

FROM THE TRENCHES: INNOVATIONS IN DISTRIBUTED GENERATION SOLAR PERMITTING

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ABSTRACT

Permitting processes vary among Authorities Having Jurisdiction (AHJ) nationwide and can add significantly to the overall installed cost of solar. Understanding permitting commonalities, requirements, and data can promote faster application and inspector review, making solar a better deal for installers, consumers, and even the AHJs themselves. The U.S. Department of Energy (DOE) has commissioned a 3-year, \$3MM project to build IT systems to reduce solar permitting costs nationwide; Clean Power Finance is leading the project and working closely with industry stakeholders, including entities involved in the DOE's Rooftop Solar Challenge. The goal is to create a free, open-source national database of permitting requirements for installers and AHJs to reduce frictional costs and provide greater permitting process transparency. This paper will review the project and results from a recently completed baseline study on permitting. It will highlight ways that stakeholders, including installers, manufacturers, and AHJs, can work together for the benefit of all.

1. INTRODUCTION

The costs of solar photovoltaic (PV) systems have fallen precipitously in recent years, help fueling a surge in solar installations in the U.S. Most of the cost reductions have resulted from lower equipment or hardware costs (Barbose et al., 2012), especially as fierce competition has vastly expanded the supply of PV modules. Nevertheless, the non-hardware or "soft costs" remain stubbornly high. Data collection and analysis on soft costs have been limited; a recent joint study by the National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL) estimate soft costs to be \$3.32/W (Ardani et al. 2012). Given current module prices, this mean that soft costs constitute more than 60% of a typical residential PV system's price in the U.S. These "soft costs" include those associated with customer acquisition, labor

and operations, financing, and permitting. Costs associated with solar permitting are particularly vexing to the solar industry because they do not stem from technological limitations, natural physical barriers (e.g. the amount of sunlight), or unpredictable consumer preferences—all factors that are beyond the control of most businesses—but rather from organizational inefficiencies, which are seemingly solvable problems. A typical permitting process, however, involves multiple Authorities Having Jurisdictions – agencies with approval authority over new installations. AHJs can include local or county governments, fire departments, and electric utilities. Each may impose building, electrical, fire, or zoning restrictions, as well as require inspections. There are reportedly more than 24,000 AHJs in the United States (if one counts the more than 6,000 utilities as AHJs), and their policies, procedures, and fees regarding solar permitting vary widely, thus creating confusion among solar installers and adding significant cost and development time. NREL and LBNL estimate the average permitting cost per system to be \$0.22/W (Ardani et al., 2012), almost \$0.20/W higher than the corresponding costs in Germany, which have more uniform and transparent rules governing solar installations (Seel et al., 2013).

A variety of initiatives have been undertaken to mitigate the difficulties and costs associated with solar permitting. The Solar America Board for Codes and Standards (Solar ABCS), with funding from the DOE, has developed guidelines for expedited permitting for residential solar (Brooks, 2012). Similarly, the Interstate Renewable Energy Council (IREC) has published guidelines for expedited field inspections (IREC, 2010) and the State of California has developed a guide for solar permitting (OPR, 2012). These guidelines describe protocols and processes for a functional end-state, but do little to direct AHJs on how to transition to such an end-state. Other efforts, like the DOE's Rooftop Solar Challenge (and its precursor the Solar America Cities), have been more hands-on by engaging local and state governments as well as solar advocates and businesses to promote solar within their respective communities.

Additionally, a few states have enacted legislation to reduce the cost of solar permitting; California and Colorado have set limits on fees for PV systems of certain sizes, while Vermont has a registration policy under which many systems are defaulted for approval.

The efforts tackling solar permitting generally fall under two categories: 1) broad dissemination of ideas and models for others to adopt (e.g., Solar ABCS) or 2) more hands-on approaches involving changes in rules and processes in specific locales (e.g., Rooftop Solar Challenge). The first type of activities tends to be passive and lack the stakeholder involvement necessary to drive change, while the second lacks geographical breadth for sweeping improvements on a broad scale.

