Streamlining Solar Standards and Processes
Southern California Rooftop Solar Challenge

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About California Center for Sustainable Energy

The California Center for Sustainable Energy (CCSE) is an independent, nonprofit organization that serves as an objective resource on energy issues for individuals, businesses, organizations, public agencies and local governments throughout California. CCSE works to implement energy and climate policy in California through program development and management, technical assistance, research, and education and outreach. These efforts are focused in three areas: energy efficiency, renewable energy, and alternative transportation.

About Energy Policy Initiatives Center

The Energy Policy Initiatives Center (EPIC) is a non-profit academic and research center of the University of San Diego School of Law that studies energy policy issues affecting the San Diego region and California. EPIC integrates research and analysis, law school study, and public education, and serves as a source of legal and policy expertise and information in the development of sustainable solutions that meet our future energy needs.

TABLE OF CONTENTS

Introduction 5

Permitting Process in Southern California 6

- Typical Permitting Process 7
- Application and Information Access 8
- Processing Time 10
- Permit Fees 12
- Inspections and Communication with Utility 13
- State Efforts in Solar Permitting 16

Interconnection Process 17

- IOU vs. POU Interconnection Process 17
- Application and Information Access 19
- Interconnection Process Time 20
- Interconnection Inspection 23

Net Energy Metering and Interconnection Standards 26

- Net Energy Metering Standards 27
- NEM Standards and Rates 29

Interconnection Standards 30

Incentives and Financing Mechanisms 34

- Solar Incentive Programs 35
- Financing Mechanisms 36
- Pace Programs 36
- Third-Party Ownership 38
- Secured Financing 40

Unsecured Financing 42

- Feed-in tariff 43
- Community Solar 44
- Virtual Net Metering 44

Solar Planning and Zoning 46

- Solar Rights and Access 46
- California Solar Rights Act 46
- Solar Rights Act: A Case Study 47
- Solar Shade Control Act 48
- Solar Zoning 49
- New Construction 50

Conclusions and Next Steps 53
Appendix 1: Financing Mechanisms 54
Resources 55

INTRODUCTION

The Southern California solar PV market is robust and growing. In the 2010 IREC Solar Market Trends report, California ranked first in grid-tied capacity additions for 2010 as well as cumulative installed capacity, representing 48% of the total capacity nationwide. These impressive statistics have been the norm for over a decade and are due to a number of innovative policies and programs at the state and local levels aimed at supporting PV market growth, along with tariff structures favorable to behind-the-meter PV applications.

The Southern California Rooftop Solar Challenge (SCRC) supports the goals of the Department of Energy (DOE) Solar Energy Technologies Program and the SunShot Initiative, which seek to make solar electricity cost competitive without subsidies by the end of the decade by reducing balance of system costs for photovoltaics (PV). To encourage market transformation, the California Center for Sustainable Energy (CCSE) is leading a regional Southern California team that will focus on expanding financing options for residential and commercial customers, streamlining permitting processes, and standardizing net metering and interconnection standards across investor- and municipally-owned utilities in the region. The goals will be achieved by fostering cross jurisdictional collaboration and information sharing.

Through the process, CCSE will publish three sets of reports outlining the lessons learned in the first year of the program, ending in February 2013. The first, the Policy Overview Document, will focus on the current policy landscape for solar installations. During the first quarter of the program, CCSE has launched a series of working group meetings to focus on the existing policy landscape. The meetings were focused on five action areas (Permitting, Interconnection Process, NEM and Interconnection Standards, Zoning, and Financing). This document aims to focus on areas of high inter-jurisdictional variability as well as policies associated with quick turnaround times and lower costs. The second report regarding Best Practices and third report regarding Model Rules and Implementation Plans will be published after the completion of future phases of this program.

Jurisdictions	Utilities	Supporting Partners
• Anaheim • City of Los Angeles • County of Los Angeles • Chula Vista • Long Beach • Palmdale • Palm Desert • Pasadena • San Diego • Santa Ana • Santa Monica	• Anaheim • LADWP • Pasadena Water and Power • San Diego Gas and Electric • Southern California Edison	• Energy Policy Initiatives Center (EPIC) at University of San Diego

FIGURE 1 PROJECT TEAM

PERMITTING PROCESS IN SOUTHERN CALIFORNIA

> *"Today's solar industry faces a patchwork of different policies and practices across states, utility territories, and local jurisdictions. Navigating this complex policy framework is costly for solar companies and frustrating for consumers. Right now paperwork and administrative processes like permitting are responsible for 30-40% of the cost of a rooftop PV system."*
>
> ***U.S. Department of Energy***

In order to install a solar PV system on a home or business, a permit from the local jurisdiction must be granted to ensure that the design and installation is safe and follows local building codes. PV systems must comply with all applicable requirements and regulations including zoning, structure height, and prior development permits governing the site. The interpretation of these requirements and the requirements themselves can vary dramatically from city to city, and jurisdiction to jurisdiction. Many solar installers will perform solar installations throughout a region and face vastly different processes from each local building department. For example, the County of San Diego has 19 different jurisdictions, each with their own building codes and permitting processes. Understanding the various permitting processes for solar PV systems can be a complex, challenging, and a time-consuming undertaking. According to the DOE, paperwork and administrative processes, such as permit application processing and review, are responsible for 30-40% of the cost of a rooftop PV system.[i] Consequently, standardizing the permitting process is an important strategy to reduce the cost of solar PV installations.

This section will give an overview of the four major permitting process categories and how they are implemented within the Rooftop Solar Challenge team area: (1) Application and Information Access, (2) Processing Time, (3) Fees, and (4) Inspections and Communications with the Utility.

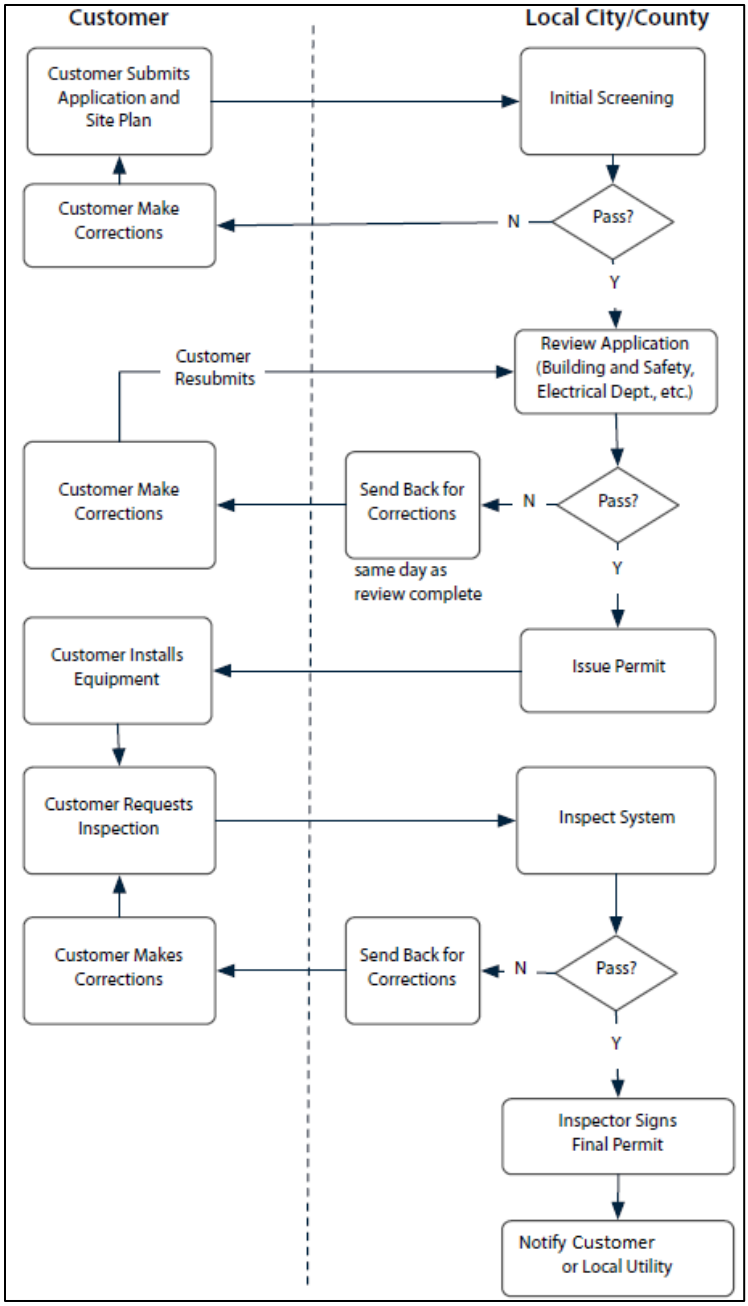


FIGURE 1. EXAMPLE PERMITTING PROCESS

TYPICAL PERMITTING PROCESS

Although permitting processes differ in each jurisdiction in the SCRC, an example of a typical permitting process can be seen in Figure 1. In this process, prior to installation the PV system, the customer must submit the application documentation and site plan to the local jurisdiction, where they are screened for accuracy. If the application passes the initial screening process, it is passed onto other internal departments. After the thorough review by all required departments has verified accuracy and compliance with local codes, a building permit is issued and the installation can proceed. When the system is installed, the customer or contractor will request an inspection from the jurisdiction to ensure all standards were properly followed. The jurisdiction will then give notification to the home or business owner when they will be inspecting the system. If the system passes the inspection, a final permit to operate is issued. Depending on the jurisdiction, the local utility will be notified to complete their inspection for interconnection to the electric grid. This process is usually completed by the installer, home or business owner, although in some jurisdictions in the SCRC, the jurisdiction's inspector will directly contact the utility to begin the interconnection process.

Application and Information Access

The solar PV permitting processes found across the eleven participating jurisdictions in the SCRC vary considerably in their costs and complexity. There are two primary topics related to the information of the solar permitting process: (1) the ease and accessibility of the application and information for the customer or the installer to access, and (2) the ability to submit and track the application.

In some jurisdictions, an applicant can find contact information, building department address, and information about a PV permit application in an easy-to-access location on the jurisdiction's webpage, while in other jurisdictions this information is difficult to locate or is not available at all. If the basic information is easily accessible, a contractor or homeowner can have their fundamental questions answered without taking valuable time from permitting office's other duties. If questions do arise that are not answered online, jurisdictions can have a specific contact person that is available to answer any PV permitting questions. While most jurisdictions have required permitting application documents available on their webpage and in person, some jurisdictions have made these documents available by mail or email on request. By having both online and hardcopy options available for obtaining permitting documents, jurisdictions have the ability to reach all of their contractors or homeowners, regardless of their access and familiarity to online technologies.

Only four jurisdictions give their applicants the ability to submit permitting documents online through the jurisdiction's application database, in addition to in person or via postal mail. Online submittals can shorten the permit process time for contractors who submit numerous applications, whereas in person submittals give a person an opportunity to ask any questions and have first-person help to resolve any issues. Having a broad range of methods to access information about the permitting process and required documents may help jurisdictions reach all types of applicants, whether they are highly familiar with the process or not.

Permit Applications in the SCRC

Figure 2 outlines the different methods for obtaining and submitting permitting applications in the SCRC. The majority of cities in the SCRC have online and in person options for obtaining applications, while only four (Anaheim, Long Beach, Pasadena, and San Diego) allow for application requests via mail or email. The City of Palmdale is the only jurisdiction in the SCRC that uses their website as the only means to obtain an application.

Note that only four jurisdictions allow online application submittals as compared to the large majority that allows this process in person.

	What are the options for obtaining an application? (Check all that apply)				What are the options for submitting an application? (Check all that apply)			
City	Online	Email	In person	Mail	Online	Email	In person	Mail
Anaheim	✓	✓	✓	✓			✓	
Chula Vista	✓		✓				✓	✓
Long Beach	✓	✓	✓	✓			✓	
Palm Desert	✓		✓		✓		✓	✓
Palmdale	✓				✓			
Pasadena	✓	✓	✓	✓			✓	
San Diego	✓	✓	✓	✓			✓	
Santa Ana	✓		✓		✓	✓	✓	✓
Santa Monica	✓		✓		✓		✓	
LA County			✓				✓	
LA City	✓		✓				✓	
Total	10	4	10	4	4	1	10	3

FIGURE 2 ONLINE OPTIONS FOR PERMIT APPLICATIONS (RESIDENTIAL AND COMMERCIAL)

For applicants to easily understand the permitting process, many jurisdictions have created an easy-to-access information portal on their websites, and a designated person to serve as the point-of-contact for any solar-related questions. In the SCRC, all but one jurisdiction has their permitting information online, while five have their information that is characterized as "easily accessible." According to the DOE, "easily accessible" means that the information about the permitting process is available online in one site location and can be easily accessed via links on the jurisdiction or permitting office's home page. Six of the eleven jurisdictions – Anaheim, Chula Vista, Long Beach, Palmdale, Los Angeles County and the City of Los Angeles – have a designated point-of-contact to assist participants with questions about the permitting process.

PROCESSING TIME

Developing a permitting process with quick application approval times can reduce the cost of PV permitting. An accelerated application process that quickly provides an application decision (whether positive or negative) can save contractors time and give them a more accurate way of planning when to install PV systems. The Solar America Board of Codes and Standards (Solar ABCs), a collaborative group of photovoltaic stakeholders, has developed an accelerated permit process for small PV (15kW or less) systems using a simplified structural and electrical review of a small PV system project and minimizing the need for detailed engineering studies.[ii] Although no jurisdiction uses the SolarABCs expedited solar template, some have considered it while developing their own very similar template, including the cities of Los Angeles and San Diego. The large majority of permit applications for residential systems are generally short and simple, taking installers "minutes" to complete, but an expedited process can help reduce application review time for permitting officials.

