and may lead to business failure.

* All data reported in this section uses each installation (not the enterprise) as the unit of analysis.

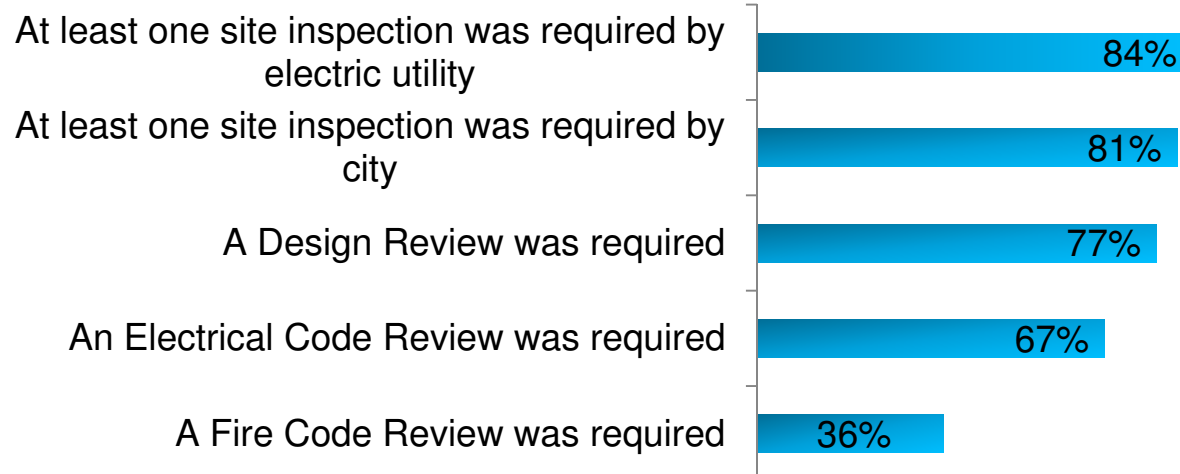
** $Estimated\ Gross\ Margin = \frac{homeowner\ cost - installer\ cost}{homeowner\ cost}$

A Patchwork of AHJs and Processes

Required steps vary widely across locales.

An average installation requires involvement from 2 AHJs.

The permutations of required steps combined with the hodgepodge of AHJs involved results in a confusing multitude of permitting processes.

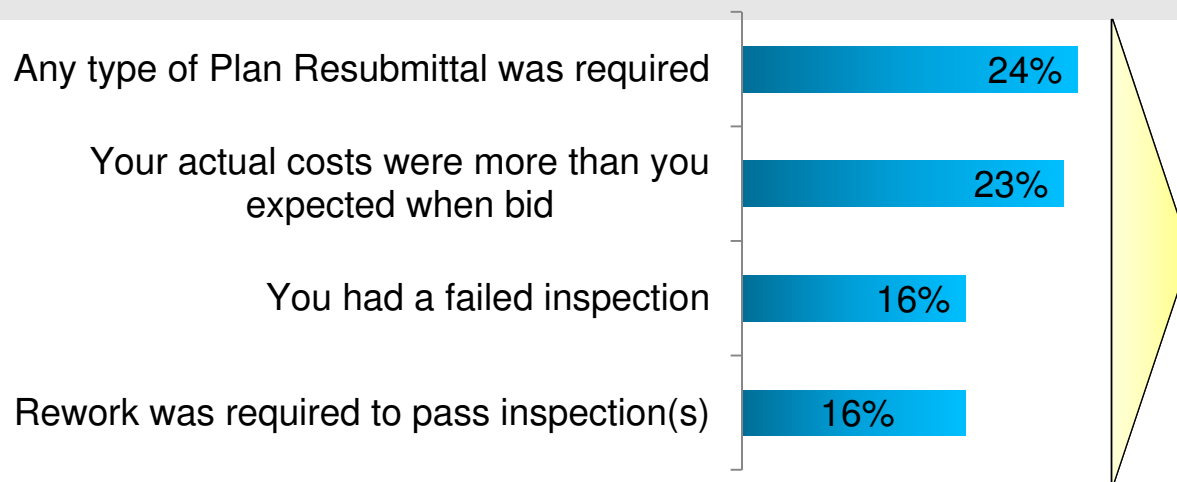


The patchwork of AHJ requirements has resulted in a patchwork of sub-optimal remedies, including avoiding “stricter inspectors.” Most installers do not have the resources to work with their respective AHJs to develop long-term solutions.