The National Solar Permitting Database (NSPD), currently being developed by Clean Power Finance with a \$3MM grant from the DOE, is unique in that it will entail active involvement of stakeholders at a national level. The NSPD is a free online, open-source database that aggregates permitting requirements and best practices nationwide. The information will be populated through crowdsourcing, whereby vested stakeholders, particularly installers and AHJs, contribute information to the database, which can then be used by other stakeholders. The NSPD will generate greater transparency in the permitting processes, thereby reducing confusion and costs for both installers and AHJs. Furthermore, the NSPD can serve as a catalyst for change by bringing together the disparate permitting efforts and providing a vehicle for communication and sharing best practices. The NSPD project has already gathered data on more than 3,000 AHJs and produced a nationwide study that has yielded valuable insights on solar permitting.

2. FINDINGS FROM THE BASELINE STUDY

The project team conducted a study to establish baseline metrics prior to the deployment of the NSPD that can be compared to metrics taken after the NSPD is fully implemented, and to provide direction to the industry about areas for improvement (Tong, 2012). The study consisted of qualitative interviews with installers and AHJ staff members as well as a survey of 273 residential installers. Data was gathered on 546 installations spanning the 12 states—CA, NJ, HI, PA, CO, NY, MA, AZ, TX, OR, MD and NM—that encompass more than 90% of the U.S. residential solar market. Below are the key findings and corresponding implications for the solar industry:

The solar permitting and inspection process typically involves 2 (and a maximum of 5) distinct agencies. Table 1 shows the variety of AHJs that are involved in residential solar installations and the frequency of their involvement.

TABLE 1: AHJS INVOLVED WITH RESIDENTIAL SOLAR PROJECTS:

AHJs	Percent of Installations
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

The types of reviews and inspections required by each AHJ can vary tremendously (See Fig. 1). The permutations of AHJs involved combined with varying combinations of inspections and reviews create confusion for both installers and AHJs on what needs to be done, in what order, and in what timeframe. This results in delays and increased administrative costs for both installers and AHJs. Exacerbating the confusion, the AHJs with authority over the same solar project often do not communicate with each other.

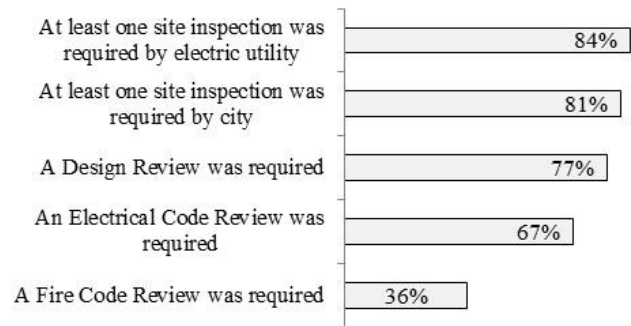


Fig. 1: An installation typically requires a variety of inspections and reviews; which ones are required and when they are required can vary depending on the specific address of the installation, which often causes confusion among installers as well as AHJs.

36% of installers avoid selling solar in an average of 3.5 jurisdictions because of associated permitting difficulties. Complicated permitting processes are preventing the adoption of solar in otherwise viable markets. Installers who have consciously decided to avoid specific communities had presumably pursued opportunities in those areas only to subsequently discover that the permitting processes were cost prohibitive. In other words, bureaucratic challenges are restricting the number of areas where solar should be competitive. Furthermore, difficult permitting

processes likely limit competition, severely handicapping would-be entrants and giving incumbent installers significant leverage to keep prices high for the residents in those jurisdictions.

An average residential solar installation requires nearly 8 weeks to be processed by all relevant jurisdictions. A long permitting process can be extremely harmful for solar installation companies, most of which are small and medium enterprises. Installers typically make large upfront equipment purchases for each installation. A longer permitting process means more of a company's cash is tied up in inventory – cash which could be used to acquire more customers, compensate employees, or repay creditors. To put things in perspective, for an installer who sells an average of two solar systems per month, a two-month permitting process will mean over \$40,000 will be tied up in inventory, representing potentially 10 to 20 forgone sales during the permitting process.¹ Poor cash flow management is a leading cause of business failure among small and medium enterprises.

Resubmissions of plans occur in 24% of all installations and rework in 16% of all installations, respectively.