Permitting Process Time in the SCRC

While most cities require that solar permit applications be reviewed by multiple departments –zoning, building, fire and safety – all but three SCRC cities internally route the permit application to the necessary departments. Generally, large commercial projects require a longer processing time due to a separate review for fire and structural safety.

	Residential				Commercial			
	Average number of business days between permit application submission and decision (issuance or denial)				Average number of business days between application submission and decision (issuance or denial)			
	≤ 3 days	4-5 days	6-10 days	> 10 days	≤ 5 days	6-10 days	11-15 days	> 15 days
Anaheim			✓			✓		
Chula Vista			✓				✓	
Long Beach	✓				✓			
Palm Desert		✓				✓		
Palmdale		✓				✓		
Pasadena	✓				✓			
San Diego	✓					✓		
Santa Ana		✓				✓		
Santa Monica				✓				✓
LA County	✓						✓	
LA City		✓						□
Total	4	4	2	1	2	5	2	1

FIGURE 3 SCRC AVERAGE NUMBER OF BUSINESS DAYS BETWEEN PERMIT APPLICATION AND SUBMISSION AND DECISION (□ SIGNIFIES NO ANSWER)

In Figure 3, only four jurisdictions in the SCRC issue a decision on residential permit applications within the three days or less: the City of Long Beach, the City of Pasadena, the City of San Diego and Los Angeles County. For commercial applications, only two jurisdictions issue decisions within five days: the City of Pasadena and the City of Long Beach.

Three of the jurisdictions in the SCRC also offer same day, over-the-counter solar permits for residential installations: the City of San Diego, the City of Pasadena, and the City of Los Angeles. However, eight of the eleven jurisdictions issue a decision on residential applications within a maximum of five business days, and six offer decisions on commercial applications within six to ten days or less. Alternatively, the Cities of Long Beach,

Pasadena, San Diego and Los Angeles provide mechanisms for installers and customers to expedite the permitting process by paying an additional fee.

PERMIT FEES

As equipment costs of solar decline, permit fees are an increasingly large percentage of the installed coast of a photovoltaic system. Consistent and predictable fees can help to create a standard set of operating procedures, reduce uncertainty, and produce more accurate estimates of system cost.[iii] The Sierra Club recommends that all cities reduce their solar permit fees to $300 or less for residential PV systems that are flush-mounted to rooftops.[iv] The $300 fee is based on the cost of two to four hours of labor for experienced building department staff members to process the permit and complete the inspection. In 2009, the SolarABCs suggested the following fee guidelines: $75–$200 for small PV systems (up to 4 kilowatts); $150–$400 for large PV systems (up to 10 kilowatts); and $15–$40 per kilowatt for systems above 10 kilowatts.[v] Additionally, some jurisdictions have demonstrated their support for solar PV by not setting permitting fees higher than cost- recovery levels.

Solar Permit Fees in the SCRC

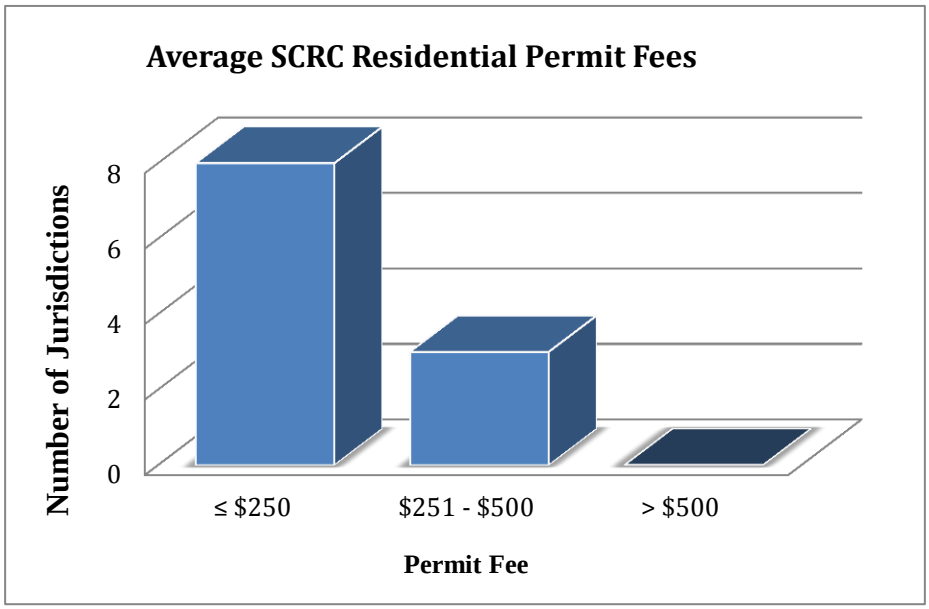


FIGURE 4 AVERAGE SCRC RESIDENTIAL PERMIT FEES

Solar permit fees in the SCRC are generally low for residential projects. In Figure 4, of the eleven jurisdictions in the SCRC, only three have solar permit fees higher than $250, and none have fees that are higher than $500. Moreover, the Cities of Anaheim, Santa Ana, Santa Monica, and Palm Desert have completely waived residential solar permit fees in their territories to encourage installations. Fees for commercial projects vary widely across jurisdictions – mainly due to a broad range of PV system sizes in commercial installations – with most cities basing their commercial PV permit fees on either project size or a sliding scale. For example, average permit fees for commercial installations in the County of Los Angeles are $11,615 and over

$8,000 in the City of Los Angeles.[vi] The following best practices document will investigate how large the systems reported were and if they result in the jurisdiction charging more than cost recovery. The City of Anaheim waives all solar energy permit fees for commercial projects. The cities of San Diego and Chula Vista have flat permit fees for residential and commercial projects with commercial permit fees around $1,000 and residential fees below $500.

INSPECTIONS AND COMMUNICATION WITH UTILITY

Residential Average Time from Inspection Request to Actual Inspection with AHJ				
Jurisdiction	≤ 2 days	3-5 days	6 -10 days	> 10 days
Anaheim	X			
Chula Vista	x			
Long Beach	X			
Palm Desert	X			
Palmdale	X			
Pasadena	X			
San Diego	X			
Santa Ana		x		
Santa Monica	x			
LA County	x			
LA City				X
Total	10	1	0	0

FIGURE 5 AVERAGE TIME FROM INSPECTION REQUEST TO ACTUAL INSPECTION

While the initial permitting application is important to ensure a solar PV system will meet local codes, ultimately the inspection determines how the system was installed, if it meets safety requirements, and if it corresponds to the submitted permitting application plans. SolarABCs recommends creating an expedited process for permitting and placing more emphasis on the field inspection, since "a well-organized permit package may simply make a poor-quality contractor look good initially, while the final inspection can more clearly identify competent installers." [viii] To determine the effectiveness of the inspection process, two time components can be evaluated: 1) the time it takes from an inspection request to the actual inspection and 2) the window of time when the inspection can occur.

Inspections in the SCRC

Of the eleven jurisdictions in the SCRC, nine have the inspection information available online, with the Cities of Anaheim, Long Beach and San Diego offering not only an online option, but also email, in-person, and a mail option for obtaining inspection information. Nine of the eleven jurisdictions in the SCRC perform a final inspection for both residential and commercial projects within less than two business days after the request for inspection

is made, with the City of Palmdale performing same day inspections if the request is received by a certain time. Of the SCRC jurisdictions, the longest inspection times are in Santa Ana, which reported three to five business days for residential and six to ten business days for commercial projects.

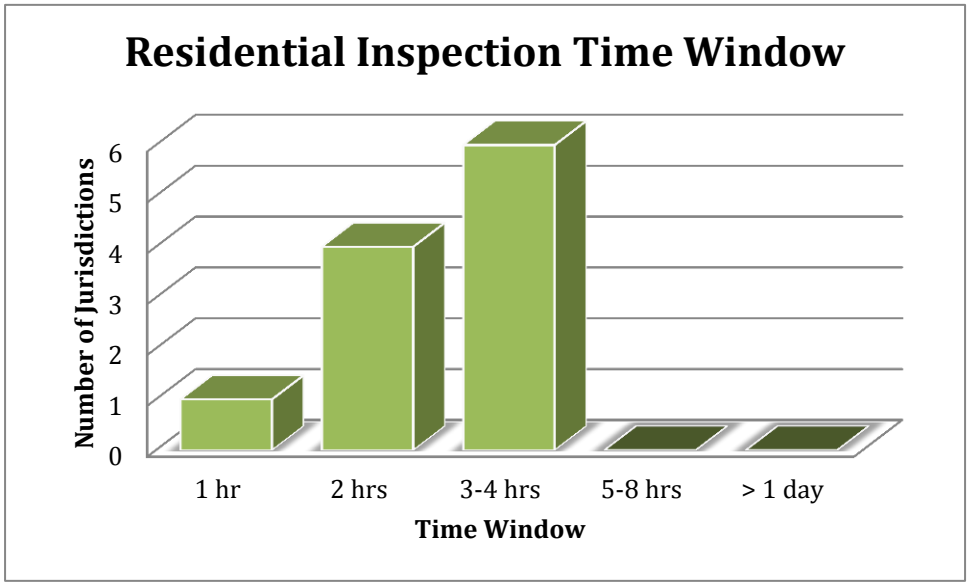


FIGURE 6. AVERAGE TIME FROM INSPECTION REQUEST TO ACTUAL INSPECTION FOR RESIDENTIAL INSTALLATIONS

Inspection windows for all jurisdictions are relatively short: four of the cities report a two-hour time window, and the rest have a three- to four- hour inspection window. The City of Chula Vista has a one-hour inspection window. For commercial projects, the time windows increase slightly with the County of Los Angeles increasing their time window from two hours to three to four and the City of Chula Vista increasing from one hour to two.

Another important aspect of the inspection process is the communication between the jurisdiction and the local utility. The process varies depending on whether a customer or contractor must first submit an application to the utility or jurisdiction. If the jurisdiction is first, upon completion and approval of a field inspection, the jurisdiction may notify the local utility that the system is ready to be interconnected to the electric grid. In other cases, a customer will complete a utility application first, which will trigger the process to request a permit by the jurisdiction. In either option, an open line of communication ensures the permitting and interconnection processes will be seamless and save time and money for customers, installers, jurisdiction, and the utility.

Six of the eleven jurisdictions coordinate with their local utility regarding inspection requirements and on-site inspection times for the permit and interconnection inspection. All of the municipal utilities communicate with their permitting departments, while San Diego Gas and Electric (SDG&E) is the only investor-owned utility that communicates with its partner jurisdictions. In the Southern California Edison (SCE) territory, practices vary if the jurisdiction communicates with the utility;

but typically, the contractor has to notify SCE and submit the appropriate information. In contrast, in Pasadena, the customer is required to get approval letter from the utility before being allowed to pull a permit for a solar installation. The letter is generated after customer applies for PSI rebate and engineering has approved the interconnection.

LOOKING FORWARD

Challenges

A significant challenge in standardizing solar PV permitting lies in the fact that the permitting process varies so widely from jurisdiction to jurisdiction. The four counties with cities in the SCRC – Los Angeles, San Diego, Orange, and Riverside – have a total of 168 incorporated cities with different permitting departments and processes. Harmonizing processes between these jurisdictions would require significant coordination. Additionally, among city staff there are variations between how different building officials and inspectors interpret a jurisdiction's policies. Training, education, and a dialogue within jurisdictions and between building officials and contractors are crucial to a successful streamlined permitting process.

Opportunities

Despite the challenges of standardizing permitting processes in the eleven SCRC jurisdictions, there are numerous opportunities for solar permitting to quickly improve. For example, eliminating the need for multiple application submittals saves time for applicants and reduces errors arising from numerous forms being passed between reviewing departments. Second, an online application database allows for ease of submittal and tracking, thereby reducing the number of paper applications that must be submitted and held by jurisdictions and the time required to submit a permit. Furthermore, there is a history of solar application processes going completely online, such as the California Solar Initiative rebate program. Although this process requires training for applicants to understand requirements, repeat applicants would understand the programs quickly and the permit submittal and review process would become faster. Also, as the number of photovoltaic systems increases, the online database would streamline application processing thereby reducing the workload of local jurisdiction staff. By standardizing the process in an online application database, contractors can easily submit permit applications throughout numerous jurisdictions without having to learn various differences in submittal requirements. Moreover, solar PV permitting information should be placed in an easy-to-access location online; this will reduce the number of people coming into the jurisdictions to get paper applications and ask common questions, and save permitting officials' time by deferring to the website for frequently asked questions. CCSE is also working on identifying a public platform – such as Go Solar California – for compiling all permitting information for SCRC jurisdictions.

STATE EFFORTS IN SOLAR PERMITTING

While permitting requirements are uniquely a local issue, several activities taking place at the state level could help to achieve a more streamlined and consistent permitting process.

Solar Permitting Guidebook

Governor Jerry Brown's Office of Planning and Research has spearheaded a solar permitting working group to identify barriers to solar installations to support Governor Brown's 12 GW statewide goal for distributed renewable energy. The working group is in the process of finalizing a solar permitting guidebook that explains the general permitting process for solar PV projects and outlines current state law governing solar PV installations. It also outlines a voluntary model streamlined process (based on best practices to date) that local governments can emulate to improve permitting. The guidebook is intended to be an informational resource for local governments, customers, and contractors.

The guidebook also contains an optional "toolkit" comprised of several template documents—such as a standard permitting checklist— that a local government can utilize as part of their informational materials. The intent of these templates is to ensure that smaller jurisdictions can learn from what has already been implemented across the state and create materials to improve their permitting process.

Legislative Changes

In addition to the work by Governor Brown, the California legislature is considering several bills related to solar permitting.