AHJs Involved	
Electric Utility	55%
City Planning Office	61%
County Planning Office	35%
City Fire Department	13%
County Fire Department	10%
Other	17%
Average number involved	1.94
Max number involved	5

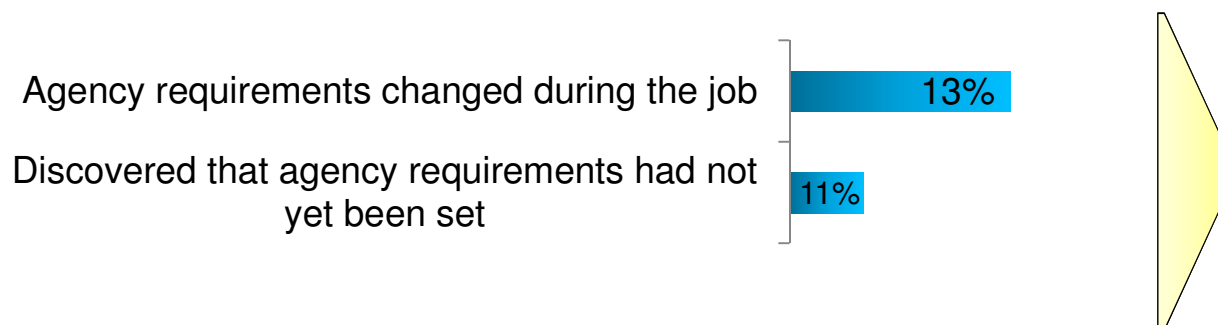
Permitting Process Breakdowns

Confusion over which AHJs to consult and which requirements apply lead to resubmissions, rework, and unexpected costs.



Resubmissions and rework are costly to both installers and AHJs. Reducing them will be mutually beneficial and can lead to lower AHJ fees and taxes.

Exacerbating the confusion, requirements can change or may be non-existent.



Public policies appear to have not kept pace with the expanding solar market. Many AHJs have yet to move up the learning curve in accommodating solar.

Permitting Process Times

It requires on average nearly 8 weeks for a project to go through all AHJ steps. Not all steps are required for every installation and process times for each step can vary tremendously.

Process Step		Percent of Installs Touched	Average Days*	Median Days*
Installer Process Steps	Initial Homeowner Conversation to Delivery of Proposal	100%	32.3	10.0
	Approval of Proposal to First Document Submitted to AHJ	100%	17.4	10.0
	Electrical Code Review	67%	11.3	7.0
AHJ Process Steps	Design Review	77%	12.7	7.0
	Fire Code Review	36%	7.9	5.0
	Plan Resubmittal	24%	10.0	5.0
	Utility Site Inspection	84%	13.5	10.0
	City Site Inspection	81%	5.2	2.0
Weighted Average of Work Days for AHJ Process Steps			38.15	

* Days = Work Days

Average time from initial document submission to AHJ to final inspection often far exceeds 38 work days. The difference may be largely attributable to installer processing or waiting times in between AHJ steps.

Installer Staff Time Spent on Permitting

Permitting consumes on average 14.25 installer personnel-hours.

Difference between the average days and median days suggests wide variance.

Employee	% of Installations Involving Staffers on Permitting	Average Hours Spent on Permitting per Installation*
Owner	20%	20.0
Installer	9%	13.0
Sales Rep	11%	12.7
File Clerk	2%	11.6
Electrical Engineer	8%	13.5
Others	59%	10.8
Weighted Average of Installer Staff Time		14.25

Installation companies hire an external electrical engineer for 21% of their residential projects, paying \$900 (median) when they do.

* The survey asked about billing rates to estimate the cost of personnel-hours. However, installers are unaccustomed to using billing rates for different staff members (most could not estimate these billing rates), making the study's estimate of personnel-cost suspect. See "Further Discussion" for details.

