Multifamily Solar Market Development Plan

A plan to promote and expand solar access to multifamily building tenants in California and beyond

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Prepared by
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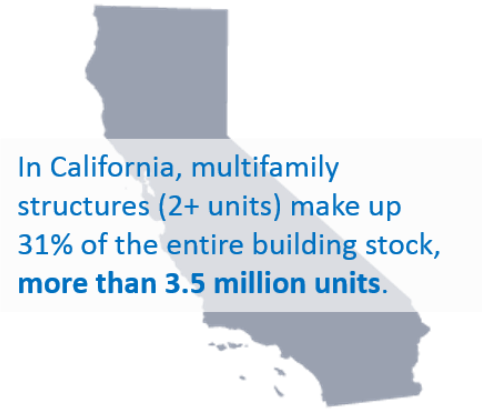
Contents

I. Introduction

The Virtual Net Metering Market Development Project is one of 15 projects that make up the U.S. Department of Energy's SunShot Solar Market Pathways (SMP) Program, which aims to increase solar adoption throughout the nation and reduce solar soft costs. The Virtual Net Metering Market Development Project is specifically aimed at promoting and expanding access to solar for multifamily buildings in California and developing replicable strategies that can be applied in regions beyond California to help inform and create pathways for multifamily tenants and building owners to gain access to and benefit from solar.[1]

Across the country, various terms are used when discussing community or shared solar programs.[2] A *shared solar program* may refer to an *on-site* installation in which a group of on-site tenants share the solar generation, like the California Virtual Net Energy Metering (VNEM) program,[3] or it may refer to an *off-site* installation in which a group of subscribers, sometimes within a certain geographic scope, share the solar generation. Whether a project includes an on-site or off-site installation, shared solar programs are meant to expand solar access to customers who may not own their own roof or whose site is not suitable due to factors such as shading. The multifamily building sector makes up 31 percent of California's entire building stock[4] and has largely been underserved by the solar industry to date.



[1] Research and reports regarding the California virtual net metering (VNEM) policy structure, an assessment of the VNEM market in California and a report on the full market potential can be found at www.energycenter.org/smp.
[2] For a more detailed discussion of the various relevant terms and their usage, see our earlier report, *Virtual Net Metering Policy Background and Tariff Summary*, available at https://energycenter.org/sites/default/files/docs/nav/programs/solar-pathways/(6902)_Virtual_Net_Metering_Policy_Background_and_Tariff_Summary_Report.pdf.
[3] The VNEM program is also referred to as a tariff and is in addition to the customer's otherwise applicable rate structure.
[4] 2014 American Community Survey 1-Year Estimates, California. Tenure by Units in Structure, Universe: Occupied housing units.

This Multifamily Solar Market Development Plan (Plan) addresses several of the core elements needed to enable additional multifamily solar projects throughout California using the available VNEM tariff, including outreach and education approaches and other proven strategies to facilitate installations. It also discusses both on-site and off-site solar program opportunities available to multifamily customers in California beyond VNEM, including the Green Tariff Shared Renewables (GTSR) Program and community choice aggregation (CCA). Finally, the Plan provides lessons learned from the Virtual Net Metering Project pilot effort in Santa Monica[5] as well as extensive stakeholder outreach and related market research conducted throughout this project. With this combination of market-specific information and real-world insight, this Plan provides knowledge and guidance to inform policymakers, regulators, local governments, multifamily stakeholders and others, in California and beyond, on effective strategies to expand multifamily solar in their respective jurisdictions.

Ultimately, executing the steps identified in the Plan will increase solar adoption rates for California's more than 3.5 million units of multifamily housing and specifically within California's investor-owned utility (IOU) territories.[6] Through strategic educational events and training sessions, the project team will recruit at least 100 multifamily stakeholder attendees. In addition, the team strives to help facilitate at least 450 multifamily solar proposals to property owners statewide from numerous contractors, and finally, the Plan will help inform and support new multifamily solar programs and projects in California and beyond, promoting even greater long-term solar market transformation.

[5] The Santa Monica Pilot Study was designed to serve as a microcosm test site for developing a virtual net metering market. The pilot project included identifying local barriers to solar deployment and relevant solutions and raising awareness through community outreach and events as well as providing technical assistance to interested property owners and contractors. The pilot was deployed during 2016, and lessons learned from that effort will be applied to the statewide 2017 market development efforts.

[6] California's three large investor-owned utility (IOU) territories include San Diego Gas & Electric (SDG&E), Southern California Edison (SCE) and Pacific Gas and Electric (PG&E).

II. Approaches to Increase Adoption of California's Virtual Net Energy Metering Tariff

While there are alternative pathways to gain access to solar energy for multifamily residents and building owners, as discussed further in Section III, California's VNEM program allows for the benefits of an on-site solar system to be shared among on-site tenants. The California VNEM model differs from other states' versions of virtual net metering and shared solar and is unique in that the solar generation can only be shared with those residents on the same property, as opposed to a wider geographic area such as a neighborhood, city or service territory.[7]

Increasing participation in California's VNEM program first requires a robust understanding of the barriers to participation. The previously conducted VNEM Market Assessment Report and internal market barriers analysis provide an in-depth overview of our research and findings on this topic. Building on our findings and work to date, the project team has identified the following core approaches to outreach, education and facilitating installations as critical to increasing VNEM uptake in California and overcoming the identified barriers. These approaches also serve to create more informed multifamily customers and solar installers and ultimately increase the number of multifamily solar installations statewide, which will yield environmental, economic and societal benefits. Herein the team describes each approach and the intended plan of action for implementation in the near term to achieve project goals. Appendix A includes a list of various 2017 outreach outlets and educational efforts the project team will deploy.