- **AB 2135.** This bill would require the California Building Standards Commission, the Department of Housing and Community Development, and the State Fire Marshal to cooperate in developing a model ordinance and guidelines to assist local agencies to develop building standards and permitting processes for solar distributed generation technology on residential and commercial property and post the model ordinance and guidelines on their respective Internet Web sites.[ix]
- **SB 1222.** This bill would make several findings and declarations relating to clean energy. The bill would state the intent of the Legislature to enact legislation that would assist local jurisdictions to develop building standards and permitting policies to ensure that there is a streamlined process for the deployment of solar distributed generation in the residential and commercial building sectors.[x]

INTERCONNECTION PROCESS

Interconnection is the process by which the owner of an electric generating system connects to a utility's electric distribution system. Customers are typically required to have completed the interconnection process prior to receiving a financial incentive, such as those offered by the California Solar Initiative, from the utility.

This section will give an overview of the three major interconnection process categories and how they are implemented within the Rooftop Solar Challenge team area: (1) Application and Information Access, (2) Processing Time, and (3) Inspections.

IOU VS. POU INTERCONNECTION PROCESS

Interconnection processes vary greatly, in large part because they are regulated by different entities. In the SCRC team, the investor- owned utilities are regulated by the California Public Utilities Commission; therefore, they have a similar net metering and interconnection processes. In contrast, a locally elected or appointed board typically governs municipal utilities. For example, the Los Angeles Water and Power Board of Commissioners govern LADWP. In addition, the California Energy Commission implements and enforces certain statewide laws that apply to municipal utilities. The difference in regulation creates inconsistencies in the way utilities process applications as well as the length of time to interconnect distributed generation systems.

IOUs		POUs
SDG&E	SCE	
San Diego	County of Los Angeles	Anaheim
Chula Vista	Long Beach	City of Los Angeles
	Palmdale	Pasadena
	Palm Desert	
	Santa Ana	
	Santa Monica	

Both types of utilities have the same components of an interconnection process, but not necessarily in the same order. The following components typically comprise an interconnection process, in no particular order:

1. Application: Customer submits application to utility to begin interconnection review.

2. Internal Review of Application: Initial internal review, responds back to customer for clarifications or errors; checks for compatible meters.
3. Solar Incentive Process: Process in which applicant applies for solar incentive rebate.
4. Communication with AHJ: Utility and jurisdiction communicate to ensure that both the permitting application and the interconnection application are both completed before interconnection.
5. Solar Inspection: Utility inspects solar installation to ensure that the system complies with what was included in the utility application and follows safety regulations and policies.
6. Permission to Operate: Utility issues a permission to operate letter to the customer after completing the technical review.
7. Meter Upgrades (optional): If a meter upgrade is necessary, a meter tech must access the property to install a new meter.
8. Billing Changes: The utility's billing department must update the customer's billing system and electric rates to reflect a solar installation

As a sample process, Figure 7 depicts SCE's process for interconnecting PV systems under 10kw.

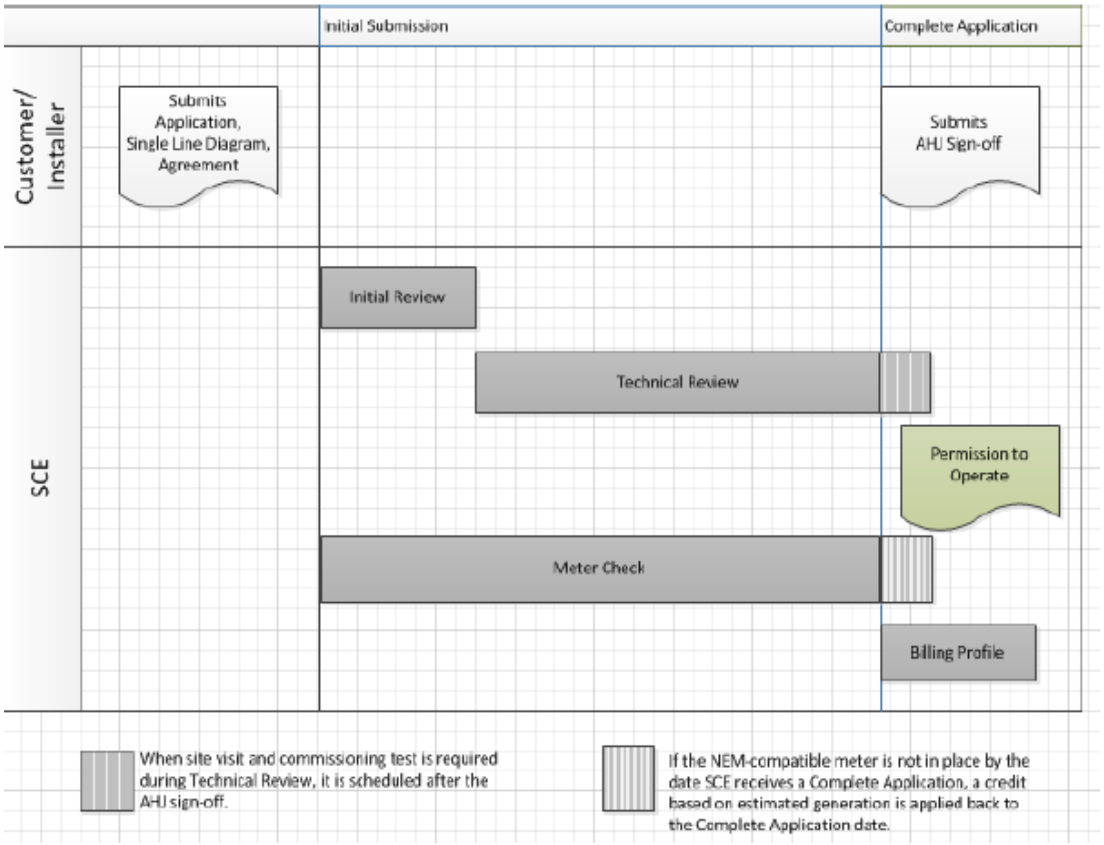


FIGURE 7. SCE INTERCONNECTION PROCESS

APPLICATION AND INFORMATION ACCESS

Interconnection processes vary depending on whether the customer begins the application process at the utility or the jurisdiction. In some cases, the jurisdiction has already signed off to install the solar system, and the customer must then complete an application with their local utility. Across the participating utilities, the interconnection process varies considerably between the investor-owned Utilities (IOUs) and publically owned utilities (POUs), as well as between residential and non-residential systems. Generally, the application form includes the submission of a single-line diagram, signed agreement(s), and completed application form.. Applications are then internally screened – if there are corrections or clarifications they are requested from the customer – and finally the application is approved and funds are reserved if there will be an incentive payout after the system is installed and inspected by all the applicable parties.

Application and Information Access in the SCRC

For IOUs, the interconnection process is fairly standardized, with all systems requiring an interconnection application and clearance from the local permitting office. The IOUs have all of the information clearly accessible on their website, with a designated point of contact for any questions. In the case of smaller systems (up to 30 kW for SDG&E and 100 kW for SCE), this application can be submitted online or through email, with large systems requiring mail delivery of physical application forms. For systems smaller than 10kw, customers have to fill out a short one-page interconnection agreement, which requires CEC-certified equipment, point of connection below the main circuit breaker (load-side tap) and no back-up generation. For any systems over 10 kW must submit a 14-page generating facility interconnection application.

SCE engages customers by following up with email tips and newsletters to help with the interconnection process. In SDG&E territory a customer can submit and track the status of the application online through the entire process. SDG&E is currently upgrading their online system by allowing contractors to save drafts into the system, upload documents from smartphones and iPads, providing status updates on pending work, and including automated notification and reports. The online improvements are scheduled to be available in later summer 2012. SCE is also in the process of creating an online system to submit and track applications.

For municipal utilities, the applications are accessible on each utility's website and there is generally a designated point of contact or helpline for questions about PV interconnection. LADWP allows installers to complete, submit, and monitor their LADWP solar incentive

applications online through their PowerClerk database application. Figure 8 shows how interconnection process information is available for all utilities in the SCRC.

	Residential				Commercial			
	How is information describing the utility interconnection process accessible? (Check all that apply)				How is information describing the utility interconnection process accessible? (Check all that apply)			
	Online and easily accessible	Online	Email	In person/ mail	Online and easily accessible	Online	Email	In person/ mail
Anaheim		✓	✓	✓		✓	✓	✓
SDGE	✓	✓	✓	✓	✓	✓	✓	✓
SoCal Edison	✓	✓	✓	✓	✓	✓	✓	✓
Pasadena		✓		✓		✓		✓
LADWP		✓	✓			✓	✓	
Total	**2**	**5**	**4**	**4**	**2**	**5**	**4**	**4**

FIGURE 8. INTERCONNECTION PROCESS INFORMATION ACCESSIBILITY.

Residential systems up to 10 kW are exempt from the interconnection application/agreement process all together. In Pasadena, the agreements are integrated as part of the application for smaller systems. For commercial systems, all but one application can be completed in less than one day. However, all municipal utilities require the customer to submit either in person or through the mail. Both LADWP and Pasadena Water and Power (PWP) require a wet signature on interconnection and net metering agreements for commercial projects, with LADWP taking the additional step of requiring a signature from the City Attorney. At LADWP, the interconnection agreement for systems above 10kw requires an insurance requirement, indemnification, and a three-year term. The customer is also required to re-sign the interconnection agreement every year or LADWP will disconnect the system. In addition to the interconnection exemption for residential systems, LADWP offers installers pre-inspection consultations to ensure that the final inspection process runs smoothly.

INTERCONNECTION PROCESS TIME

For purposes of evaluation, interconnection process time is measured from the date the utility's interconnection department approves the application, with all required documents (e.g., final single line diagram, final building permit, etc.), to the date the "permission to operate" letter is issued. However, there are many internal steps that can affect the

interconnection process time, such as a technical review or approval from the billing department. One aspect of the timing is the utility decision to approve or deny an interconnection application. Figure 9 outlines the number of business days for a utility decision on an interconnection application.

	What is the average number of business days between application submission and utility decision (approval/denial) for installation to proceed?							
	Residential				Commercial			
	≤ 3 days	4-5 days	6-10 days	> 10 days	≤ 5 days	6-10 days	11-30 days	> 30 days
Anaheim	✓				✓			
SDGE	✓					✓		
SoCal Edison				✓				✓
Pasadena				✓			✓	
LADWP				✓				✓
Total	**2**	**0**	**0**	**3**	**1**	**1**	**1**	**2**

FIGURE 9. TIME FRAME FOR INTERCONNECTION APPLICATION TO DECISION.

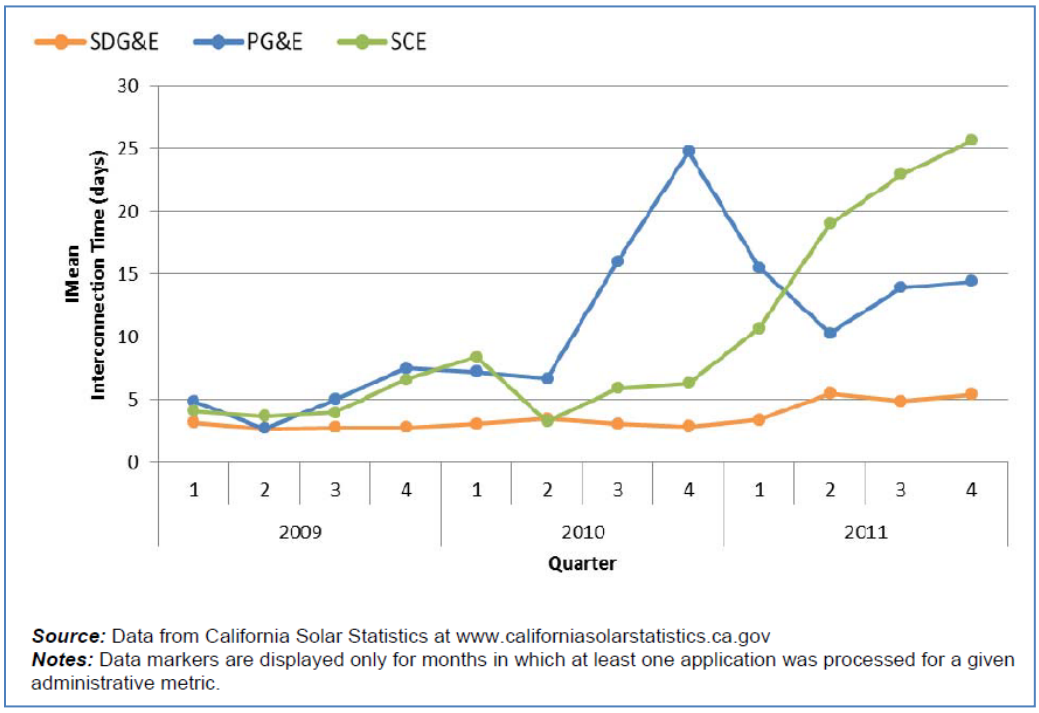
Interconnection Process Time in the SCRC

There are significant variations in complexity of the approval process internally within a utility. For example, SCE has three major departments that are involved in solar installations: net energy metering, engineering, and billing. In contrast, LADWP internally has six different internal departments for systems under 10kw, including the City Attorney and City Controller. Pasadena also requires contract routing through several city departments, including City Finance, Liability and Claims, City Attorney, and City Clerk (using same process as any other contract with the City). Utilities have cited that the coordination of the internal processes is one of the major obstacles to achieving a more streamlined interconnection process.

Data from the California Solar Initiative Report Data Annex for the second quarter of 2011 shows the average number of calendar days to complete the interconnection process for residential and nonresidential customer projects by California's three large IOUs (Figure 9 and 10).