Resubmissions and rework can add hundreds and occasionally thousands of dollars to the cost of a solar installation. These costs are abhorrent to solar installers, who see themselves absorbing these costs or reluctantly passing them on to the end consumer. What is not so apparent to installers (and arguably to most solar advocates) is that resubmissions and rework are also costly to AHJs; they create extra work, disrupt internal processes, and add administrative costs, which are not always recovered in the fees or tax the AHJs charge.

13% of installations experience changes in agency requirements during the installation process. Interviews with installers indicate that these changes are usually the result of the AHJ changing its interpretations of previously published requirements, and not changes to the letter of those requirements. Communication of these changes to the relevant stakeholders tend to be lacking, leading to conflicting interpretations not just among solar installers, but also among the AHJ staff members. This results in resubmissions, rework, and general frustration for both installers and AHJs.

11% of installations encounter situations in which agency requirements for solar have not even been set. The boom in residential solar is a relatively recent phenomenon. Consequently, most AHJs' policies and processes have

¹ These calculations assume a system size of 6 kW, hardware costs of \$1.70/W, and customer acquisition costs of \$2000 - \$4000 per installation.

simply not been updated to accommodate solar. AHJs seeking to modify their permitting practices may not know what codes or standards to apply and what resources are available to help them transition to more efficient processes.

The study also involved interviews with AHJs and participants in the Rooftop Solar Challenge. The discussions revealed a numbers of insights into the AHJs' operations as well as implications for future reforms:

- AHJs cite installer errors, such as incomplete paperwork, as a significant source of frictional costs and frustration.
- "Do-it-yourself" (DIY) solar installers are becoming increasingly common. Because these installers lack experience and are often looking to do just one solar project, they typically commit more errors. Although DIY installations are still relatively rare, they can create severe disruptions in the permitting process for all installers, much as one bad driver can wreak havoc for many other drivers during rush hour traffic.
- Many AHJs are facing budget constraints and high staff turnover, particularly in the current economic climate; furthermore, since residential solar projects are still rare, AHJ staff members are often simply unaware of existing solar permitting practices or that a problem even exists.
- AHJs looking to simplify their permitting processes face enormous challenges in engaging all the relevant stakeholders (including installers), much less getting them to agree on standards.
- Public criticisms of AHJs can be counter-productive, especially when alternatives are not offered. AHJs can become defensive or even less transparent with their policies. In the course of the baseline study, the author encountered AHJs that—though addressing the solar permitting problem—refused to share data for fear of being subjected to attacks by the solar industry.

3. CONSEQUENCES OF SOLAR PERMITTING

Many in the solar industry characterize the economic ramifications of inefficient permitting processes as a tax on solar. Using Germany's solar permitting cost as a benchmark, the tax would amount to \$0.19/W (Seel et al., 2013) or \$1140 for an average residential system of 6 kW. However, the baseline study indicates that unnecessary permitting costs are even worse than a tax; they result in deadweight loss. A tax suggests that government agencies are making income from solar permitting. Difficulties with solar permitting, however, are costly to both AHJs and the solar installers; both sides lose. Moreover, the public also loses because unnecessary permitting costs reduce the

accessibility of solar to end consumers, many of whom might go solar if the frictional cost related to solar permitting were lower.

4. FRAMEWORK FOR A LONG-TERM SOLUTION

Attitudes of AHJs vary widely from being solar-friendly to being highly resistant or even hostile to solar. The baseline study indicates that the overwhelming majority of AHJs is not aware of the problem or does not know how to address it. This suggests that a federal mandate to standardize permitting policies across all AHJs policies—which some have been urging—may not be practical; most jurisdictions will likely not recognize the need for such policies and perceive this solution to be costlier than the problem. Because residential solar installations are still uncommon in most jurisdictions, this paper suggests a more measured approach involving three equally essential steps:

1. Raise awareness of the problem among AHJs
2. Identify specific areas or process steps that can be improved, both on the installer side and on the AHJ side
3. Offer solutions that can be readily adopted

AHJs are unlikely to take any action until they recognize that there is indeed a problem. Acknowledgment of the problem—though a critical step—will likely not be enough; AHJs will need to be able to identify what exactly can be improved, what alternatives exist, and how they can implement them. The NSPD will be a useful tool for all three steps.