Outreach: Raising Awareness Among Multifamily Stakeholders

A fundamental barrier to greater uptake of multifamily solar via VNEM is a pervasive lack of awareness, both in terms of availability of the program as an option for multifamily dwellings, as well as how it works. Many property owners are unaware that there is an opportunity through their utility's existing VNEM tariff to provide solar electricity and its benefits to their

[7] For more information about other states' shared solar programs, including their various geographic restrictions, see IREC's State Shared Renewable Energy Program Catalog at www.irecusa.org/regulatory-reform/shared-renewables/state-shared-renewable-energy-program-catalog. In addition, although now somewhat out of date, other states' shared solar programs are described in our prior report, *Virtual Net Metering Policy Background and Tariff Summary*, available at https://energycenter.org/sites/default/files/docs/nav/programs/solar-pathways/(6902)_Virtual_Net_Metering_Policy_Background_and_Tariff_Summary_Report.pdf.

residents, as well as serving their facility's common electricity load for shared spaces. Similarly, many multifamily residents either do not know about VNEM, or else assume that, since they do not own or control their roofs, there is not an avenue for them to tap into solar energy.

To remedy this awareness challenge, project outreach efforts will establish a foundation of knowledge and awareness among the key constituents who are integral to advancing multifamily solar projects in California. In addition, the project will focus on statewide dissemination of information to ensure more widespread uptake of multifamily solar across diverse geographic and utility service territories. Outreach efforts will directly target multifamily property owners, including apartment building owners as well as condo owners and communities, steering them to the project's resources, events and *Facilitating Installations* platform. The Educational and *Facilitating Installations* sections of this Plan are discussed later. The project team expects to reach other audiences indirectly, such as renters, management companies, commercial multitenant building owners and solar contractors. Public outreach will leverage established target audience networks through multifamily dwelling associations (through strategic memberships) and will include advertisements, newsletter and magazine articles, email blasts, workshops and postcard mailers. Details regarding the specific publications, outlets and impacts will be made available at the end of the project.

Guided by this awareness challenge, the project team has identified the key considerations that will shape the details of outreach efforts.

Identifying and Reaching the Multifamily Decision-Maker

Identifying the appropriate decision-maker for multifamily dwellings poses a unique challenge, which necessitates utilizing atypical forums to more effectively reach these important players with information about solar and VNEM. To address this aspect of the Plan, the project team has identified the following forums for expanded engagement.

- City or county government offices and agencies, such as an office of sustainability or a building department, may be able to provide valuable information to help inform and guide specific outreach efforts to multifamily stakeholders. Through this project, an informal partnership with the City of Santa Monica was key to navigating local challenges and identifying outlets for information sharing to support the Santa Monica

Solar VNEM Pilot Project. In addition, the City of Santa Monica's Rent Control Board[8] provided a comprehensive list of multifamily properties that fall under Santa Monica Rent Control regulations, which has proven to be (and will continue to be) useful for relaying relevant information to building owners subject to rent control regulations (which has been identified as a separate barrier for solar adoption in the multifamily sector). While not all cities have and/or will be able to share this information, exploring this forum more extensively in other jurisdictions will prove viable for future outreach efforts.

- Professional associations, such as apartment, condo, multifamily and other building associations, serve as liaisons between property owners and industry vendors and/or other stakeholders. These multifamily associations exist nationwide and may be specific to a city, state or country. There is usually a fee to become a member, and typically, there are owner memberships and vendor memberships. As such, for outreach purposes as well as network building, this forum is likely key for long-term success and replication of multifamily solar success stories.

  In recognition of this important consideration, the project team has become a member of several California-based associations[9] and will consider other memberships throughout the state for a wider geographic distribution of our promotional and outreach efforts. Vendor-member benefit "packages" vary slightly across different memberships and associations, but generally include some hybrid of the following outreach avenues: a listing in the association's vendor directory, email blasts to members, publication of newsletter and magazine articles and the opportunity to present at key events and meetings.

Understanding Property Owner Motivations

In multifamily buildings with a single owner, the building owner and/or supporting manager will make the decision to go solar. Applying solar to common load utility accounts (e.g., lighting in

[8] Rent control, or rent stabilization, is a collection of laws that restrict the rents a landlord can charge and limits the reasons for eviction. In California, the Rent Control Board, together with Rent Control Agencies, carries out the Rent Control Law's goals and administer the Rent Control Laws. The following cities in California are subject to rent control regulations http://www.dca.ca.gov/publications/landlordbook/appendix2.shtml. For more information on the Santa Monica Rent Control Board, visit: http://www.smgov.net/rentcontrol/.

[9] To date, the project team has purchased memberships with the following associations: East Bay Rental Housing Association (EBRHA), San Francisco Apartment Association (SFAA), Apartment Association of Greater Los Angeles (AAGLA), US Green Building Council – LA (USGBCLA) and San Diego County Apartment Association (SDCAA).

common areas) in this scenario tends to present a more straightforward value proposition, particularly if those accounts are in the owner's name and the associated environmental or economic benefits are accrued directly by the owner. However, pursuing solar for the benefit of residents, where allocation of credits and benefits to multiple accounts and meters via the available VNEM tariff will be required, poses a much more complex challenge and less straightforward value proposition. To the extent financing options may be necessary to pursue on-site solar, additional complexities can arise. The combination of complexities and lack of tools to navigate the process can be key deterrents for property owners. As such, gaining a better understanding of property owners' motivations for going solar and the strategic promotional messages that will help translate those motivations into action are critical to the deployment of a project. For example, several of the existing projects utilizing VNEM in California feature property owners that were enticed by the opportunity to distinguish their apartments from others with solar. The combination of tenant utility bill savings and greater rate stability over the long term, as well as appealing to eco-minded tenants, may result in a reduced tenant turnover rate.

Other value streams for multifamily property owners include: reduced operating costs for the common loads, potential for increased property value and a return on investment once the system has paid for itself. Environmental benefits are an added driver, but if those benefits are external to the actual cost of the system, oftentimes these benefits are not enough additional motivation to invest in an on-site solar project.

Gaining an understanding of property owner motivations for solar can be accomplished in a few ways, including through case studies of existing projects, surveys, focus groups, workshops and/or individual consultations. The project team has employed many of these strategies to date through the project and will continue to deploy these and other approaches with new markets going forward.

Understanding On-site Solar Models

It is important for multifamily property owners to be aware of and understand the different VNEM business models available in their respective markets and the models' pros and cons. The project team's outreach efforts will provide more specific information, details and opportunities for property owners to learn more about the following main models for on-site multifamily solar.