This time is generally under the utility's control and does not depend on additional inputs from other entities, such as cities or counties. However, extraneous factors such as

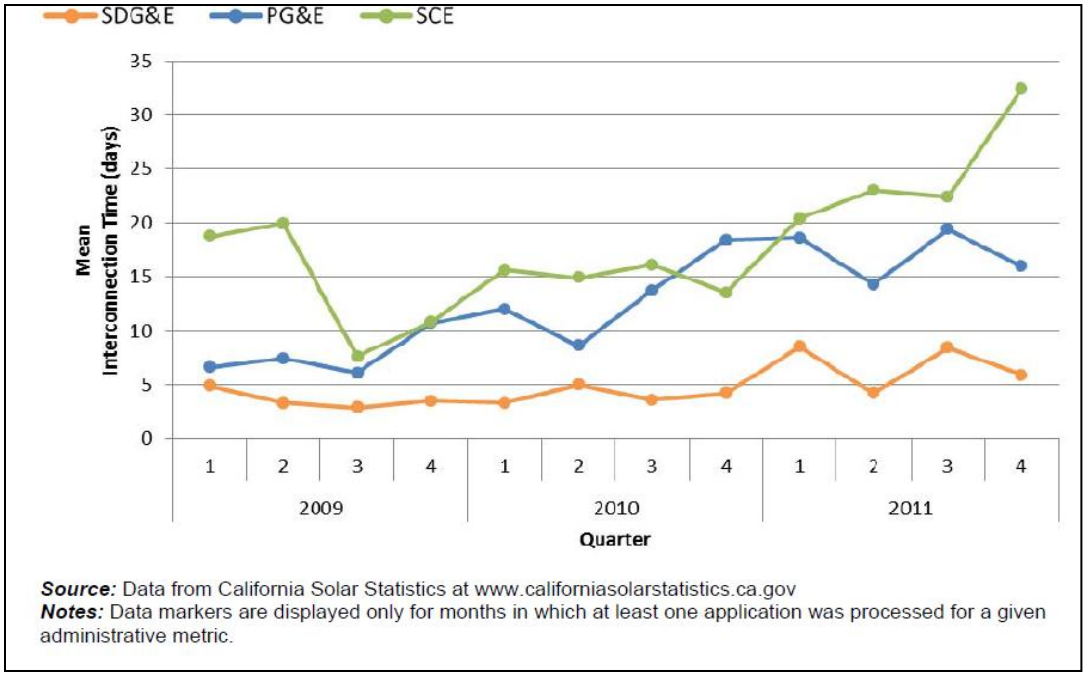
customer availability, adverse weather conditions, or unexpectedly high volume of applications may impact this process.



Source: Data from California Solar Statistics at www.californiasolarstatistics.ca.gov
Notes: Data markers are displayed only for months in which at least one application was processed for a given administrative metric.

FIGURE 10. RESIDENTIAL INTERCONNECTION TIME FOR IOUS.

Among the large IOUs, SDG&E and SCE respectively have the shortest and longest process for interconnection of net-metered solar systems. Together, these two electric utilities cover 55% of the IOU customer base in the state—and over 40% of the entire state's electric consumers.



Source: Data from California Solar Statistics at www.californiasolarstatistics.ca.gov
Notes: Data markers are displayed only for months in which at least one application was processed for a given administrative metric.

FIGURE 11. NONRESIDENTIAL INTERCONNECTION TIME FOR IOUS

INTERCONNECTION INSPECTION

For residential systems, interconnection typically requires an on-site inspection by a representative of the local utility. Larger commercial systems often require more in-depth interconnection studies to demonstrate that the system will not adversely affect the grid. Some utilities inspect 100% of their systems, while others only inspect a percentage. Figure 12 shows the average number of business days from inspection request to actual inspection for the utilities in the SCRC.

Inspections in the SCRC

	What is the average number of business days from the inspection request to actual inspection?							
	Residential				Commercial			
	≤ 2 days	3-5 days	6 -10 days	> 10 days	≤ 2 days	3-5 days	6 -10 days	> 10 days
Anaheim	✓				✓			
SDGE	✓				✓			
SoCal Edison			✓				✓	
Pasadena		✓				✓		
LADWP				✓				✓
Total	2	1	1	1	2	1	1	1

FIGURE 12. TIME FRAME FOR INSPECTION REQUESTS.

The inspection portion of the interconnection process also varies in the SCRC. For example, SDG&E currently schedules interconnection automatically once the city approves an installation and does not require the installer to be on-site. SDG&E is changing to an online database for interconnection for systems under 30kW. For these systems, the installer must confirm that the system is accessible 24 hours a day, upload a picture of the meter and the warning plague, and will then be automatically interconnected without an inspection. Inspection requests within LADWP are made internally within the City and are scheduled within a 24-hour period, and the city actively seeks to avoid failures by offering pre-inspection consultations. However, inspections in SCE territory tend to have lengthy inspection windows and take longer to be carried out than in any other utility territory. LADWP inspects 100% of the installed systems. PWP does not require an interconnection and metering agreement application, but rather includes it in the initial incentive application package that is reviewed by the Engineering department. With approval, there is no need for an additional interconnection application. In PWP territory, when the system is fully installed, the customer will submit the incentive claim form and signed off building permit, which will notify PWP that the installation is complete and the utility must inspect the site. PWP inspects 100% of the installed systems prior to interconnection.

LOOKING FORWARD

Challenges

There are significant differences in regulation between Investor-Owned and Publically Owned utilities within the Rooftop Solar Challenge team. This disconnect in the regulatory framework creates inconsistencies in the way utilities process applications as well as the length of time for the interconnection of distributed generation systems. It also makes the prospect of unifying requirements and processes difficult to attain for the Rooftop Solar Challenge team. However, similar fundamentals of the interconnection process can be adopted among the SRSC team. For example, some utilities have simplified their interconnection agreements, which can be used as a model for another utility to adopt.

Opportunities

The trend of utilities nationwide is to automate and submit applications electronically. San Diego Gas and Electric is on the forefront of these upgrades and is expecting to roll out their new online system this summer. The new rollout will give the Rooftop Solar Challenge team the opportunity to assess the changes and learn firsthand from SDG&E's challenges and successes. Like the permitting inspection process, there are significant variations in how inspectors interpret installation regulations and the accuracy of certain installers. Therefore, there is an opportunity for an open dialogue to coordinate training across the Rooftop Solar Challenge for utility inspectors and installers.

NET ENERGY METERING AND INTERCONNECTION STANDARDS

Net Energy Metering
is the billing arrangement by which a customer can receive a financial credit for power generated by their onsite system and fed back to the utility.

- California Public Utilities Commission

Interconnection
is the technical rules and procedures allowing customers to "plug in" to the grid.

- Network for New Energy Choices Freeing the Grid

Net energy metering (NEM) is defined as the billing arrangement by which a customer can receive a financial credit for power generated by their onsite system and fed back to the utility. In essence, a customer's meter spins backwards to credit the customer for power generated onsite. Interconnection standards are the technical rules and procedures that enable a distributed generation technology, such as solar, to "plug in" to the grid. The CPUC regulates and standardizes all utilities' NEM policies in the SCRC region, with the exception of LADWP. Figure 13 shows that California is the leader in installed grid connected. California's high solar penetration can be attributed to a suite of policies favorable to solar installations, including electric rates, incentives, net metering, interconnection, and climate change policies. According to the Network for New Energy Choices' *Freeing the Grid 2011* report: "Net metering rules and interconnection programs provide the smooth roads that transition us from dependence on centralized, dirty power generation to a system that embraces clean, distributed resources. Without effective policy, that road is going to be rocky and tumultuous. We are now in the decade of retail grid parity for photovoltaics, and as the price of renewables aligns with that of grid supply, good net metering and interconnection policies are going to be more important than ever."[xi]

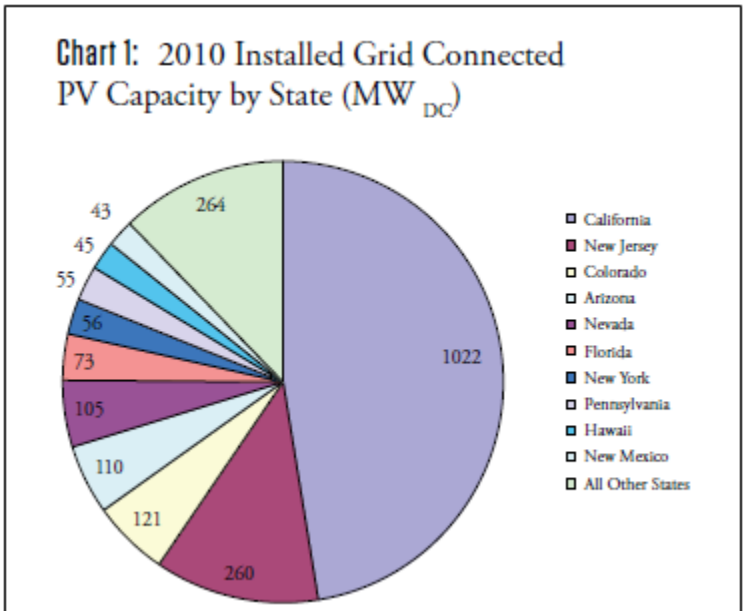


FIGURE 13. 2010 INSTALLED GRID CONNECTED BY STATE
SOURCE: NETWORK FOR NEW ENERGY CHOICES FREEING THE GRID 2011

California has a long history of leadership on NEM and interconnection standards. According to *Freeing the Grid* report, California scored an "A" rating for its NEM policies and a "B" in its interconnection policies. An "A" rating in NEM policy signifies the following: "Full retail credit with no subtractions. Customers

protected from fees and additional charges. Rules actively encourage use of distributed generation (DG)." A "B" rating in Interconnection policy signifies "Good interconnection rules that incorporate many best practices adopted by states. Few or no customers will be blocked by interconnection barriers. There may be some defects in the standards, such as a lack of standardized interconnection agreements and expedited interconnection to networks." By meeting a uniform set of procedures and electrical specifications, a wide variety of products and technologies can be developed at low cost by unleashing innovation and customer choice in the marketplace. Additionally, the use of one consistent engineering standard ensures safe and practical daily application.[xii]

Net Energy Metering Standards

NEM requirements in California have facilitated photovoltaic (PV) installations with eligibility available for behind-the-meter PV systems up to 1 MW, and renewable energy credit (REC) ownership remaining with the system owner. In 2010, these requirements contributed to large capacity additions throughout the state, which led to the decision to expand the NEM cap for the IOUs from 2.5% to 5% of peak demand through Assembly Bill 510.[xiii] In a CPUC's proposed decision released April 11, 2012, the CPUC clarified the definition of "aggregate peak demand" used to calculate the NEM cap. The resulting change from the current method based on system-peak demand changed to the denominator being non-coincident peak. The change will significantly increase the number of MW allowed to install under the NEM cap. The CPUC final vote is scheduled to occur on May 24, 2012.

Benefits of a Revised NEM/Interconnection Policy:

- ✓ Encourage greater renewable energy generation;
- ✓ Promote customer-sited distributed generation;
- ✓ Help meet the goals of renewable portfolio standards;
- ✓ Reduce demand on an increasingly strained electric grid;
- ✓ Reward investment in renewable technologies;
- ✓ Facilitate energy self-reliance;
- ✓ Improve air quality and public health;
- ✓ Reduce greenhouse gas emissions;
- ✓ Promote in-state economic development and create jobs.

A recent decision by the California Public Utilities Commission (CPUC) directed the investor owned utilities (IOUs) – Pacific Gas and Electric Company (PG&E), SCE, and SDG&E – to expand the virtual NEM tariff designed for the Multifamily Affordable Solar Housing (MASH) Program (a component of the California Solar Initiative) to all multitenant developments.[xiv] This change will effectively open the market to a new urban segment previously untapped by PV integrators.

Net Metering in the SCRC

California's NEM law, which took effect in 1996, requires all utilities, with the exception of the LADWP, to offer NEM to all customers for solar and wind-energy systems up to 1 MW (with SCE and SDG&E allowing 1 MW of net metering for all renewable and zero-emissions technologies, not only solar and wind.) LADWP also allows PV customers to net-meter their systems without the statewide 1 MW limit requirement. In addition to the increase in the NEM cap for the IOUs to 5% of peak demand, all of the POUs in the SCRC allow capacity limits of 5% of peak demand or greater. The largest difference amongst the member jurisdictions is that while in the IOU territories REC ownership is maintained by the customer, however in the LADWP and Anaheim Public Utility (APU) service territories, customers almost exclusively sell their RECs to the utility for energy export in exchange for additional compensation. Similarly, in the Pasadena Water and Power Department (PWP) customers own the RECs for self-consumed generation but may opt to sell RECs associated with any net surplus generation to PWP for additional compensation.

Section	Question[2]	PG&E	SCE	SDG&E
4.b.1	Total NEM Customers Interconnected	60,204	28,405	15,768
4.b.2	Solar Specific NEM Customers Interconnected	60,053	27,998	15,735
4.b.3	CSI Specific NEM Customers Interconnected[1]	33,847	18,932	8,327
4.b.4	Total NEM Cumulative Capacity Interconnected (CEC AC-MW)	559.01	325.64	125,368
4.b.5	Solar Specific NEM Capacity Interconnected (CEC AC-MW)	556.88	309.75	125,259
4.b.6	CSI Solar Specific NEM Capacity Interconnected (CEC AC-MW)[1]	358.45	216.99	76.73
4.b.7	Percentage of aggregate customer peak demand represented by all NEM customers	2.68%	1.41%	2.68%
4.b.8	Percentage of aggregate customer peak demand represented by solar NEM customers	2.67%	1.34%	2.68%
4.b.9	Percentage of aggregate customer peak demand represented by CSI-participating solar NEM customers[1]	1.72%	0.94%	2.08%

FIGURE 14 NEM CAPACITY, CUSTOMERS, AND AGGREGATE PEAK DEMAND AS OF DECEMBER 31, 2011
SOURCE: CALIFORNIA SOLAR STATISTICS

Typically utilities prefer that a customer upgrades to a smart meter when a distributed generation system is installed. All of the utilities in the SCRC provide either a new meter at no cost to the customer. In SCE territory, if the meter is not installed within thirty days of the permission to operate letter, SCE refund the customer a credit on their utility bill. All of the SCRC utilities allow for net metering under third party ownership models. Further, SDG&E and SCE allow for a net metering credit for a community renewable system that may not be physically located on the customer's property.