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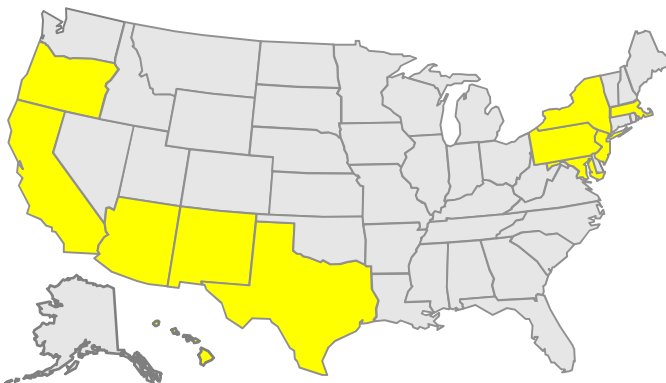
A Solar Market Limited by Bureaucracy

36% of installers avoid an average of 3.5 jurisdictions because of permitting difficulties

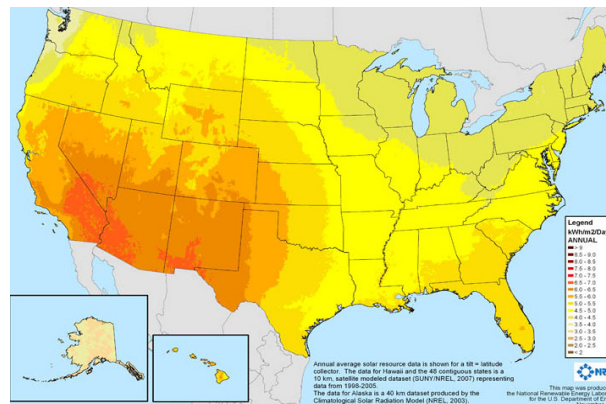
- Installers are avoiding a large number of areas where solar opportunities have been identified.
- These areas of opportunity are relatively rare in the US, because of low irradiance or the relatively low cost of electricity.
- Permitting difficulties are curtailing the expansion of the solar industry and diminishing consumer options for solar providers.

Despite high growth rates for the US residential solar industry, the number of markets where solar is currently competitive remains relatively small. Difficult solar permitting processes make that number even smaller.

States Covered in Baseline Survey

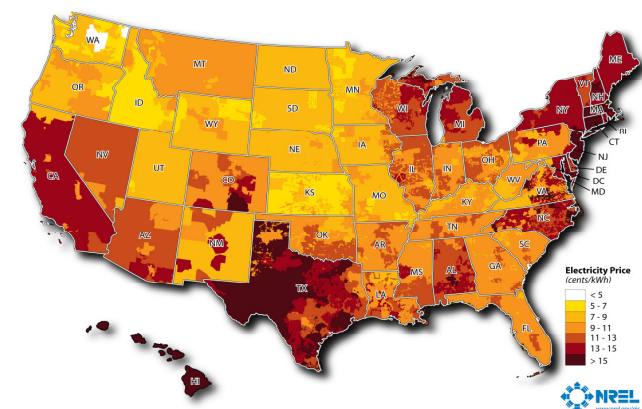


PV Solar Radiation in US*



Source: NREL

Electricity Prices in the US (2010)



Source: NREL

Potential to Improve Installer Businesses

Improved pricing strategies can improve sales conversion and margins.

- **Nearly half of installers (46%) use flat-fee \$/W rate for their bids to homeowners.**
- Because each PV system is highly customizable and costs can rapidly change, a flexible pricing approach should theoretically yield more sales or higher margins than flat-fees.
- Presumably, the proportion of installers using a flat-fee will decline as tools assisting installers to control and gauge cost (such as the NSPD) are deployed.

Reducing permitting and installation times can improve cash flow and profitability.

- **AHJs require on average nearly 8 weeks to complete all required tasks for installations.**
- Because installers typically make a large upfront equipment purchase, permitting processes can be tying up thousands of dollars for almost two months or forcing installers to use credit.
- Similarly, installers with total installation times that far exceeds 8 weeks likely have inefficiencies in their operations; reducing these inefficiencies will likely free up cash and may immensely improve profitability.

Installations-to-bids ratios suggest a huge variance in the business performance of installers.

- **Most installers are completing very few installations relative to their number of bids submitted, but a select group are doing exceptionally well.**
- It is unclear what sets this group apart; they may be installing projects sold by other companies or may pre-qualify their consumer leads better. Further analysis is required.

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Potential Paths for Public Policies

AHJ policies & processes have not kept pace with burgeoning solar market.

- Awareness among AHJs about permitting problems (much less the solutions) is lacking. **11% of installations encounter a situation where no requirements have been set.**
- Mechanisms to educate AHJ staff and share best practices can lead to convergence on policies and procedures.

Criticisms of AHJs to become solar-friendly may be counterproductive.

- AHJs are handicapped with issues beyond their control, including budget cuts and staff turnover and installer errors that are avoidable.
- Many AHJs want to minimize resubmissions/rework that can be costly to them; one-sided criticisms of AHJs may encourage them to be less transparent with their processes.