- **Direct ownership model.** Under this model, the property owner initiates the project and owns it, using existing capital, a loan or a hybrid of the two, and selects the participant residents and then determines the allocated percentage benefit for each. The tenants

would receive a proportionate share of monthly solar energy in the form of VNEM kilowatt-hour (kWh) credits on their utility bill, and the property owner would likely recoup the investment through the monthly rent, ideally still allowing each tenant to see a net savings between the reduced utility bill and slightly increased rent. Property owners can determine which method of recoupment is most appropriate for their site, as increasing rent is just one example of a recoupment pathway. This model likely entails an obligation for the property owner to manage the solar project and ensure quality control over the life of the project (i.e., monitoring the systems' production to ensure proper performance and/or conducting any other necessary ongoing operations and maintenance tasks). The owner also may serve as a liaison between the resident and the utility in the case of billing credit disputes. This option affords the property owner greater system control and allows for the option to take the federal investment tax credit for solar.

- **Third-party financed.** Under this model, the property owner initiates the project, just as with the direct ownership model, but is not the system owner. Rather, a third-party financer (a lease or power purchase agreement [PPA] provider) owns and maintains the system and collects a lease or PPA fee from the property owner each month. Lease and PPA agreements are typically contracted for a 20-year duration. The residents would receive a proportionate share of monthly solar energy in the form of VNEM kilowatt-hour (kWh) credits on their utility bill, and the property owner would be responsible for collecting each resident's portion of the lease or PPA monthly fee, based on their percentage solar allocation. Although the property owner would not be responsible for operations and/or maintenance of the system, it is still encouraged that the property owner monitors the system's monthly production to ensure ideal system performance and quality control for the case of tenant bill credit disputes or inquiries. In this model, the third-party owner is entitled to the federal investment tax credit, as opposed to the property owner.

- **Roof leasing model.** Under a "roof income agreement," a third-party company seeks out the property owner for use of the property's roof for solar, in exchange for lease payments. Pending the terms of the agreement, the third-party company would work with the building owner and tenants to recruit on-site participants. The solar electric system installed would be owned and financed by the third-party provider, who would ultimately bear responsibility for recouping payments from participating tenants, thus relieving the property owner of that obligation. The residents would receive a proportionate share of monthly solar energy in the form of VNEM kilowatt-hour (kWh) credits on their utility bill, and each participating tenant would pay the third-party

company a predetermined $/kWh amount pursuant to the project's solar contract. Optimally, the tenant would receive a net utility savings each month over the term of their participation. The property owner, in this scenario, also may have the option of participating to offset common loads. Of the existing third-party service providers of this model, each has varying levels of interaction with the residents. Some may work directly with residents to collect payment each month, while others still depend more heavily on the property owner for assistance with tenant interactions. The roof leasing model may relieve the property owners from many of the responsibilities and obligations associated with the direct-ownership model, while also providing the owner with monthly roof rental income. The roof leasing model also may afford residents interested in solar the ability to play a more proactive role in the solar transaction, which may be an appeal to some.

The project team will coordinate with solar contractors and finance experts to guide and inform the most effective outreach strategies to help raise awareness among property owners about the viability and availability of these different models.

During 2017, the project team will strive to reach at least 10,000 multifamily stakeholders statewide through outreach efforts. Various methods for tracking the number of consumers reached will be used, including, but not limited to, the number of email impressions, click-throughs, mailer recipients and magazine subscribers.

Education: Trusted Content, Knowledgeable Champions and Useful Tools

A corollary barrier to the overall lack of awareness of multifamily solar options is a lack of reputable and trusted information that can help multifamily stakeholders make better informed decisions about solar. Similarly, many in the solar industry lack the requisite exposure, experience and/or training to be well-versed spokespeople and champions for solar in the sector. The project team has identified the following educational strategies, tools and targeted methods for dissemination to help overcome this critical education barrier and ensure greater market uptake.

Solar Contractor Trainings

The project team will develop and offer solar contractor trainings, targeting contractors within designated utility service territories. The trainings will equip contractors with key information and tools they will need to serve as champions for multifamily solar, including, but not limited to, information on how the California VNEM tariff works, relevant interconnection process

details and documents for specified utilities, solutions for common questions and concerns, useful strategies for engaging multifamily stakeholders, insights on property owner motivations and lessons learned from existing projects. These trainings also will feature the existing online project tools and resources, including tariff and interconnection resources and mapping tools to identify multifamily markets in California as well as visuals to help explain the VNEM concept.

Property Owner Trainings

The project team will offer two distinct property owner trainings.

- *Solar for Apartments* (targeting apartment building owners, managers and developers). The content will focus on value proposition; tenant management methods and tools, including recouping project costs; pros and cons to certain financing methods; and the importance of postinstallation monitoring and administration. The Apartment Toolkits will be useful for these workshops.
- *Solar for Condos* (targeting condominium owners and condo homeowner association [HOA] board members). The content will be tailored to provide additional focus on the complexities of condominium owners opting for on-site solar, including considerations for the HOA community approval process, how to achieve participant equity, pros and cons of including all or only some owners, pros and cons of offsetting common loads as well as tenant loads and understanding financing limitations for condos going solar. The project's existing Condo Toolkits will be used to guide the information session, though each community will need to apply the lessons to their respective community model.

  A challenge with the condo sector, with respect to these trainings, is the number of decision-makers that are needed to make the final commitment, and oftentimes, not all decision-makers will attend these public trainings. Additionally, the public training will not address any specific restrictions or nuances to a specific community. For this reason, as seen by many solar contractors and the project team, condo communities often request a "private" training to be held for their community. While this method has been explored by the project team and many contractors, it has proven to be an inefficient method for disseminating high-level solar information. A possible remedy is a recorded information session that condo communities can review at their community meetings prior to contacting a contractor. From the Santa Monica Pilot, the project team heard from VNEM solar contractors that condo projects would be much more appealing if the communities had some existing knowledge and certain approval tasks completed. The project's Condo Toolkits offer supporting worksheets and guiding steps that will support communities in their initial exploratory steps for going solar.

Other Stakeholder Trainings and Workshops

The project team's education efforts will target cities/municipalities, but will remain flexible to accommodate other stakeholders as needed. Some cities have nuanced rules or mandates that may benefit from a more tailored webinar or presentation (e.g., cities under rent control restrictions or jurisdictions mandating that all newly constructed buildings install solar). The aim of these trainings will be to assist jurisdictions facing similar challenges to overcome barriers and deploy more solar.