NEM Standards and Rates

In early 2012, SDG&E submitted its Phase 2 General Rate Case for service in 2013 that would have established a network use charge (NUC) for customers, including solar PV generators, for their use of the electric distribution grid. SDG&E stated that under its current rate design, NEM customers do not pay their fair share of costs incurred on their behalf by the utility to provide service, including use of the distribution system. As a result, SDG&E contended that non- NEM customers subsidize NEM customers. The CPUC stated that new charges that would have increased a DG customer's generator costs beyond those of other customers in the same rate class who are not generators, and therefore rejected the proposed NUC.[xv]

SDG&E has convened the San Diego Solar Stakeholder Collaboration Group (Stakeholder Group) to bring together interested stakeholders to explore how to make solar energy sustainable in the San Diego region. One of the main findings from initial meetings was the need for a detailed analysis of to identify and determine the current and projected future costs and benefits of net energy metered solar photovoltaics to SDG&E's electric system. On behalf of SDG&E and the Stakeholder Group, the Energy Policy Initiatives Center (EPIC) is managing a study to determine the impact of the services that utilities provide NEM customers and the services NEM customers provide to the grid (including but not limited to energy, capacity, and environmental benefits) and to assess costs and/or value of each of these services. The objective of this study is to quantify the costs and benefits create by NEM PV systems to the electric grid. [xvi]

The CPUC hired Energy and Environmental Economics, Inc. (E3) to perform an analysis of the costs and benefits of net-energy metering (NEM) in compliance with Public Utility Code 2827, which requires the CPUC to "…submit a report to the Governor and the Legislature on the costs and benefits of net energy metering…"[xvii] Some key highlights of the report are that on a lifecycle basis, all PV generation on NEM tariffs will result in a net present value to ratepayers of approximately $230 million over the next 20 years.

INTERCONNECTION STANDARDS

> "CA Rule 21 was drafted through a cooperative effort of stakeholders, including California's two principal energy agencies and the state's investor-owned and key municipal utilities."
>
> - Interstate Renewable Energy Council

Interconnection standards are the technical rules and procedures allowing customers to "plug in" to the grid. Interconnection standards for a vast majority of California's distributed PV systems are guided by Rule 21. Rule 21 was developed jointly by the California Energy Commission (CEC) and CPUC through an extensive stakeholder engagement process, including representatives from the state's electric utilities.

The standards cover topics such as:

1. Eligible Technologies
2. Individual System Capacity
3. "Breakpoints" for Interconnection Process
4. Timelines based on Federal Energy Regulatory Commission (FERC) standards
5. Interconnection Charges
6. Engineering Charges
7. External Disconnect Switch
8. Certification
9. Technical Screens
10. Standard Form Agreement
11. Insurance Requirements
12. Dispute Resolution
13. Rule Coverage

Interconnection Standards in the SCRC

Investor-Owned Utilities Interconnection Standards

In 2000, Rule 21 was adopted by the CPUC as the model tariff establishing metering and operating standards for systems interconnected into the grid of its regulated IOUs – PG&E, SCE, and SDG&E – which accounts for roughly 80% of the state's total energy usage.[xviii] Rule 21 only applies to systems that connect to a utility distribution system, not projects that connect to a utility transmission system, which are regulated under Wholesale Distribution Access Tariff- (WDAT) or smaller projects interconnecting to lines under FERC jurisdiction, which use the Small Generator Interconnection Procedures (SGIP).

Rule 21 created an 8-screen initial design review that simplified the interconnection path for interconnection to distribution systems. Rule 21 has created the successful interconnection of 110,593 Solar PV systems through December 31, 2010 and has not triggered any major reliability problems with interconnecting a high volume of self-generation facilities.

According to Network for New Energy Choices' (NNEC) interconnection best practices[xix], California's Rule 21 compares favorably to the FERC SGIP, receiving a grade of "B" (with only 6 states achieving a grade of "A") as compared to a "C" for the FERC SGIP. The lower grade can be attributed to the following characteristics of Rule 21:

Rule 21 System Goals

- ✓ Size and Technology Neutral
- ✓ Offers Simplified Interconnection for Distributed Generation
- ✓ Sets out operating and metering standards for DG facilities that draw on technologies available to customers
- ✓ Saves DG customers time and expense
- ✓ Improves communication between utilities and customers
- ✓ Maintains consistent DG interconnection standards in CA

- Does not establish a specific size limit for generation facilities;
- Has one evaluation process for an interconnection request of all sizes;
- Fees are waived for NEM customers, engineering and interconnection charges are capped;
- Forces a supplemental review for any projects that fail any of the technical screens;
- Has simple interconnection forms for small-scale interconnection projects;
- Does not automatically mandate insurance for most systems.

Rule 21 Settlement Process

In 2011, the CPUC convened a working group of eighty parties to review and modify the original Rule 21 to evaluate issues related to transparency and the interconnection study framework. The following are some of the main points of the Rule 21 settlement:

- A national best practice for distributed generation penetration levels is introduced, under which aggregate interconnected generating capacity can be equal to 100% of minimum load on a distribution line section. This provision is the first of its kind in the U.S.
- Specific, transparent time frames for each analysis track are proposed, ranging from simplified Fast Track review to the detailed Independent Study Process.

- New rules under which distributed generation developers obtain and retain queue position are set out, including publication of an integrated queue by each investor-owned utility for exporting generating facility applicants at the distribution level.
- A "Pre-Application Report" is proposed as a first look at a potential point of interconnection, to assist distributed generation developers with early identification of potential technical benefits or challenges of siting decisions.
- New dispute resolution mechanisms are introduced that are designed to respond to developers' needs, including a utility ombudsman authorized to address certain interconnection-related disputes, and expedited handling of timeline-related disputes by the CPUC's Alternative Dispute Resolution Program.
- It also establishes data points of online queues that IOUs are required to maintain and publish. [xx]

On March 16, 2012, fourteen parties to the Distribution System Interconnection Settlement Process filed a settlement to the CPUC. The CPUC is reviewing the settlement and expected to make a decision by third quarter of 2012.

Public Utilities Interconnection Standards

In addition to the CPUC-regulated IOUs, many POUs have also established interconnection and NEM rules based on the framework established by Rule 21. Pasadena Water and Power (PWP) is not subject to Rule 21, however PWP's Regulation 23 is the equivalent to Rule 21 that governs interconnection practices.[xxi] Anaheim Public Utility (APU) is also not subject to Rule 21, but rather uses Rule No. 22 to set requirements for their interconnection standards.[xxii]

Although LADWP follows the guidelines under Rule 21, it has some variances in its interconnection practices: not waiving fees for NEM customers or capping engineering fees; requiring a redundant external disconnect switch; and, not addressing insurance requirements.

PWP's Regulation 23 is very similar to Rule 21 in most technical aspects. For example, all customer-sited generators qualify, generators of up to 20MW are permitted, UL 1741 / IEEE 1547 standards are used in addition to other options, some FERC technical screening standards are adopted, and timelines are the same as FERC standards. Similar to LADWP, PWP has some significant differences from the IOUs under Rule 21: interconnection fees, specifically engineering fees, are not capped at certain levels and an additional disconnect switch is required for installations (but net metered customers' fees are waived) and a redundant external disconnect switch is required.

Anaheim's Rule 22 has some of the same characteristics of Rule 21, such as following UL 1741 / IEEE 1547 standards and fixing engineering charges, but also has some additional variations including scale-based interconnection fees, redundant external disconnect switches, and additional requirements for insurance.

LOOKING FORWARD

Challenges

The NEM context became somewhat more complicated in 2011 and 2012 with the passage of the California Feed-in Tariff (FIT) and Renewable Auction Mechanisms (RAM). Local jurisdictions and their active contractor communities had to enact broad changes to implement the FIT, which has expanded and diversified the population of installed solar projects, and changed the economics of solar in California. Alongside the FIT, the implementation of the RAM increased penetration of larger-scale PV systems in many jurisdictions. Looking ahead, the need for effective interconnection and net metering policies is crucial as there is greater PV penetration and larger and more complex PV projects are proposed.

Opportunities

The Rule 21 settlement process is a great opportunity to adapt to a rapidly growing PV market in California, especially in terms of large installations. The change to allow Virtual NEM for all multitenant properties and the implementation of the FIT in the IOU territories will open the market to a new urban segment previously untapped by PV integrators. The increase in interconnection applications that are associated with these projects (especially complex, energy exporting PV installations) will stress Rule 21's interconnection review process. Developing a "fast-track" screening process for specific PV installations to facilitate approval of PV projects will help reduce a backlog in interconnection applications which will allow for expedited review of larger generation facilities instead of a lengthy independent review which commonly occurs currently. These changes to Rule 21 could reduce bottlenecks for applicants and help keep California's interconnection standards at the forefront of the nation.

INCENTIVES AND FINANCING MECHANISMS

> *"Large upfront cost is the most frequently cited barrier to investing in solar energy. The ability of a consumer to finance a system and pay for it over time, rather than having to pay the whole cost up front, is often critical in determining whether or not the consumer adopts solar at all."*
> ***U.S. Department of Energy***

California is among the nation's leaders in providing and supporting innovative financing options for rooftop solar PV. All of the state's major PV incentive programs allow for alternative ownership structures and actively engage Power Purchase Agreement (PPA) and Lease providers when designing and changing program designs and requirements. In the CSI, the nation's largest PV incentive program, third-party-owned systems represent a significant and growing percentage of application volume, representing over 47% of all applications received since the start of 2011 (Table 1). Alternative ownership structures extend to the POUs as well, with universal support for leased systems and across-the-board support for PPAs.

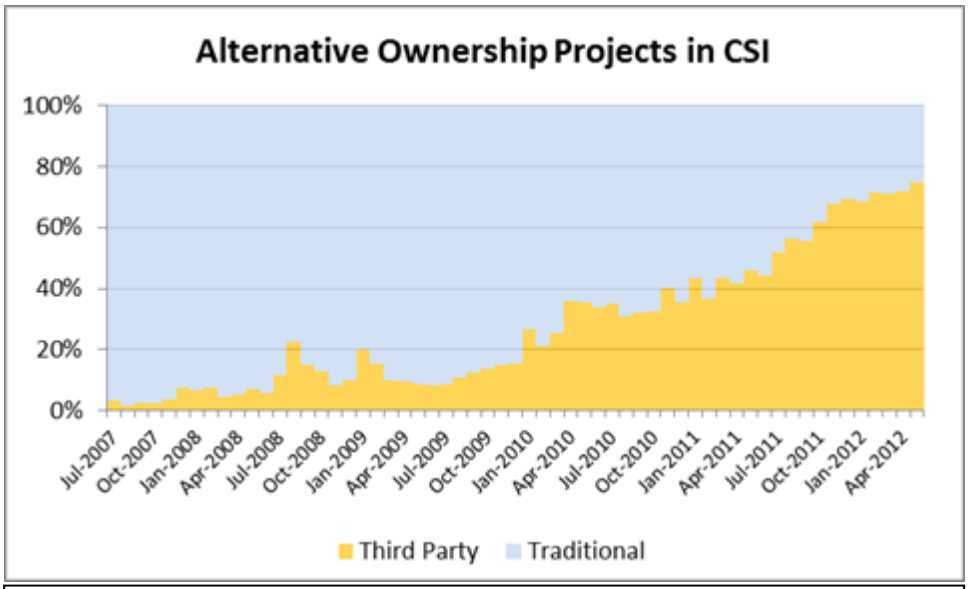


Table 1 – Percent of CSI Applications with Third-Party Ownership Structure (i.e., Solar Lease or PPA) - Source: California Solar Statistics Current Working Dataset [xxv]

SOLAR INCENTIVE PROGRAMS

All eleven jurisdictions in the Southern California Rooftop Challenge (SCRC) have access to solar incentives for eligible installations. All utilities in California fall under the GoSolar! brand, part of the requirements from Senate Bill 1. The two of the investor-owned utilities (IOU) in the SCRC participate in the California Solar Initiative-- offering solar incentives to eight of the eleven jurisdictions – and three of the POUs administer municipal rebate programs. As shown in Figure 11, incentives are much higher in the publicly owned utilities, in part because they have significantly lower rates and need a higher incentive to justify an installation of solar.

IOU Incentive Programs

The California Solar Initiative[xxiii] (CSI) is a $2.1 billion solar rebate program for California consumers that are customers of the investor-owned utilities - PG&E, SCE, SDG&E. This program offers solar rebates to customers in seven of the eleven jurisdictions in the SCRC: Chula Vista, Long Beach, Palm Desert, Palmdale, San Diego, Santa Ana, Santa Monica, and Los Angeles County.