5. THE NSPD AS A CATALYST FOR CHANGE

The National Solar Permitting Database will enable stakeholders to readily identify the AHJs that face significant permitting challenges. Moreover, by collecting and disseminating data on specific aspects of AHJs processes, both AHJs and the solar community can target areas for improvement (e.g., fees, common errors, process times, etc.). Currently, the channels for AHJs to communicate with solar professionals or with each other are lacking. For instance, a number of Rooftop Solar Challenge teams have experienced significant challenges in finding and convening the relevant stakeholders to simplify solar permitting in their respective jurisdictions; most of these teams do not know what best practices or alternatives exist. The NSPD will provide a medium to share knowledge and experiences, enabling the stakeholders in different jurisdictions to learn from each other. The NSPD will also serve as a forum for discussion and sharing changes to rules and procedures. Even if AHJs want to tackle the permitting problem, they may not know what they should do (many

installers can't agree either) and how best to communicate their actions. Without a communication channel to installers, an AHJ that simplifies its permitting process will likely create more confusion.

5.1. How the NSPD Will Work

The NSPD will function in a manner similar to Wikipedia. Users, including installer and AHJs, will contribute and update permitting information specific to the different cities, counties, or utility service areas. Each AHJ will have a webpage on the NSPD. Information about the AHJ will include (among other things): contact information; hours of operations; required forms and documents (which will be downloadable from the NSPD website); process times; fees; and tolerances for system specifications. Users will verify each other's data submission through voting mechanisms similar to those found on several social media sites. Additionally, AHJs will be contacted and asked to verify the information found on the webpage dedicated to them. Users will also be able to customize their accounts and filter only the AHJs that are relevant to them and receive news feeds from these AHJs, including important updates to rules or procedures.

6. CONCLUSION

The NSPD will be more than just a go-to source for solar permitting information. It will be a collective voice for the solar community—a vehicle for cooperation among competitors. Currently, each solar company must maintain its own permitting information and take on any stubborn AHJ by itself. Thousands of solar businesses throughout the nation replicate this same painful permitting work over and over again. By enabling installers to share their insights and knowledge, the NSPD will reduce everyone's workload and headaches. Moreover, by providing information such as which AHJs have easy processes, which AHJs have excessive fees, or which AHJs simply don't understand solar, the solar industry and policymakers can then pinpoint which cities need help and what exactly can be improved (e.g., the length of the permitting application, the wait times for inspections, etc.). The NSPD will provide actionable data to support improvements and unite individual voices into a cohesive call for change. Cities are more likely to change their policies when they know enough people demand change, they can identify what exactly they should change, and they can borrow proven practices from other cities. The NSPD facilitates all of this.

The impact of the NSPD will ultimately depend on the solar community's involvement. The more solar installers, manufacturers, distributors, service providers and solar-friendly cities contribute information to the database, the

faster the industry can drive towards standardization of permitting requirements and lower the cost of solar. Skeptics have questioned whether installers would be willing to share their information about permitting processes; many of these installers, after all, have spent significant amount of time collecting this information and thus would seem hesitant to freely give it away to potential competitors. Feedback from installers, however, provides evidence to the contrary: the overwhelming majority of installers that the project team has met have expressed strong interest in contributing to the NSPD. With very limited recruiting efforts, the project team has already collected data on more than 3000 AHJs.

This cooperation among competitors, or co-opetition, is encouraging not just for this project, but for the entire solar industry. The industry faces several challenges other than solar permitting, including: a growing dispute over net metering; the pending expiration of the investment tax credit; a relatively short supply of capital for solar projects; and perhaps most significantly, a consumer population that has largely been resistant to solar adoption. Despite the overwhelming public support of solar (SEIA 2012) and the recent surge in solar installations, the total stock of residential installations in 2011 stood at 188,000 or about 0.1% of the 130MM single-family housing units in the U.S. (Sherwood, 2012; US Census.).

It is highly doubtful that any solar company can take on any of these challenges alone; businesses in the solar industry are typically small, particularly the businesses on the front line of advancing solar adoption – i.e., those selling directly to the homeowners. For solar to achieve massive adoption and reach a tipping point, the various players and competitors will need to cooperate on common goals. Simplifying solar permitting is a goal that arguably all solar companies can agree upon, regardless of where in the value chain they sit. Thus the NSPD will not only help drive down soft costs, but it will also serve as a model for the co-opetition necessary to accelerate the adoption of solar.

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