Throughout the educational events and training sessions, the project team intends to recruit at least 100 multifamily stakeholder attendees, through both in-person trainings and digital webinars.

Facilitating Installations: Connecting Multifamily Solar Stakeholders

The focus of this effort will be to connect interested multifamily property owners with trained solar contractors, which will help overcome another critical barrier to multifamily solar adoption. To create a more efficient, streamlined process for linking property owners with contractors, the project team sought to incorporate an online multifamily solar marketplace into the existing project webpage to further facilitate installations.

By using the online platform's tracking mechanisms, as well as information provided by each utility through data requests, the project team aims to see an additional 100 VNEM projects statewide by the end of 2017.

The project team explored and leveraged existing tools that serve similar functions, including EnergySage, Pick My Solar and the New York Shared Solar Gateway. Ultimately, the project team partnered with EnergySage to develop a unique multifamily marketplace, found at MultifamilySolarCA.com.

During the development process, the project team utilized strategic recruitment approaches to secure participation of contractors experienced and familiar with the multifamily market and virtual net metering. The online marketplace allows a property owner to indicate his/her interest in solar, provide relevant property and energy use details and submit an agreement to be contacted by a vetted solar contractor with a solar proposal specific to their multitenant site. This tool also enables the project team to track project data and metrics, to inform the level of statewide interest and other project characteristics.

III. Opportunities for Multifamily Solar beyond VNEM

To date, the project team has focused on expanding participation in VNEM by customers of California's large investor-owned utilities (IOUs): PG&E, SCE and SDG&E. The outreach, education and facilitation efforts described in Section II are aimed at this same goal. However, California's multifamily customers have other solar options available to them beyond VNEM.

> ***Shared renewable energy programs should expand renewable energy access to a broader group of energy consumers, including those who cannot install renewable energy on their own properties.***
>
> -IREC's *Model Rules for Shared Renewable Energy Programs*, Guiding Principle #1

Customers of the three IOUs may participate in the individual utility's Green Tariff Shared Renewables (GTSR) Program. In addition, some cooperative, municipal and small investor-owned utilities do offer VNEM and/or shared solar options to customers in their service territories or have the potential to do so. Community choice aggregators (CCAs) are also increasingly providing customers in all utility service territories with another way to get a higher proportion of their electricity from renewable energy. Additional details regarding each of these opportunities is discussed.

The project team notes that more extensive outreach, education and/or tracking of these programs is beyond the scope of this Plan and project. In addition, a more comprehensive analysis of pros and cons for the various solar options available to the multifamily sector is outside the scope of this effort. However, to the extent outreach efforts identify multifamily stakeholders interested in exploring these other options, the project team will endeavor to provide them with appropriate information to further guide their solar decision-making process.

Green Tariff Shared Renewables (GTSR) Program

Under Senate Bill 43 (Wolk 2013), California's large IOUs were required to implement GTSR programs pursuant to rules approved by the California Public Utilities Commission (CPUC) in

early 2015.[10] The GTSR program is intended to expand access to renewable energy to all customers, including residential, commercial and institutional customers, who are currently unable to access the benefits of on-site generation. Each utility's GTSR program comprises two different options for customers—a Green Tariff and an Enhanced Community Renewables (ECR) option. Unlike VNEM, the GTSR program does not fall under the state's net metering rules and has a separate statewide program capacity limit of 600 MW, divided proportionally among the utilities, as shown in Table 1. In addition, the statute requires that 100 MW be reserved from the total 600 MW for facilities up to 1 MW located in "disadvantaged communities," as identified by the California Environmental Protection Agency, with each utility reserving its proportional share, which the CPUC has called the "Environmental Justice (EJ) Reservation." The statute also reserves 100 MW for participation by residential customers, which the CPUC determined can be met by EJ Reservation facilities and/or general market participation in either the Green Tariff or ECR option. PG&E and SCE opened their programs in 2016; however, as discussed further, neither utility's program has garnered much customer interest to date, likely at least in part because they are not currently financially attractive. SDG&E expects to open its green tariff program by the end of the year and its ECR program in the first quarter of 2017.

Table 1: California's GTSR Program Capacity by Utility

	Program Capacity	Environmental Justice Reservation
PG&E	272 MW	45 MW
SCE	269 MW	45 MW
SDG&E	59 MW	10 MW
TOTAL	600 MW	100 MW

Green Tariff: Under the Green Tariff option, a participant can pay a renewable energy rate for half or all their monthly bill to purchase energy derived from a portfolio of utility-owned solar facilities ranging from 500 kW to 20 MW. Utilities procure these projects through a competitive solicitation known as the Renewable Auction Mechanism (RAM). By statute, the Green Tariff rate must ensure nonparticipating ratepayer indifference, and thus, it incorporates all costs

[10] Cal. Pub. Util. Code § 2831; CPUC D.15-01-051, Decision Approving Green Tariff Shared Renewables Program for San Diego Gas & Electric Company, Pacific Gas and Electric Company and Southern California Edison Company Pursuant to Senate Bill 43, A.12-01-008 et al. (issued Feb. 2, 2015); *see also* CPUC D.16-05-006, Decision Addressing Participation of Enhanced Community Renewables Projects in the Renewable Auction Mechanism and Other Refinements to the Green Tariff Shared Renewables Program, A.12-01-008 et al. (issued May 19, 2016) (further refining the GTSR program).

attributable to the program, less credit for the value of the generation. The CPUC has determined that costs should include the renewable power rate (i.e., the cost of the power purchase for solar energy), the Power Charge Indifference Amount (PCIA), and various program charges, including a Resource Adequacy (RA) charge, a grid management charge, Western Renewable Energy Generation Information System (WREGIS) fees, a renewable integration charge and administrative and outreach costs. The CPUC also has determined that credits should include the class average generation rate (the cost of the energy that would have come from the grid) plus appropriate solar value adjustments, including time-of-delivery (TOD) and RA credits. Notably, although the statute permits other "applicable credits," the CPUC has not approved any additional values for the rate, including any values associated with transmission and distribution benefits or other avoided costs. In practice, since this rate is on top of their normal electricity rate, after balancing the credits against the costs, this rate structure results in customers paying a relatively significant premium per kWh of electricity to participate in the program, as shown in Table 2.