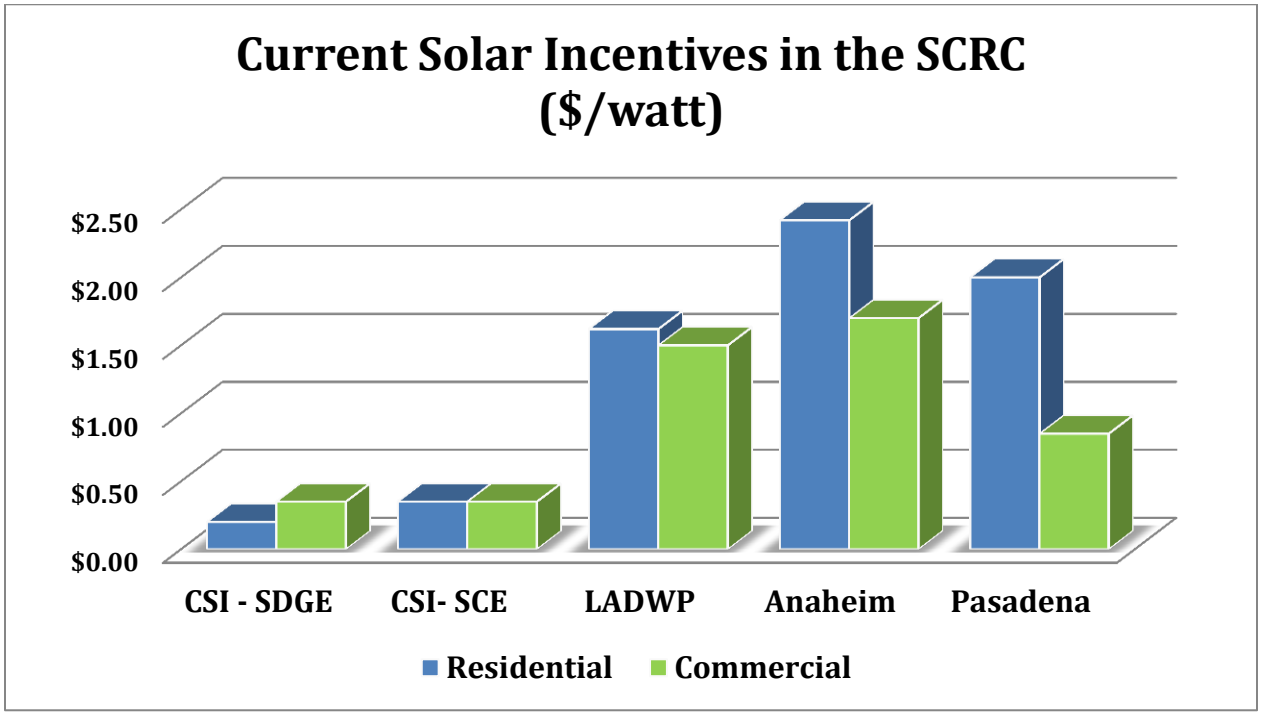


FIGURE 15 CURRENT SOLAR INCENTIVES IN THE SCRC

*** OTHER REBATE TYPES ARE AVAILABLE IN CERTAIN UTILITY TERRITORIES. SOME UTILITIES OFFER DIFFERENTIAL REBATES FOR CUSTOMER-OWNER SYSTEMS OR LEASED SYSTEMS, AND ALSO FOR ESTIMATED AND PERFORMANCE-BASED REBATES.**

POU Incentive Programs

The Los Angeles Department of Water and Power (LADWP) Solar Incentive Program[xxiv] is a multi-year investment designed to expand solar power in the City of Los Angeles. Anaheim Public Utilities offers the Anaheim Solar Advantage Program[xxv] which provides financial rebates to customers who purchase and install solar energy systems. The Pasadena Solar Initiative[xxvi] is offered by Pasadena Water and Power which aims to help its customers install 14 MW of solar power by 2017 through rebates, additional incentives and educational programs.

FINANCING MECHANISMS

Financing Mechanism	Type of Program	Anaheim	Chula Vista	Long Beach	Palm Desert	Palmdale	Pasadena	San Diego	Santa Ana	Santa Monica	County of Los Angeles	City of Los Angeles
PACE	Federal/ State					CalPACE		CalPACE**				
*Program Pending **Exploring Program	Local		California First	Commercial PACE	Energy Independence Program	Commercial PACE		California First**		Commercial PACE	Commercial PACE / Residential PACE*	Commercial PACE / Residential PACE*

FIGURE 16 PACE PROGRAMS IN THE SCRC- REFER TO APPENDIX 1 FOR FULL CHART OF FINACNING MECHANISMS

PACE PROGRAMS

Property-Assessed Clean Energy (PACE) programs are financing mechanisms for property owners to fund energy efficiency and renewable energy projects. They allow property owners to repay financial obligations through standard property assessment mechanisms, which are secured by a property lien and paid with standard property taxes. The concept of using property-assessed financing to fund clean energy projects was created – and first established – in California. Beginning in 2008 with the Berkeley First Pilot[xxvii] and a municipally-funded effort in Palm Desert, the PACE concept moved quickly to Sonoma County, San Francisco, San Diego and dozens of other localities across the nation.

Since their inception, PACE programs have changed and evolved to adapt to the varying needs of jurisdictions and fluctuating policy landscape in California. Sonoma County's Energy Independence Program[xxviii] (SCEIP) was established in 2009, making it the first countywide PACE program in the State of California. This program is administered by the local government and is funded by a combination of public bonds, private investors, and open market financing. SCEIP offers a mechanism to finance renewable energy improvements through a voluntary assessment that is attached to the property and is paid back through the property tax system at a fixed interest rate.

In 2010, the Federal Housing Finance Agency's mortgage-finance agencies, Fannie Mae and Freddie Mac, resisted the idea that PACE loans would be senior to existing mortgage debt if borrowers default on their loans. The disagreement created a virtual deadlock in PACE programs on any federally-financed properties, thereby dramatically altering the viability of PACE programs. To reduce the significant barriers to implementation, PACE programs evolved to address not only the loan seniority issue, but also to reduce funding and administrative risks to local jurisdictions, and to diversify financing options for property owners. The first of these modified PACE programs in California was the Western Riverside Council of Governments (WRCOG). Although this program is administered by the WRCOG it differs from previous PACE programs by receiving funding from private entities. The Los Angeles County PACE program[xxix] went one step further by creating a third-party administered, privately-funded program for commercial buildings, thereby reducing involvement of the local jurisdictions in both financing and administration. Finally, CaliforniaFIRST[xxx], a statewide program created by a joint authority of the California Statewide Communities Development Authority (CSCDA), created an open-market PACE program which allows renewable energy financing through any private lender, not just those associated with the program. The CaliforniaFIRST projects will be overseen by third-party administrators, as opposed to the local jurisdiction.

The State of California has remained very active on the PACE issue, filing suit against the federal government to revise its policy of refusing to back or purchase loans on properties with PACE liens. Two of the three primary cosponsors of the federal PACE legislation currently under consideration—HR 2599, the PACE Assessment Protection Act—are from California.

PACE in the SCRC

Within the Southern California Solar Rooftop Challenge (SCRC), myriad variations of PACE programs exist. As the Federal issues with PACE are being resolved, different jurisdictions have created local programs to spur financial investment. For example, the City of Palm Desert's Energy Independence Program (EIP)[xxxi] offers loans for both residential and commercial solar projects. After Fannie Mae and Freddie Mac challenged the seniority of PACE loans, the City of Palm Desert restarted the EIP with the requirement that property owners must sign a disclosure statement that participation in the program may violate their mortgage contracts. The Los Angeles County PACE program offers funding for nonresidential solar projects for the following cities: Long Beach, Palmdale, Santa Monica, and the City of Los Angeles. The CaliforniaFIRST program offers PACE financing for the City of Chula Vista, and the City of San Diego is exploring adopting this program for implementation in its territory in the near future. The California PACE program also offers

PACE financing for commercial properties in Palm Desert and the City of San Diego are exploring this program as well.[xxxii]

THIRD-PARTY OWNERSHIP

Financing Mechanism	Type of Program	Anaheim	Chula Vista	Long Beach	Palm Desert	Palmdale	Pasadena	San Diego	Santa Ana	Santa Monica	County of Los Angeles	City of Los Angeles
Third-Party Ownership	Local	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs
	Other			Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)			Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	

FIGURE 17 THIRD PARTY OWNERSHIP IN THE SCRC

Third-party ownership is a financing mechanism for reducing or eliminating the high upfront cost of solar PV installations. Two common third-party ownership mechanisms exist in the solar PV market: 1) Power Purchase Agreements (PPA) and 2) leases. A PPA is a legal agreement between a solar developer and a property owner where the developer finances, owns, installs, operates and maintains a PV system located on the property. The property owner then agrees to purchase all of the electricity produced by the PV system

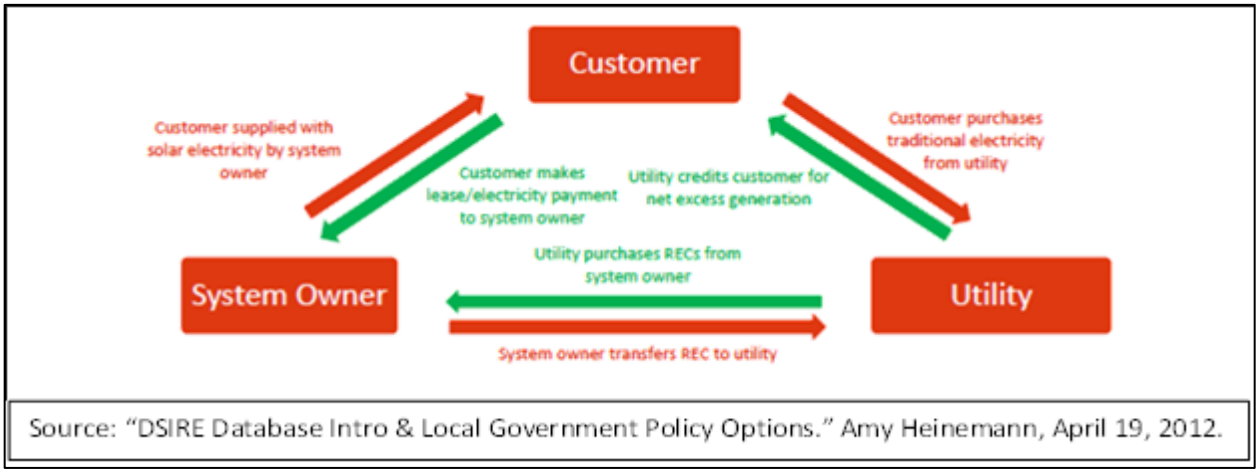


FIGURE 18 DSIRE LOCAL GOVERNMENT POLICY OPTIONS FOR SOLAR

from the solar developer. A solar lease is a transaction between a solar developer and a property owner where the developer agrees to lease a PV system located on the property. Unlike a solar PPA which involves a sale of electricity, under a solar lease the property owner makes monthly lease payments to the solar developer. In return, the property owner benefits directly from all of the electricity produced by the PV system. One major

difference between a PPA and lease is that under a PPA the third party owner takes the risk of system performance; that is, the customer only pays for what the system generates. In the lease format, the customer takes the risk of a poor system performance since set lease payments are made regardless of the amount of energy generated. Thus, under a lease, it is critical that the customer ensures that the highest quality installation is performed, to maximize system generation capability.

Third Party Ownership in the SCRC

All jurisdictions in the SCRC allow both PPAs and leases for residential and commercial solar installations. SCE offers an additional leasing option, the Solar Rooftop Program[xxxiii], in which commercial building owners can lease their roof space to SCE to install solar systems. SCE will pay the building owners to lease their rooftop and generate electricity for the SCE energy grid.

Financial Structures Available for Solar

End User Comparison of Financial Structures

Characteristics	Capital Purchase (Cash)	PPA	Lease
Upfront Capital Requirement	Yes	No	No
System Performance Risk	Yes – The owner is responsible if the system does not perform	No – PPA provider has ongoing responsibility to ensure the system continues to operate as required	Yes – The lessee / host is responsible if the system does not perform
Ongoing Payments	Fixed monthly fee if financed through a loan	Ongoing payments tied to electricity produced by the facility	Fixed monthly fee - the lessee bears the increased cost of electricity in a poor solar month
Optimize Tax Benefits	No – Owner may not get full benefit if unable to reduce taxable income or if government or not-for profit	Yes	Yes
Ongoing Cost	Operations, maintenance and insurance costs	No	Operations, maintenance and insurance costs
Guarantees/Liens Required	Probably if financed	No (assuming host has sufficient credit rating)	Probably
Length of Contract *Typical	N/A	20 – 25 years	7 – 10 years
Buyout price at the end of contract	N/A	Fair Market Value	Fair Market Value
Early Buyout	N/A	Yes – after year 7	Yes – after year 7
Option to renew	N/A	Yes	No

FIGURE 19 FINANCIAL STRUCTURES AVAILABLE FOR SOLAR (SOME LEASES, LIKE LADWP, HAVE LEASES MORE THAN 20 YEARS OR THEY REDUCE THE INCENTIVE LEVELS)

SECURED FINANCING

Secured financing is a loan in which the borrower pledges some asset as collateral. Typically for a solar installation this collateral is a home or building. The following secured loans are available in the SCRC region:

Financing Mechanism	Type of Program	Anaheim	Chula Vista	Long Beach	Palm Desert	Palmdale	Pasadena	San Diego	Santa Ana	Santa Monica	County of Los Angeles	City of Los Angeles
Secured Loans	Federal/ State	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver
	Local	HELOC / Low-Interest Energy Efficiency Loan (Non-Res)	HELOC / Home Upgrade, Carbon Downgrade	HELOC / Matadors Community Credit Union	HELOC	HELOC	HELOC	HELOC	HELOC	HELOC / Matadors Community Credit Union	HELOC / Matadors Community Credit Union	HELOC
	Other				CHF Residential Energy Retrofit Program							

FIGURE 20 SECURED FINANCING IN THE SCRC

Home Equity Lines of Credit[xxxiv] *(HELOCs) and Home Equity Loans (HELs)*[xxxv]

HELOCs are forms of revolving credit in which a home serves as collateral. A HEL is a loan that has a fixed rate and term and also uses a home as collateral. The major difference between these two types of financing mechanisms is that HELOCs are similar to a credit card – you can withdraw money as needed and pay back the debt indefinitely – whereas an HEL gives you a one-time lump sum of cash that is paid off over a fixed amount of time.