Proposed hard limits on AHJ fees may potentially hurt the solar industry.

- Fixed fee policies that prevent AHJs from recovering costs from installer errors can put undue financial burden on AHJs and increase the number of errors being submitted.
- Without an ability to recover costs, AHJs may be more inclined to approve systems that do not meet standards, creating performance and safety risks.

More convergence and transparency may solve most of the problems.

- Local conditions (e.g., risk of hurricanes or historic preservation rules) will likely prevent complete standardization.
- Even when AHJs follow the same codes/guidelines, interpretations can vary widely; mere convergence of interpretations and delineation of exceptions can drastically reduce confusion.

Simplification of permitting requirements may increase confusion.

- Without a channel for AHJs to communicate to installers, simplification to existing permitting policies may increase cost in the short-term and be met with installer resistance.
- **About 1 in 8 installations already see agency requirements change during the job,** creating frictional cost for both installers and AHJs.

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Research Constraints and Limitations

Areas for Future Research

- The study focused on metrics that can be directly impacted in making requirements more transparent through the NSPD (i.e., metrics internal to installers); other metrics, such as permitting fees, were thus excluded. However, the NSPD will be designed to collect such data and make comparative analyses on permitting fees and other metrics possible.
- For practical reasons, the study covers the top 12 states for residential solar. Vermont (not included in this study) has a policy in which certain systems are defaulted for approval. Metrics from Vermont may provide useful comparative benchmarks.
- The analysis calculated a weighted average personnel cost of \$664 (or \$0.11/W) for permitting per installation. Because installers are unaccustomed to using billing rates for different staff members (some employees are paid by \$/W of a system and other an hourly wage) this calculation is highly suspect and is thus excluded from the findings.

Future White Papers for Solar Installers

Though intended as a baseline study for the NSPD, the research raised a number of insights and questions about the solar installation business, which will be discussed in a series of white papers to be published on the NSPD website on a periodic basis in 2013.

46% of solar installers use a flat-fee \$/W pricing for their consumer bids.

- Why would some installers use a flat-fee and others use customized pricing?
- What are the tradeoffs between the two approaches?

Average AHJ processing time is about 8 weeks, but most installations far exceed this timeframe.

- What other factors are slowing the installation process?
- How can installers address them? How much can doing so improve profitability?

Gross margin per installation varies widely; 9% of installations have negative gross margins.

- What may be causing these unprofitable installations and how can installers avoid them?

Most installers have a low installations-to-bids ratio, but a few do exceptionally well.

- How does this ratio relate to installer profitability?
- What can installers do to improve this ratio?

Clean Power Finance seeks to conduct further analyses and provide business insights and potential approaches to help installers reduce costs and improve profitability.

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Summary of Research Methodology

- A relevant and geographically diverse population of installers was identified for this “pre/post” survey following previously defined criteria.
- A reliable sample size of installers was interviewed prior to the deployment of the NSPD. Installers provided detailed data on 546 separate installations.

The metrics developed for this study can be used to evaluate the effect of the NSPD and complementary permitting tools:

- Total installer staff time spent on permitting activities
 - Cycle times required for permitting process steps
 - Homeowner cost per kW
 - Installer cost per kW
 - Flat Rate charged per watt (among those installers that use this method)
- Sufficient profiling data was collected to assure “apples-to-apples” sample construction for the post-deployment survey.
 - Clean Power Finance will conduct the same study after the deployment of the NSPD to measure its impact.

Methodology: Survey Design

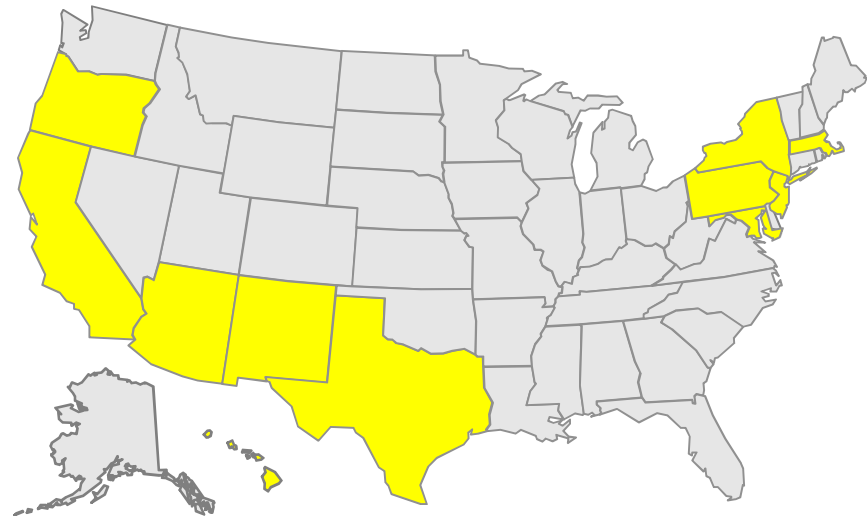
Primary research was conducted with installers, AHJs, and different teams from the SunShot Initiative's Rooftop Solar Challenge. The interviews informed the design of the survey.