ECR Option: The ECR option allows a participant to pay a third-party provider for energy derived from a specific renewable energy facility, again ranging from 500 kW to 20 MW, and procured through the same RAM process. It more closely resembles shared renewables programs available in other states, at least as compared to the Green Tariff. At the outset, at least 30 percent of customers participating in an ECR facility must be from the same "community" in which the facility is located, defined as the same municipality or county, or within ten miles of a specific customer's address. Once an ECR project is developed, however, participants can be located anywhere within the utility's service territory. The ECR component is intended to allow customers to choose a project that suits their locational, budgetary and other preferences and enter an agreement with the third-party provider. Separately, the third-party provider enters a power purchase agreement (PPA) with the utility, but assigns its right to payment for subscribed energy to its participating customers. The customer receives credit on his/her utility bill under the same rate structure described above for the Green Tariff, except that the customer pays the developer instead of the utility and thus does not receive the "renewable power rate" charge bill component, and thus the customer receives a negative credit instead of a positive charge. Despite the bill credit from the utility, however, the customer is ultimately likely to pay a significant premium to participate in the ECR option once the payment to the ECR provider is factored in to the total cost to the customer. This is because the PPA rate charged by the solar developer to the customer would have to be less than 5 to 8 cents/kwh (value of ECR credit) for the customer to have a net savings. The solar developer would then have to have a contract with the utility for an even lower cents/kwh to cover the cost of the project and have any return on their investment. In the near term, at least, it is very unlikely that any developer will be able to develop and offer such a project, especially considering the additional outreach and management costs associated with ECR projects. In addition, most of the GTSR

costs/credits (both GT and ECR) fluctuate year to year, introducing uncertainty on top of the fact that customer costs to participate are higher than the energy savings they receive from their solar subscription.

Table 2: California's GTSR Rates for Residential Customers by Utility*

	Green Tariff Premium (per kWh)	ECR Credit (per kWh)**
PG&E	$0.029	($0.053)
SCE	$0.041	($0.049)
SDG&E	$0.015	($0.080)

* Green tariff premiums and ECR credits are based on utilities' advice letter filings proposing 2017 rates.[11] Only the premiums and credits for residential customers are included; rates vary for other customer classes (small commercial, large commercial and industrial, agricultural, etc.). For the ECR credit, although the RA and TOD values are ECR-facility-specific, this table follows PG&E's and SDG&E's examples and assumes the same RA and TOD values for the ECR rate as for the Green Tariff rate.
** This column reflects the ECR credit only. The total cost (premium) for a customer to participate in the ECR program will depend on the actual price charged by the third-party provider, less the ECR credit to the customer's utility bill, listed here.

Each of the utilities provides further information on their websites regarding Green Tariff and ECR options, which the utilities have branded with different names.

[11] PG&E AL 4933-E, Green Tariff Shared Renewables and Enhanced Community Renewables 2017 Rate Proposal (Oct. 7, 2016).

As of October 2016, as shown in Table 3, the utilities had procured a total of 130 MW for their Green Tariff programs, but no ECR capacity. For the two utilities with programs currently open to participants (PG&E and SCE), customer interest has been limited relative to the program capacity, with a total of about 13 MW of enrollment, 4.6 MW of which is attributed to residential customers. It seems likely that the limited customer enrollment is at least partially due to the premium cost to participate, especially when compared to other tariffs such as NEM or VNEM, where participants offset their electricity bills and save money. Therefore, while the GTSR program offers multifamily customers a renewable energy option, it may not be attractive or financially viable for many of them. In addition, because no ECR capacity has been procured, the GTSR program does not offer any options for customers primarily interested in third-party offerings and/or participation in a specific renewable energy facility, although that may change in the future. The less attractive financial structure, along with the locational restrictions and other programmatic requirements, likely make ECR projects less appealing to developers as well. PG&E and SCE held their ECR Request for Offers in fall 2016 and will announce the PPAs in spring 2017, at which point industry will better understand the ECR market. SDG&E will hold its first ECR auction in spring 2017.

PG&E

Solar Choice
www.pge.com/en_US/residential/solar-and-vehicles/options/solar/solar-choice/solar-choice.page

Regional Renewable Choice
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Green Rate
www.sce.com/wps/portal/home/residential/rates/Standard-Residential-Rate-Plan/Green-Rates

Community Renewables Rate
www.sce.com/wps/portal/home/business/generating-your-own-power/solar-power-for-business/Community-Green-Rates

SDG&E

EcoChoice
www.sdge.com/environment/connected-to-the-sun/ecochoice

EcoShare
www.sdge.com/environment/ecoshare-for-developers

Table 3: GTSR Program Procurement and Participation as of October 2016[12]

	Green Tariff Procured Capacity	Green Tariff Residential Customer Enrollment	Green Tariff Nonresidential Customer Enrollment	ECR Procured Capacity	ECR Customer Enrollment
PG&E	50.75 MW	4.505 MW	8.073 MW	0 MW	0 MW
SCE	60 MW	0.12 MW	0.08 MW	0 MW	0 MW
SDG&E	20 MW	0 MW	0 MW	0 MW	0 MW

Opportunities Outside of Large Investor-Owned Utilities

Cooperative, Municipal and Small Investor-Owned Utilities

As discussed, only PG&E, SCE and SDG&E are required to offer VNEM. While these utilities serve about three-quarters of the state's customers, the other 25 percent are served by around 50 municipal and cooperative utilities and three small investor-owned utilities (Pacific Power, Bear Valley Electric Service and Liberty Utilities). Some of the municipal utilities, including the Los Angeles Department of Water Power (LADWP) and Sacramento Municipal Utility District (SMUD), are quite large. In fact, the number of customers served by LADWP is comparable to the number of customers served by SDG&E (in 2010, 1.45 million LADWP customers as compared to SDG&E's 1.4 million).[13]

Based on the project team's examination of the three, small investor-owned utilities and nine of the largest publicly owned utilities,[14] most of these utilities do not currently offer VNEM or other shared solar options, nor do they appear to be poised to do so in the near term, with a

[12] Monthly Green Tariff Shared Renewables Program Progress Report of Pacific Gas and Electric Company (U 39 E) for Activities Occurring in October 2016, A.12-01-008 et al. (Nov. 30, 2016); Southern California Edison Company's (U 338-E) Monthly Green Tariff Shared Renewables Program Progress Report, A.12-01-008 et al. (Nov. 28, 2016); Monthly GTSR Program Progress Report of San Diego Gas & Electric Company (U 902-E) for Activities Occurring October 2016, A.12-01-008 et al. (Nov. 23, 2016).