FHA 203(k) Rehabilitation Loans[xxxvi]

The Federal Housing Administration (FHA), which is part of the U.S. Department of Housing and Urban Development (HUD), administers various single family mortgage insurance programs. These programs operate through FHA-approved lending institutions which submit applications to have the property appraised and have the buyer's credit approved. These lenders fund the mortgage loans which the Department insures, thereby giving a line of credit to the property owner to make property upgrades, such as solar PV installations. The 203k loan can be applied to purchase or refinance a home and immediately begin renovations. This loan can then be paid off over the term of your mortgage.

HUD Title 1 PowerSaver Loans (Secured or Unsecured)[xxxvii]

The PowerSaver program is a financing variant of the Title I property Improvement Loan of the HUD. The Title 1 program insures loans to finance small or moderate improvements to a home, such as a solar energy upgrade. The PowerSaver pilot will provide lender insurance for secured and unsecured loans up to $25,000 to single family homeowners specifically targeting residential energy efficiency and renewable energy improvements.

In addition to the widely-available secured finance mechanisms previously discussed, certain jurisdictions have adopted other variants of secured financing in their regions. These programs will typically have lower interest rates that were reduced by funds from the local jurisdictions.

Home Upgrade, Carbon Downgrade (HUCD) Community Revolving Loan Fund[xxxviii]

The goal of the City of Chula Vista's Home Upgrade, Carbon Downgrade (HUCD) Community Revolving Loan Fund is to provide low interest financing for property owners to implement energy efficiency retrofits and/or to install renewable energy systems at their homes or businesses in Chula Vista. This program is administered by the City of Chula Vista, which in certain cases, will reduce the interest rate to 0%. This program uses $130,000 from the American Recovery and Reinvestment Act to provide the initial capitalization for the revolving loan. As the loans (and interest in some cases) are repaid, the repayment money will fund the next rounds of loans to eligible customers. To be eligible for the HUCD, homeowners must have equity in their property equal to the amount of the loan.

Low-Interest Energy Efficiency Loan Program[xxxix]

Anaheim Public Utilities (APU) offers Low-Interest Energy Efficiency Loans to small businesses, some landlords, and nonprofit organizations. These loans offer low-cost financing for energy-efficiency measures through the State Assistance Fund for Enterprise, Business and Industrial Development Corporation (SAFE-BIDCO). Under this program, Anaheim customers can obtain low-interest loans with no application fees or points. In addition, APU will provide, at no cost to the customer, a comprehensive energy audit and analysis as required by SAFE-BIDCO to identify and verify energy uses and needs, and evaluate the feasibility of potential measures to improve efficiency.

Los Angeles County Energy Loans[xl]

The Energy Upgrade California (EUC) Program in Los Angeles County offers property owners a 2% interest rate on eligible residential energy efficiency and solar projects. These loans are offered through Matadors Community Credit Union with support from Los Angeles County.

The CHF Residential Energy Retrofit Program[xli]

For a limited time, eligible homeowners can get a 0-3% fixed interest rate loan to make energy efficiency home improvements through the CHF Residential Energy Retrofit Program. Additional grants up to $1,950 per home are also available. No minimum credit score or appraisal on the home is required to qualify. In the SCRC, the CHF program is

available in Riverside County (the City of Palm Desert), San Diego County (the Cities of San Diego and Chula Vista) and to the City of Palmdale in Los Angeles County.

UNSECURED FINANCING

Unsecured financing is a loan that is not backed by any collateral. Credit cards and personal loans are the most common examples of unsecured financing. Unsecured financing products available for energy upgrades include personal loans and contractor-sponsored products. However, unsecured financing does come with drawbacks: a good line of credit is typically required with no collateral and the interest rates tend to be higher than with secured loans. However, with some publicly-supported programs, the jurisdiction will pay the interest rate down to attract borrowers.

In the SCRC region, there are many unsecured, solar-specific loans available:

Financing Mechanism	Type of Program	Anaheim	Chula Vista	Long Beach	Palm Desert	Palmdale	Pasadena	San Diego	Santa Ana	Santa Monica	County of Los Angeles	City of Los Angeles
Unsecured Loans *Program Pending	Federal/ State	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*
	Local							SDMCU Energy Efficient & Solar Loans		Community Solar Fund*	Matadors Community Credit Union	Matadors Community Credit Union
	Other									Municipal Facilities Revolving Load Fund*		

FIGURE 21 UNSECURED FINANCING IN THE SCRC

Fannie Mae Energy Loan[xlii]

Fannie Mae offers a direct, non-recourse consumer loan program that will finance up to $20,000 in energy improvements without putting a lien on your home. Energy Loan is a simple interest, fixed rate loan with longer terms available then typical bank financing.

San Diego Home Energy Upgrade Program[xliii]

San Diego Metropolitan Credit Union and the City of San Diego have partnered to provide affordable financing to San Diego residents on home energy efficient upgrades as part of the San Diego Home Energy Upgrade program.

Los Angeles County Energy Loans[xliv]

As with the secured loan, Matadors Community Credit Union and Los Angeles County are offering low-interest loans for energy upgrades and renewable energy projects.

	Public	Secured	Unsecured	Solar Specific
Payment Terms	Longer	Longer	Shorter	Varies
Monthly Payment	Lower	Lower	Higher	Usually Higher
Rates	Lower	Lower	Higher	Higher
Tax Deductible	No	Yes	No	No
Special Concerns		Includes closing costs.		Ownership provisions on sale of home or end of contract.
	Typically, local financing programs use subsidies to offer lower interest rates compared to other loan options.	Secured financing is a loan in which the borrower pledges some asset as collateral. For example, a residential mortgage loan uses the house it finances as collateral.	Unsecured financing is a loan that is not backed by any collateral. Credit cards are the most common examples of unsecured financing.	Solar specific financing typically involves a homeowner contracting with a third party to produce solar energy for their homes or lease equipment.

FIGURE 22. COMPARISON OF SECURED AND UNSECURED LOANS

The City of Santa Monica Municipal Facilities Revolving Loan Fund

The City of Santa Monica is developing two unsecured financing programs in its jurisdiction: the Municipal Facilities Revolving Loan Fund (MFR) and the Community Solar Fund (CSF). The MFR is a revolving loan program where the City will commit $100,000 to develop solar projects on municipal buildings. Upon repayment the savings and incentives from State and Federal rebate programs will be added to the fund to cover administration, marketing and outreach.

OTHER FINANCING MECHANISMS

Feed-in Tariff

In April 2012, LADWP announced that it was rolling out a feed-in tariff for solar customers. Through the FIT Demonstration Program, LADWP will purchase energy from small and medium-scale solar photovoltaic projects (from 30 kilowatts up to 999 kilowatts in ac capacity). The program is a new opportunity to sell energy directly to LADWP by using a customer's property as the generation site. The demonstration program will offer 10 MW, which will ramp up to between 75 MW and 150 MW for the full program. LADWP plans to purchase solar energy from projects under a long-term Standard Offer Power Purchase Agreement (SOPPA) that will be offered through competitive bids and utilizes time of

delivery pricing. The pilot program is scheduled to start receiving applications in May 2012 and award contracts by September of 2012.

Community Solar

Community solar is a way for multiple individuals to share in the benefits of a single solar installation by pooling resources to develop a community-scale solar energy project that provides the benefits of solar energy to a group or neighborhood. Community solar is important as it gives an opportunity for renters, condo owners, and homeowners with shading issues that prevent them from installing a PV system a means to directly benefit from a solar energy. SDG&E proposed two community solar programs to the California Public Utilities Commission – "Share the Sun" and "SunRate."[xlv] In each case, solar generating facilities would be located within the SDG&E service territory, giving access to solar facilities for customers who cannot install their own system. Los Angeles County also offers the Open Neighborhoods Community Solar program[xlvi] which allows its customers to essentially purchase a share of a larger distributed renewable energy facility and net meter against the system output in proportion to their ownership share.

Virtual Net Metering

In the SCRC, one community solar option that is available for numerous jurisdictions is virtual net energy metering (VNEM). VNEM is an agreement under which a share of production credits from a single integrated solar system can be distributed to individual ratepayers in a multi-tenant property. Currently VNEM is offered for low-income multifamily projects in SDG&E and SCE territories, but is currently being expanded to include all multi-tenant and multi-meter properties.

LOOKING FORWARD

Despite the many incentive programs available in the Southern California region, expanding financing options still remains one of the largest hurdles for widespread PV adoption.

Challenges

The standstill in residential PACE programs after the FHFA's actions remains one of the largest challenges to financing solar PV. Prior to FHFA involvement, PACE was quickly becoming one of the most popular mechanisms for solar financing. However, PACE is not the silver bullet for solving solar financing problems; two potential pitfalls for PACE programs are potential high interest rates and a need for equity in a property. Therefore,

solar financing requires numerous complementary programs to reach a broad market for widespread adoption.

Furthermore, although the CPUC rejected SDG&E's proposed network usage charges, it is likely that more network use charge challenges will be brought up again. Currently there are several bills that will require the CPUC to do a study similar like the San Diego Solar Stakeholder Collaboration Group to determine if cost shifting is occurring statewide.

Opportunities

Amongst the partners involved in the SCRC region, a wide range of financing programs exists. With enhanced information sharing leading to the adoption of best practices, Southern California can distinguish itself as a leader in solar financing mechanisms. By implementing the various financing programs that are already operating in other cities, a wide range of solar financing options will be available for consumers. Additionally, the State of California has moved forward with modified PACE programs despite the resistance to residential PACE from the FHFA. When the FHFA deadlock is resolved, California's alternatives to current PACE programs will be ready to implement. Furthermore, the establishment of new community solar programs and the widespread availability of solar leases have formed the foundation for investment opportunities for both non-property-owners and those whose properties are not ideal for solar installations.

SOLAR PLANNING AND ZONING

Solar planning and zoning are important policy issues that protect the rights of solar system owners and the ease with which PV can be installed effectively. Zoning rules affecting solar in the Southern California region, and the state as a whole, already exhibit a good deal of consistency and support for rooftop solar PV due to two California Laws: the Solar Rights Act and the Solar Shade Control Act. These laws provide a framework for consumers to exercise the legal right to solar access on their properties. The majority of jurisdictions in the SCRC territory adopted zoning practices to allow for the installation of rooftop solar facilities automatically "as a matter of right." Multiple jurisdictions have established local standards for new construction to reduce barriers to solar deployment through solar easements and solar-ready construction guidelines, expedited permitting and entitlements processes.

Solar Easements
allow the owner of a solar energy system to secure rights to current and future access to sunlight from a neighboring party whose property could be developed in such a way (e.g., building, foliage) as to restrict the system's access to sunlight.

Solar Rights Laws
provide protection for residential and businesses by limiting or prohibiting private restrictions (e.g., neighborhood covenants and bylaws, local government ordinances and building codes) on the installation of solar energy

SOLAR RIGHTS AND ACCESS

CALIFORNIA SOLAR RIGHTS ACT

The Solar Rights Act, enacted in California in 1978, creates a legal framework for solar access by allowing consumers access to sunlight and limiting the ability of homeowners associations (HOAs) and local governments from preventing the installation of solar energy systems. Specifically, the Solar Rights Act seeks to achieve this goal by: limiting the ability of covenants, conditions, and restrictions to preventing solar installations; requiring local governments to preserve passive cooling and heating opportunities to the extent feasible in new developments; prescribing how local governments can permit solar projects; and establishing a legal right to solar easements.

One requirement of the Solar Rights Act that directly affects local jurisdictions is the establishment of permitting standards. Section 65850.5 of the Act creates permitting standards for solar energy systems based on health and safety concerns, equipment certification and performance standards. The Act requires cities and counties to "administratively" approve applications to install solar energy systems by issuing a building permit or other non-discretionary permit. Based on this section of law, local

governments cannot implement or use a discretionary permitting process to review solar energy applications.

Additionally, by creating a legal right to solar easements, the Solar Rights Act set the foundation for local jurisdictions to standardize a process where property owners can secure rights to current and future access to sunlight from a neighboring property. Despite a need for solar access protection, there are some limitations to solar easements. First, a solar easement must be a collaborative agreement. Neighboring landowners must agree to grant an easement, it cannot be filed without consent from both parties. Second, a landowner may have to get easements from numerous neighbors, not just from one; this can complicate the ability to get a solar easement, since consent must be given by all neighboring parties. Finally, solar easements must be written, not simply expressed. If litigation were to occur over solar access, there must be a mechanism for submitting written solar easements.

Solar Rights Act: A Case Study

Numerous court cases have invoked the right of the Solar Rights Act. Below is a case which invoked California's solar access laws to protect solar access.

Palos Verdes HOA v. Rodman

This case provides guidance on what constitutes a reasonable restriction on solar energy system installations. The issue in this case was whether the HOA's actions violated the Solar Rights Act Section 714's reasonable restriction standard which allows an HOA to impose "reasonable restrictions that do not significantly increase the costs of the system or decrease its efficiency or specified performance, or that allow for an alternative system of comparable cost, efficiency, and energy conservation benefits." "Significantly" is defined as an amount not to exceed $2,000 over the original cost, or decreasing the efficiency of the system by 20% of the original proposal.