This survey assesses the permitting process: its cost, cycle times, and impacts on willingness to offer installation services in specific geographic territories, etc.*

The survey population included installers who operate in: CA, NJ, HI, PA, CO, NY, MA, AZ, TX, OR, MD, and NM.

These states were selected based on the 2011 SEIA forecasted highest ranking states for residential installations in 2012 and currently encompasses over 90% of the market.

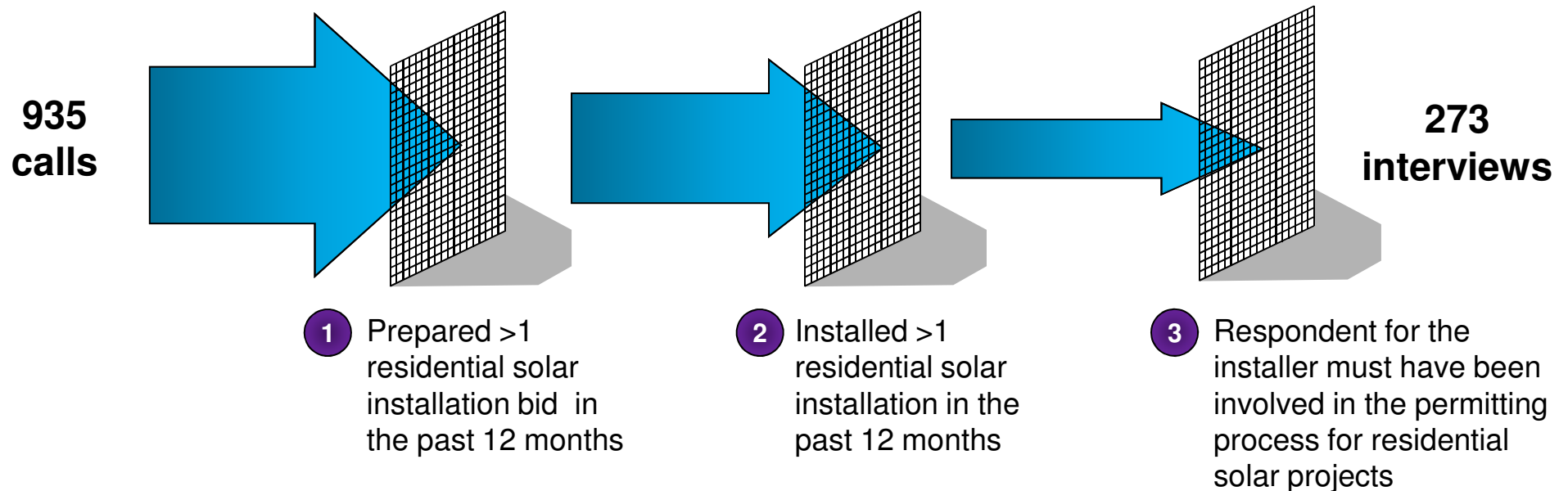
By executing this survey prior to the launch of the National Solar Permitting Database and again after the tool has been in use for a period of time, we expect to evaluate the effect of the tool on streamlining the permitting process.



* Data collection and data tabulation performed by HINER and Partner, Inc.

Methodology: Selection of Respondents

Random telephone calls were placed to the population and were selected per the following criteria:



29.2% of installers met the screening criteria

Each respondent provided data on two installations for a total of 576 units of analysis

Average interview length was 18.6 minutes

Methodology: Creating a Control Group

Anticipating that the composition of those installers who adopt the new permitting tools may skew toward early adopters, the survey profiled installer attitudes and behavior toward technology.