[13] For more information on California's electric utility service areas and other statistics, see California Energy Commission, Electric Utility Service Areas, www.energy.ca.gov/maps/serviceareas/Electric_Service_Areas_Detail.pdf.

[14] Publicly owned utilities reviewed include LADWP, SMUD, IID, Silicon Valley Power, Modesto Irrigation District, Anaheim Public Utilities, Riverside Public Utilities, Burbank Water and Power and Roseville Electric Utility.

few notable exceptions. Specifically, although it does not currently have a VNEM option, SMUD (approximately 620,000 customers) was a shared solar pioneer with its "SolarShares" program, which was launched in 2008 and allows customers to receive bill credits for energy produced at a local solar farm. In addition, SMUD offers a "Greenergy" program, in which customers pay an extra fee ($3 or $6 per month), and SMUD offsets 50 or 100 percent of their electricity needs with renewables. The Greenergy program was established in 1997, and currently 12 percent of SMUD customers participate (73,000 customers), making it the fourth largest voluntary program in the nation in terms of number of participants and second largest in terms of participation rate.[15]

In addition, LADWP has indicated its intent to implement a shared solar program in 2018, which is a companion program to the soon-to-launch Solar Rooftops Program, expected in early 2017.[16] According to preliminary information provided on its website, LADWP intends its shared solar program to provide solar access to customers who are unable to install solar on their own, up to 50 percent of their historical yearly consumption. It may prioritize low-income customers, followed by renters and multi-dwelling unit customers. LADWP would build and own the solar facilities.[17] LADWP's service territory is attractive for a shared solar program or VNEM, given its urban environment and large proportion of multifamily housing.[18]

Other utilities, such as Silicon Valley Power, also may be poised to offer VNEM or other shared solar options in the near term considering the proportion of multifamily housing in their service territories and/or their interest in and commitment to renewable energy. Although the project team's efforts focus largely on improving VNEM in the large investor-owned utilities' service

[15] For more information on SMUD's programs, visit https://www.smud.org/en/residential/environment.
[16] Ivan Penn, The DWP Is Expanding Its Rooftop Panel Program to the 'Solar Desert' to Meets Its Energy Goals, *L.A. Times* (Nov. 23, 2016) (describing the program, which, beginning in early 2017, will allow residential customers to receive a $30 credit each month or $360 a year in exchange for allowing LADWP to put city-owned solar panels on their property), *available at* www.latimes.com/business/la-fi-dwp-solar-deserts-20161122-story.html.
[17] For more information, see LADWP Community Solar Program, https://ladwp.com/ladwp/faces/ladwp/residential/r-gogreen/r-gg-commsolarprogram.
[18] LADWP's service territory contains 1.3 million housing units, including over 555,000 apartments (41% of all housing). *See* National Multifamily Housing Council, Resident Demographics, http://nmhc.org/Content.aspx?id=4708#Large_Cities.

territories, the team expects that our resources also could support implementation and improvement of similar policies in other California utility service territories.

Community Choice Aggregators (CCA)

Community choice aggregation is becoming increasingly popular in California, with five CCAs in operation at publication of this report and several more in various stages of planning and implementation.[19] A CCA allows a local government or group of local governments to establish an alternative energy provider for customers within their jurisdiction, with the electricity delivered through the existing power supply grid by the incumbent utility. Customers may opt out of CCA service and stay with their existing utility if they wish. As the number of CCAs in California increases, many multifamily tenants may find themselves within a CCA service territory.

CCAs tend to be interested in procuring a cleaner energy supply and, at least to date, have offered their customers energy with a higher proportion coming from renewable sources (more than the required statewide renewables portfolio standard percentage, 25 percent for 2016), at the same or better cost as compared to the incumbent utility. In addition, CCAs typically offer a higher priced 100 percent renewable energy option for customers willing to pay for it, which resembles the investor-owned utilities' Green Tariff programs. CCAs also can offer VNEM or other shared solar options to their customers, and at least one—Sonoma Clean Power, has already done so. As a companion to its NEM program (called "NetGreen"), Sonoma Clean Power offers a VNEM program called "Virtual NetGreen."[20] In addition, MCE offers a "Local Sol" program, which allows customers to pay more to receive 100 percent of their energy from a local solar facility,[21] which bears a resemblance to the ECR option except that it is offered by a CCA instead of a competitive third-party provider.

CCAs can potentially offer multifamily customers a path to increased solar access, especially if they cannot or do not want to participate in their incumbent utility's VNEM offering. As more CCAs come online and begin to implement program offerings for their customers, including

[19] Operational CCAs include MCE (formerly Marin Clean Energy), Sonoma Clean Power, Lancaster Choice Energy, CleanPowerSF and Peninsula Clean Energy. According to the Clean Power Exchange (http://cleanpowerexchange.org), a project of the Center for Climate Protection that tracks Community Choice expansion in California, by the close of 2016, 26 of the 58 counties in California either had operating CCAs, were on schedule to launch service, or were at some earlier stage of evaluation. Over 300 cities are similarly engaged in operational or emerging CCAs.

[20] SCP Virtual NetGreen, https://sonomacleanpower.org/virtual-netgreen.

[21] MCE Local Sol 100% Locally-Produced Solar Energy, www.mcecleanenergy.org/100-local-solar.

specifically VNEM and other shared solar options, the project team expects that our resources also may be useful to them.

IV. Emerging Best Practices for Multifamily Solar Programs

California's experience with several programs available for the multifamily sector provides valuable lessons learned that can be used to guide the development, implementation and/or improvement of new and existing programs. Beyond California, other similar programs that are available for, but not necessarily targeted at, the multifamily sector provide additional insights that are helpful for understanding what is and is not working as it relates to the broader multifamily solar market.