Rodman, a resident of the Palos Verdes Home Association, sought to install a passive solar water heating system on the roof of his home. The Palos Verdes HOA requires a homeowner to receive prior approval from the HOA for any improvements made outside of a home and has guidelines for installing specific solar energy systems. Rodman installed a system that was not approved by the HOA, and was informed that he had to remove the system after installation. Rodman argued that the HOA's solar installation guidelines restricted his solar energy system installation which was against his rights defined in the Solar Rights Act. By installing an HOA-approved system, Rodman argued that the cost would significantly increase. Since there were solar water systems in the HOA guidelines were of similar cost to the system installed by Rodman, the court ultimately ruled in favor

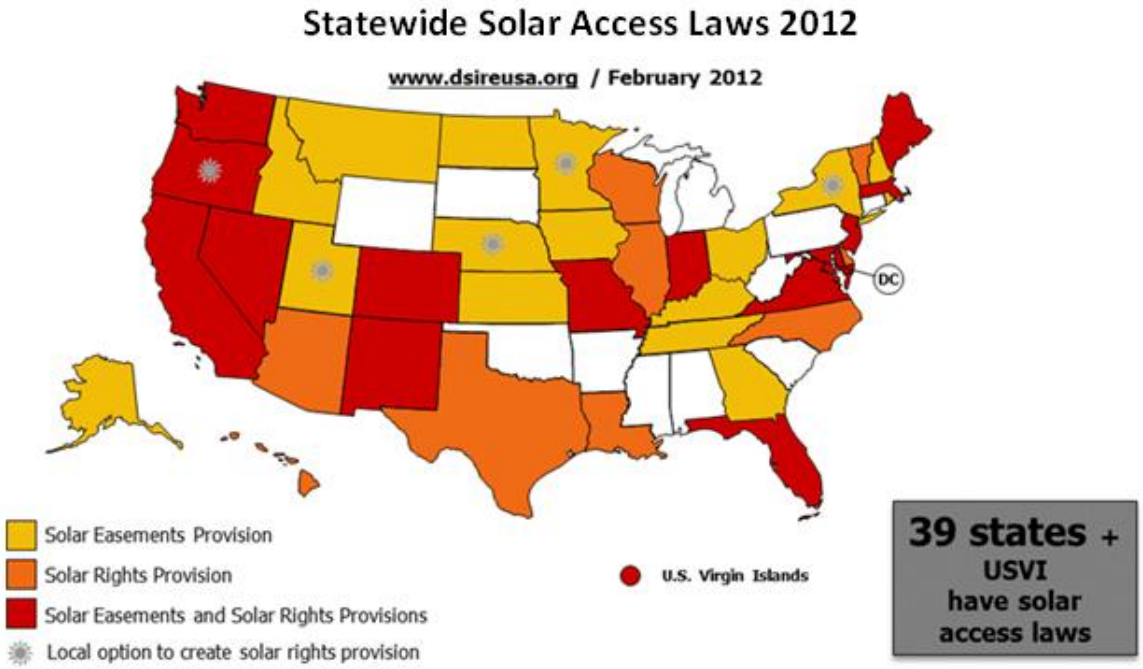


FIGURE 23 NATIONWIDE COMPARISON OF SOLAR ACCESS LAWS

of the HOA by stating that an installer of a solar energy system cannot ignore HOA guidelines when they would only minimally increase installation costs.[xlvii]

SOLAR SHADE CONTROL ACT

The Solar Shade Control Act advanced the protection of solar access by requiring that shading from neighboring vegetation cannot interfere with the use of solar systems on adjacent properties, provided the shading trees or shrubs were planted after the solar collecting device was installed. Specifically, vegetation cannot cast a shadow which covers more than 10 percent of a solar collector's absorption area at any one time between the hours of 10 a.m. and 2 p.m. if the tree or shrub is planted after the installation of the solar collector.[xlviii] Section 25985(a) of the Solar Shade Control Act allows any city or unincorporated areas of a county to adopt an ordinance exempting itself from the Act. This exemption applies only to trees planted and maintained by the municipality itself, and not to trees owned by private citizens. This has not been enacted by any municipalities in the SCRC, but in 2002 the County of Santa Clara in Northern California exempted itself from the Solar Shade Control Act. [xlix]

Solar Shade Control Act: A Case Study
California v. Bissett

This case was the first and only prosecution under the Solar Shade Control Act. In 1996, Bissett and her husband Treanor introduced three redwood trees in their backyard. Over the next five years, they planted five more redwoods. In 2001, plaintiff neighbor Vargas installed solar panels on his roof and shortly thereafter asked the defendants to remove or prune the shading redwood trees. After the defendants refused to comply, the District Attorney's Office commenced its prosecution against the defendants under the Act. [l]

As a result of this case, and the widespread attention it received nationwide following the conviction, an amendment to the Solar Shade Control Act was passed exempting all trees and shrubs planted prior to the installation of a solar panel.

Solar Rights and Access in the SCRC

The Solar Rights Act and Solar Shade Control Act both grant solar access protection measures and the ability to voluntarily enter into solar easements in all jurisdictions in the SCRC. There are two enforcement mechanisms within the SCRC to uphold consumers' solar access: agencies and courts of law. Jurisdictions could potentially use an agency – an administrative body tasked with the enforcement of solar rights laws or prohibitions of restrictive covenants – with the authority to engage in conflict resolution to avoid costly litigation that occurs in a court of law. However, since the California Solar Rights Act is a state law, a court of law is usually the best agent to inspect these laws, as opposed to a local jurisdiction. In the SCRC, Long Beach, Palm Desert, and Palmdale each use an agency to support solar rights, while the other eight jurisdictions rely on a court of law to enforce solar access claims. A similar and predictable process across jurisdictions would be helpful to create a common method for individuals challenging Solar Rights Laws.

Some jurisdictions have created Solar Maps in their jurisdictions with the purpose to predicting costs of installation for a landowner and showing where solar installations have occurred. The County of Los Angeles[li], City of Santa Monica[lii], San Diego[liii], Anaheim[liv], and Chula Vista all have solar maps. While these maps do show a property's access to the sun, there are limitations: they show solar access at one particular point in time, they do not show changes to neighboring vegetation, and they do not include the option of registration of the easement or solar access. Although these solar maps are a good starting point to demonstrating solar access, a good system of solar access registration is still lacking in the SCRC.

Solar Zoning

The State of California was the first to adopt a statewide Green Building Code, known as CALGreen [lv], which requires sustainable building practices for retrofits and new construction. Along the lines of CALGreen, many jurisdictions adopted other sustainable

building practices and ordinances to further the adoption of solar. With a few exceptions in historical districts of certain jurisdictions, solar installations are easy to pursue in the SCRC and solar access rights can be protected for current and future system owners through solar easements.

The large majority of jurisdictions in the SCRC indicate that more than half of the structures – and in many cases all structures – are zoned to allow rooftop solar facilities automatically "as a matter of right" without a public hearing or the issuance of a conditional permit. In all jurisdictions of the SCRC, smaller PV systems only need a basic sign-off at the Planning Department counter. However, some communities with historical districts such as Long Beach, Pasadena and Santa Ana have zoning requirements that require structures to undergo a formal hearing process to approve the installation of solar facilities.

Additionally, eight of the eleven jurisdictions have completed a review of local ordinances to identify barriers to solar installations to assist in eliminating extraneous barriers. The jurisdictions' approach toward solar ordinances varies greatly in the SCRC. The City of Palm Desert does not have any specific solar ordinances, but they created a conditional use permit process that allows abnormal installations to be reviewed and altered with the city's assistance. The City of Los Angeles is currently doing an overhaul of solar-related zoning codes by defining height restrictions and regulations directly in their building code making their sustainability requirements above and beyond CALGreen.

Alternatively, with the establishment of strong solar rights laws in California, many Planning Departments in the SCRC have chosen to not address solar rights access locally, leaving the regulations to the state. The City of Anaheim has no solar-specific ordinances in their building codes; instead, the planning department defers to state laws and approves solar projects on a case-by-case basis to ensure code compliance. The City of Los Angeles has created a solar zoning ordinance that addresses parking spaces and parking lots and building height limitations, and creates conditional use permits for other solar installations. By issuing conditional use permits the City of Los Angeles is allowing for solar installations to propose alternatives to what is addressed in the zoning codes; this allows the City to avoid complex zoning ordinances to address all scenarios and future technology developments of solar, allowing for reviews of installations that differ on a case-by-case basis.

New Construction

In addition to the mandatory CALGreen standards that were enacted in 2011, multiple jurisdictions have established local standards for solar-friendly new construction such as solar-ready construction guidelines, expedited permitting, and entitlements processes. In

the SCRC, Chula Vista, Long Beach, Palm Desert, and Pasadena have adopted solar-ready construction guidelines to enhance the ability to install solar on newly constructed homes and businesses. The City of Chula Vista passed a proactive solar-ready ordinance that requires the installation of electrical conduit and plumbing pipe for newly constructed homes during building.[lvi] The Cities of Palm Desert, Long Beach, and Los Angeles created building codes that require new developments to be solar-ready if the owner chooses to install a solar system.

LOOKING FORWARD

The Solar Rights Act and Solar Shade Control Act provide for strong support for solar access rights in California. These laws created a framework for the protection of solar rights, but there are still challenges to overcome and opportunities for advancement.

Challenges

Although the Solar Rights Act created a mechanism for local governments to develop solar easements, in many jurisdictions this has not occurred. Although solar easements can be a useful mechanism for protecting solar access, they have many shortcomings, one of which is the increased bureaucracy that a solar access ordinance could potentially create for consumers and installers. Another particularly challenging issue is implementing zoning standards to automatically allow solar PV in historical districts, where strict codes require comprehensive plan reviews. In the City of Los Angeles, properties that are located in Historic Preservation Overlay Zones (HPOZs) do not have to go before a board, but are required to follow specific design guidelines and must have a consultation with the Planning Department to mitigate any aesthetic impact of the panels.

Opportunities

Fortunately for the jurisdictions in the SCRC, California has some of the most progressive solar zoning practices in the nation. The Solar Rights Act and the adoption of solar easement ordinances provide blueprints that can be tailored to the SCRC jurisdictions to ensure that solar rights are protected. Although implementing enforcement agencies creates an opportunity to save time and money by avoiding costly litigation, this also creates another level of bureaucracy that may not be necessary due to a lack of frequency in solar access claims. Therefore, the jurisdictions of the SCRC can work together to incorporate the most effective, and least bureaucratically cumbersome, solar easement process that benefits all solar stakeholders.

In addition, there are examples of other jurisdictional policies conflicting with installation of solar panels. For example, if all new construction buildings are situated to access the sun to maximize solar PV system generation, it also increases the amount of heat from direct

sunlight, which requires more energy to cool the building. With the goal of reducing carbon emissions and energy use, jurisdictions could use a more global approach to determine the best mix of tools – optimizing new construction practices, adopting solar-friendly zoning, applying energy efficiency practices – for the development of a building code that incorporates all sustainable building practices to minimize energy usage and maximize efficiency.

Although California has progressed to the forefront of the nation in solar access laws and solar-friendly building ordinances, there is still work that can be achieved to reduce bureaucratic processes and ensure access to solar energy systems for all consumers.

CONCLUSIONS AND NEXT STEPS

This document has mapped the solar policies and procedures that currently exist for jurisdictions and utilities in the Southern California Rooftop Solar Challenge team. There are significant variations in the way jurisdictions treat solar permitting, net metering, interconnection, finance and planning in the Southern California region. To further expand the Southern California market, there is a need for transparency and innovation in the solar marketplace. Although we cannot expect each jurisdiction to completely standardize with the rest of the region, it is important for jurisdictions and utilities to increase access to information on solar programs and improve the predictability of the solar installation process.

Over the next six months, the Rooftop Solar Challenge team will evaluate the existing policies to identify best practices within the region. Keeping in mind that many jurisdictions are fiscally constrained, the SCRC will strive to reduce the costs required to process solar applications. The group has also noted that there is great variation in the quality of solar installers. Training and education will also be a key component of creating a successful solar marketplace. The team is also in the process of identifying and launching pilot programs that will work on topics such as such as increasing information access, streamlining inspections and launching training programs. CCSE has also fostered collaborations with many state and local organizations that will be conduits to disseminate information and training of the best practices from our working groups. The upcoming Best Practices document will identify these best practices and any lessons learned from the initial pilot programs.

For updates and more information on the Southern California Rooftop Solar Challenge, please visit our website:
www.energycenter.org/sunshot

APPENDIX 1: FINANCING MECHANISMS

Financing Mechanism	Type of Program	Anaheim	Chula Vista	Long Beach	Palm Desert	Palmdale	Pasadena	San Diego	Santa Ana	Santa Monica	County of Los Angeles	City of Los Angeles
PACE	Federal/State				CalPACE			CalPACE**				
*Program Pending **Exploring Program	Local		California First	Commercial PACE	Energy Independence Program	Commercial PACE		California First**		Commercial PACE	Commercial PACE / Residential PACE*	Commercial PACE / Residential PACE*
Third-Party Ownership	Federal/State											
	Local	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs	Leases/PPAs
	Other			Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)			Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	Commercial Solar Rooftop Lease (Utility-owned)	
Secured Loans	Federal/State	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver	HUD 203k / PowerSaver
	Local	HELOC / Low-Interest Energy Efficiency Loan (Non-Res)	HELOC / Home Upgrade, Carbon Downgrade	HELOC / Matadors Community Credit Union	HELOC	HELOC	HELOC	HELOC	HELOC	HELOC / Matadors Community Credit Union	HELOC / Matadors Community Credit Union	HELOC
	Other					CHF Residential Energy Retrofit Program						
Unsecured Loans	Federal/State	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*	Fannie Mae Energy Loan / Loan Loss Reserve (ABx114)*
*Program Pending	Local							SDMCU Energy Efficient & Solar Loans		Community Solar Fund*	Matadors Community Credit Union	Matadors Community Credit Union
	Other									Municipal Facilities Revolving Load Fund*		

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