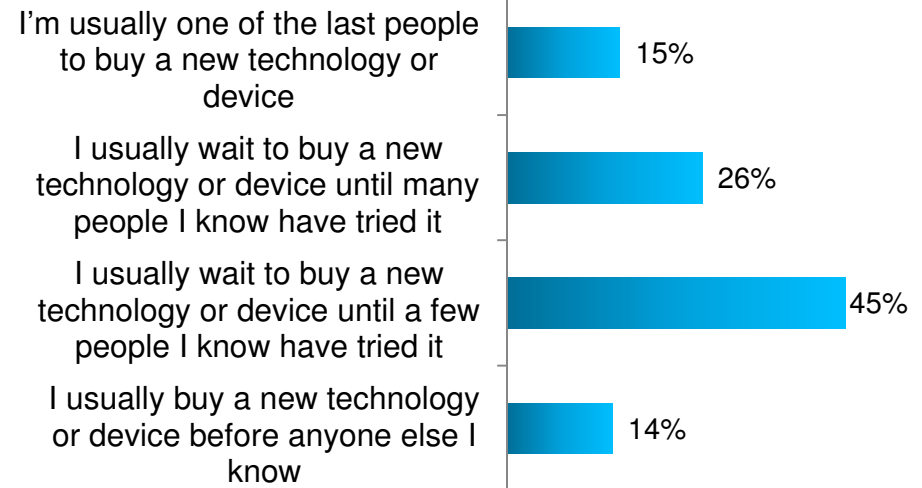
- Post-deployment survey participants will be compared to this profile.

Technology Behavior

How often use smartphone, iPad, or laptop

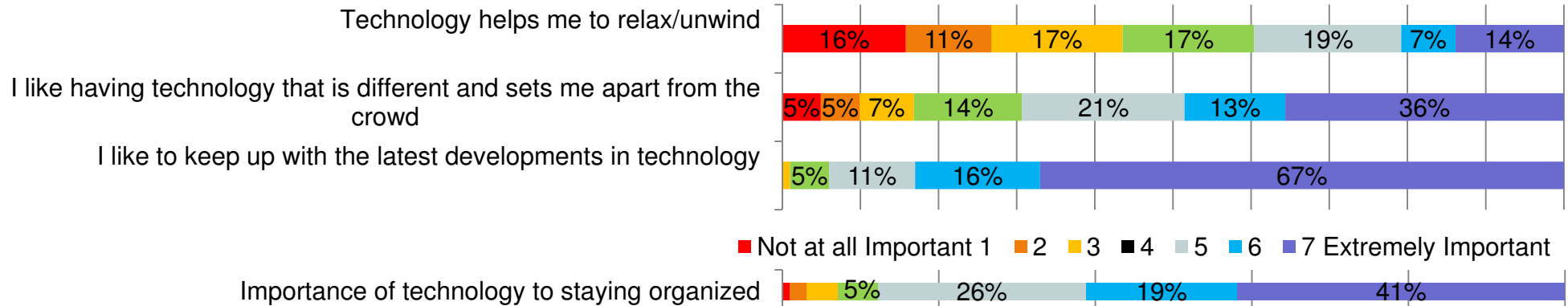
Multiple times per day 92%

Technology Adoption



Technology Attitudes

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree



Further Information

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About Clean Power Finance

Clean Power Finance is driving the mass-market adoption of residential solar by building an online business-to-business marketplace to connect the solar industry and the capital markets. Clean Power Finance provides solar professionals, including marketers, installers, manufacturers and distributors, with access to a variety of non-exclusive, white-label residential finance products and an easy-to-use solar sales quoting and design tool. The company's transparent pricing makes it easy for financial firms and lenders to invest in residential solar projects that provide reliable rates of return. Founded in 2007, Clean Power Finance is venture backed by Kleiner Perkins Caufield & Byers (KPCB), Google Ventures, Claremont Creek Ventures, Clean Pacific Ventures and Sand Hill Angels. To learn more about how Clean Power Finance can accelerate the growth of solar businesses, please visit www.cleanpowerfinance.com.

About the National Solar Permitting Database

The National Solar Permitting Database (NSPD), supported by a \$3MM grant from the U.S. Department of Energy's SunShot Initiative, is designed to help streamline and reduce the time and costs associated with the solar permitting process. This community-based, free online tool compiles the most complete and accurate permitting requirements from solar professionals and Authorities Having Jurisdiction (AHJs) from around the United States in one single online location. Users will be able to search the database quickly for complete and accurate information on permitting requirements and other relevant information about AHJs. The NSPD can be accessed at www.solarpermit.org