Best practices for developing and implementing a successful multifamily solar program are still emerging and will continue to be refined as more entities gain direct experience with this unique subset of the residential housing market. It is also worth noting that much work has been done on the development and refinement of shared solar best practices, design considerations, which should be leveraged and considered alongside this report (see Appendix B - Additional Resources).

The following identified emerging best practices are based on the California multifamily solar experience; drawing from the insights gleaned from this project as well other related state and utility programs. These emerging best practices are intended to provide an initial framework for widespread multifamily solar deployment for California, while also informing similar efforts in other jurisdictions. The project team will continue to refine these over the course of this project and beyond. As more stakeholders gain experience with multifamily solar, the project team expect more critical lessons learned to emerge

1. **Develop a robust understanding of the barriers to multifamily solar.** The multifamily sector is multifaceted in terms of the housing types (e.g., apartments, condos, townhomes, affordable housing, etc.) as well as ownership structures (e.g., renter-occupied, owner-occupied, etc.). As such, there are unique barriers to solar participation within each facet of this sector of the residential market, which must be taken into full account when designing a program geared to serve multifamily customers. Whether a state-led program or a voluntary utility tariff, program development should ideally stem from a foundation of understanding of the real and

perceived barriers to solar adoption and participation. In addition, barrier identification processes should be as specific as possible to the targeted segment of the multifamily market. There are notable differences between owner-occupied vs. renter-occupied multifamily buildings, as well as distinctions between affordable housing and general market housing. Whether through pilot efforts or more targeted market surveys, initial research into the barriers and solutions to those barriers can help ensure programs are both successful and scalable.

California's market-rate VNEM program[22] was an extension of the initial virtual net metering tariff,[23] serving affordable housing through the Multifamily Affordable Solar Housing (MASH) program. Through the initial experiences gleaned from the MASH program, utilities, solar contractors and multifamily housing providers developed a better understanding of the unique challenges and opportunities surrounding the multifamily solar market. To some extent, some of these lessons learned translated to the general market. However, given the distinct nature of the two markets, there were several components of the MASH market that were not applicable in the general market, and therefore the market-rate VNEM program has run into challenges of its own. As such, to the extent pilot efforts are used to identify barriers and solutions, the pilots should be designed to gain a solid understanding of their intended multifamily market, while also keeping in mind the differences between and among markets. Success in demonstrating a program design framework across different markets can be valuable for other reasons, including reaching historically underserved populations and providing important "proof of concept" opportunities for new policies or programs.

2. **Avoid unnecessary project restrictions**. Given the multiple structure types and ownership arrangements, multifamily owners and tenants (and any involved financial partners) stand to benefit from programs devoid of unnecessary, inefficient and/or burdensome restrictions. An apt example of this type of restriction that emerged in California was the Service Delivery Point (SDP) requirement for market-rate VNEM projects, which until recently was required under the utilities' tariffs. As elucidated through research conducted in this project, the SDP requirement allowed only those meters on a multifamily building fed by a single SDP to be included in a

[22] Distinguished as NEM-V (SCE territory); NEM-V (SDG&E territory); NEMV (PG&E territory)
[23] Distinguished as MASH-VNM (SCE territory); VNM-A (SDG&E territory); NEMVMASH (PG&E territory)

single market-rate VNEM arrangement powered by a single solar electric system. The lack of publicly attainable resources, such as utility maps, to easily identify SDP layout within a site was an additional obstacle for potential solar adopters. In addition, many multifamily properties span over multiple SDPs, and by limiting market-rate VNEM arrangements to one system per SDP, the value for those projects was severely reduced, if not eliminated. Technical information about this barrier gathered by the project team was included as part of the net metering regulatory proceeding. Decision-makers determined, through a regulatory review process and subsequent rulemaking, that the SDP was an unnecessary and overly restrictive requirement – one that was not necessary for system safety or reliability and had little technical justification. With the removal of this restriction, solar providers across all three utility service territories are now able to more easily and quickly design and interconnect systems to serve the multifamily sector. Programs and tariffs should be mindful of imposing restrictions that might unfairly or arbitrarily impact certain multifamily arrangements from participating. Programs should also avoid the need for requirements that will impose unwarranted cost or complexity burdens on contractors, owners, tenants and/or utilities.

3. **Employ targeted education and outreach**. Multifamily solar projects entail multiple moving parts, processes and players, and the pathways to install and/or participate are often more complex than for those participating in traditional on-site or off-site shared solar programs. To minimize confusion, clarify complexities and streamline solar uptake, programs designed with targeted education and outreach components are more likely to be successful and achieve scalable uptake. These efforts should involve targeted outreach to solar contractors/providers, building owners/managers, as well as the end-user customers/tenants. On-line toolkits for Apartment and Condo owners, such as the ones informed by and created specifically for this project, are examples of useful tools that can help simplify complex multistep processes and can easily be modified for other markets. Workshops and websites, such as the examples listed in Section II, can provide helpful forums to proactively address common questions/concerns among multiple participants, while also ensuring that all involved stakeholders are on the same page, which could help avoid challenges midway through the project development phase. Where property owners or building managers are involved in the solar decision-making process, peer-to-peer information sharing and educational workshops disseminated through existing networks (e.g., apartment owners associations) can be helpful in navigating the complexities and providing an important forum for addressing common questions, concerns and misconceptions.

4. **Prioritize targeted solar contractor training.** Solar contractors can and should be champions for multifamily solar, given the tremendous potential to tap a new and vastly underserved solar market. It is imperative that these contractors have access to regular training and resources, such as Contractor Toolkits, trainings and standardized financing models, to ensure they have the tools necessary to navigate the multifamily market. In addition, solar contractors should be equipped to identify and address unique challenges in different multifamily scenarios, including navigating roof space limitations, applying solar to parking structures or other shade structures, understanding the pertinent codes and standards applicable to multifamily buildings and knowing how to navigate the interconnection and permitting process with the local utility and/or local government. Dedicated and ongoing support for contractors, ideally provided by reputable industry education associations and/or trusted nonprofit partners, is instrumental to retaining and attracting qualified contractors to serve the multifamily sector in any market.

5. **Deploy tools to help connect project developers and installers with interested property owners and tenants**. In addition to the above referenced outreach efforts, developing more sophisticated and easily accessible tools to streamline the process of connecting interested customers, building owners and contractors may help increase uptake within a geographically diverse multifamily program. A recent survey of contractors in New York City, conducted by the Sustainable CUNY with the City University of New York as part of the Shared Solar NYC Gateway project, revealed that one of the main obstacles to serving their huge multifamily market within their new Community Distributed Generation program was difficulty with site selection, lack of viable roof space for solar and finding and connecting willing participants. The latter was solved with the launch of a new online portal, willing contractors, customers and building owners are now able to register and make connections more easily, thus helping to reduce an upfront hurdle (and cost) of the solar transaction. In addition to these types of creative approaches, more targeted community campaigns with dedicated support from local governments and/or local community organizations (such as the Santa Monica VNEM Pilot Project) can help bring communitywide visibility to and build important momentum for a multifamily solar campaign. In addition, these communitywide campaigns may prove helpful in addressing and overcoming restrictive zoning and/or siting challenges, should they arise. Ultimately, having reputable, trusted entities facilitating these efforts can help all parties gain greater confidence in the solar process, while also helping to reduce customer acquisition costs and inefficiencies.

6. **Incorporate robust monitoring and reporting specific to multifamily solar.** To effectively measure program success and effectively identify challenges to customer uptake, program monitoring and reporting requirements should be built in to program design. This applies not only to multifamily solar programs, but to all shared solar energy programs. Most state and utility programs lack readily available and/or transparent information to assess whether programs are achieving identified goals and/or policy objectives. Whether applied to a state policy or program or a utility tariff, consistent and regular metrics reporting can help provide an important track record of success (or shortcomings) that can help improve program design over time. In addition, this tracking can provide important insight on how to more effectively serve the multifamily market as this sector of our housing stock continues to grow.

7. **Ensure utility billing software can handle bill crediting**. Utilities responsible for tracking and allocating credits from solar generation to bills are likely to need upgraded billing systems capable of supporting the bill crediting process inherent to serving the multifamily market. More antiquated billing systems or inefficient manual processes are common among utilities. Fortunately, as more utilities recognize the added benefits of updating out-of-date billing systems for their customers' benefit, there are likely to be ripe opportunities to simultaneously ensure the billing systems are set up "smart from the start" to accommodate virtual billing arrangements, for multifamily solar programs as well as related shared or community solar programs. Software solutions abound in the digital economy, and there are now several providers of software and billing systems tailored for utilities, which are proven to streamline and simplify all manner of utility customer engagement and billing transactions. Upfront expenditures for such systems can certainly be a deterrent for utilities; however, arguably broader customer benefits will be realized from modernizing antiquated billing systems and should be adequately factored into account when evaluating the options. Regulators, policymakers and/or municipalities can provide important clarification that reasonable billing expenses can be recovered through program costs, as needed to offset the upfront expense.

V. Conclusion

Throughout 2017, the project team will deploy the strategies outlined in this Plan in support of the project's overarching goal of expanding solar access to California's untapped multifamily housing sector and increasing uptake in California's virtual net metering program. The project team anticipates that these efforts will prove useful for other market actors and increase the awareness of solar opportunities for multifamily residents, including California's GTSR program and other offerings outside of the large investor-owned utilities' service territories, as described in Section III. The project team will track success according to identified metrics mentioned in Section II, including the number of consumers reached through outreach and educational efforts and installations deployed. As seen to date, the team will continue to gather lessons learned from California's VNEM experience to refine and supplement those articulated in Section IV. The team will not only apply these lessons to efforts as they progress forward, but also will share them within California and across the nation, as other local governments, states and utilities seek to develop and improve solar energy programs to serve and benefit multifamily customers.

Appendix A

2017 SMP Marketing & Education Schedule

Effort	Source	Avenue for messaging	Target Region(s)	Target Audience
Outreach	East Bay Rental Housing Association	Email blasts; article publications in *Rental Housing Magazine*; events to present; green workshops	Alameda and Contra Costa Counties	Multifamily property owners
Outreach	San Francisco Apartment Association	Article publications in *SF Apartment Magazine*; member meetings to present	City of San Francisco	Multifamily property owners
Outreach	San Diego Apartment Association	Educational expo's and other events to present	San Diego County	Multifamily property owners
Outreach	Apartment Association of Greater Los Angeles	Email blasts; digital newsletter article publications; events & meetings to present	Los Angeles County	Multifamily property owners
Outreach	US Green Building Council – LA	Article publication	Los Angeles County	Multifamily property owners; building professionals
Education	VNEM Workshop Series	In-person workshop at an AAGLA educational event	SCE service territory	Apartment building owners
Education	VNEM Workshop Series	In-person workshop at LA Clean Tech Incubator	SCE service territory	Contractors & solar professionals
Education	VNEM Workshop Series	In-person workshops (x2) at the East Bay Rental Housing Association member meeting	PG&E service territory	Apartment building owners
Education	VNEM Training Series	In-person workshop at the PG&E Pacific Energy Center	PG&E service territory	Contractors & solar professionals
Education	VNEM Workshop Series	In-person workshop	SDG&E service territory	Apartment building owners
Education	VNEM Workshop Series	In-person meetings	SDG&E service territory	Condo residents and HOA members
Education	VNEM Training Series	In-person workshop	SDG&E service territory	Contractors
Education	VNEM Webinar Series	Digital webinar	Statewide	Rent controlled cities
Education	VNEM Webinar Series	Digital webinar	Statewide	All stakeholders
Education	Conference	Panel discussion at Intersolar SF	San Francisco	All stakeholders

Visit www.energycenter.org/events for updates.

Appendix B

Additional resources

- U.S. Department of Energy Solar Market Pathways
- Solar Market Pathways Community Solar Toolkit
- Virtual Net Metering Policy Background & Tariff Summary Background
- IREC's Model Rules for Shared Renewables
- IREC's *State Shared Renewable Energy Program Catalog*
- IREC's *Shared Renewable Energy for Low- to Moderate-Income Consumers: Policy Guidelines and Model Provisions*
- Solar for Apartments Toolkits
- Solar for Condo Toolkits
- VNEM Contractor Toolkits
- Santa Monica VNEM Pilot Project Summary
- NEM-V Market Assessment Report

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