Strategic Energy Plan: City of Carpinteria

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Executive Summary

ES.1 – Project Origin and Objectives

In an effort to address state and local emissions reduction goals, and in the wake of the 2017-2018 Thomas Fire and Montecito debris flows, the City of Carpinteria (City) partnered with the County of Santa Barbara and the City of Goleta to create the Strategic Energy Plan (SEP) in order to prepare for emergencies by improving the resiliency of the local electric distribution system. Increasing resiliency by promoting local renewable energy, energy efficiency, and energy storage projects will allow the residents and businesses in Carpinteria to reduce their dependence on the local electric distribution system and increase electricity reliability during power outages.

Due to Carpinteria's unique location close to the end of the Southern California Edison (SCE) electric service area, the emergency scenarios that are targeted by the SEP extend far beyond natural disasters. There is less resiliency at the end of the SCE power grid because most of the electric generation is coming from only one southeasterly direction, which places higher emphasis on reducing electrical load and hardening a few key sections of the power grid. Furthermore, the major Investor-Owned Utilities (IOUs), such as SCE, recently implemented a new protocol called the Public Safety Power Shutdown (PSPS)[1] as a measure to proactively prevent wildfires and other natural disasters. The PSPS would allow and require IOUs to turn off some of these key sections of the power grid upstream of Carpinteria during high-risk scenarios such as high-wind events, which could result in utility-induced power outages.

Additionally, in 2018, SCE released a Request for Proposals (RFP) for local generation to fulfill local capacity requirements around Carpinteria, but its "Least Cost Best Fit" selection methodology provided minimal consideration for the renewable content of energy.[2] As such, none of the selected projects included local renewable energy generation despite strong community interest in the development of local renewable resources.

Therefore, the objective of this SEP is to address these resiliency concerns by promoting local renewable energy development in three ways:

1) Identifying total resource potential for distributed solar development in Carpinteria on rooftops and parking lots;
2) Creating a list of priority sites for renewable energy development throughout Carpinteria; and
3) Developing a set of strategies to remove barriers to renewable energy development in diverse program areas ranging from drafting regulatory frameworks to creating new financing mechanisms.

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[1] Southern California Edison, 'SCE Proposes Grid Safety and Resiliency Program to Address the Growing Risk of Wildfires', 2018 <https://newsroom.edison.com/releases/sce-proposes-grid-safety-and-resiliency-program-to-address-the-growing-risk-of-wildfires> [accessed 10 April 2019].

[2] California Public Utilities Commission, 'Utility Scale Request for Offers (RFO)', 2019 <http://cpuc.ca.gov/Utility_Scale_RFO/> [accessed 10 April 2019].

ES.2 – Renewable Energy Potential in Carpinteria

Table ES.1 summarizes the estimated maximum solar potential in Carpinteria. Although most of the potential is on rooftops, roughly 17% of the potential is in parking lots, where solar carport structures could provide shade for vehicles while simultaneously creating energy. Due to Carpinteria's constrained geography and urban/suburban make-up, alternative renewable energy sources, such as wind, biogas/biomass, hydroelectric, and geothermal hold minimal potential for local development, and solar photovoltaic (PV) energy is the primary target for local renewable electricity generation.

Table ES.1: Distributed Solar Potential in Carpinteria

Solar Resource	Potential Generation Capacity (MW)	Potential Annual Generation (GWh)	Households Powered
Rooftop	31 – 39	42 – 57	15,000 – 20,000
Parking Lots	7 – 8	9 – 12	3,000 – 4,000
Total	38 – 47	51 – 69	18,000 – 24,000

ES.3 – Barriers to Renewable Energy Development in Carpinteria

Table ES.2, on the following page, summarizes the key barriers to renewable energy development that were identified in Carpinteria. These barriers were determined through engaging both City staff and members of the Carpinteria community, including regional renewable energy project developers, through public workshops, individual communications, and feedback opportunities on draft versions of the SEP. Although some of these barriers are state or federal concerns, such as the decrease in federal tax credits, many are unique to, or heightened in, Carpinteria.

Table ES.2: Barriers to Renewable Energy Development in Carpinteria

Type of Barrier	Barrier(s)	Description
Property Ownership	Split Incentive	Landlords do not have any incentive to make energy improvements on behalf of tenants.
	Load Constraints and Rooftop Leasing Challenges	Many high-potential areas do not have the load to install a maximum-sized array & rooftop leases do not provide enough financial benefit to make up for the additional liability.
Financial / Funding	Financing Mechanisms	Several programs to help finance energy projects have not achieved desired objectives
	Altered Time-of-Use (ToU) Rate Schedules	Changes in electricity rates are will lower the value of solar generation.
	Funding Sources	The City is over-reliant on funding from utilities.
Institutional / City	Energy Assurance Plan (EAP)	The City does not have a formal EAP to ensure electricity reliability at critical facilities.
	Regional Collaboration	There is limited regional framework for municipal collaboration on energy, climate, and resiliency issues in Santa Barbara County.
Public Awareness	Cost Awareness of Renewable Energy	Public awareness of the costs & benefits of renewable energy can be outdated due to technology improvements and changing electricity rates and programs.
Regulatory / Utility	SCE RFP Process	SCE's RFP process for increasing local electrical resiliency does not place additional value on renewable energy.
Technical / Infrastructural	Distribution Grid	Parts of the distribution grid in downtown Carpinteria may not be able to interconnect additional renewable electricity due to low-capacity infrastructure.
	Solar Automatic Shut-Off	Solar panels without backup inverters or battery storage must be shut off for safety reasons and not provide power during outages.
State and Federal Policy	Federal Investment Tax Credits (ITC)	The federal ITC is currently planned to drop down and then phase out, which will reduce project viability.

ES.4 – Recommended Actions to Overcome Barriers

The strategies in Table ES.3 were developed to directly target the specific barriers identified in Carpinteria. These strategies span five major program areas: (1) regulatory policy-driven actions to drive new local development, (2) actions aimed at changing the electricity supply to Carpinteria, (3) actions related to increasing options for financing renewable projects, (4) actions to address electricity usage and supply at City facilities, and (5) actions related to outreach and advocacy both inside and outside Carpinteria.

Table ES.3: Recommended Actions to Overcome Renewable Energy Barriers in Carpinteria

Program Areas	Strategies	Description
Regulatory	Create Solar and Storage Permitting Procedures	Update residential and small commercial solar ordinances to go beyond AB2188 and AB546 regulations.
	Commercial Building Energy Benchmarks	Institute energy benchmarks for large commercial buildings to encourage commercial building owners to undertake energy projects.
Utility	Backup Inverter Program	Supply backup inverters for critical circuit operation during power outages.
	Community Solar Project	Develop a community solar project for those without access to on-site renewable energy.
Financial and Funding	Financing Mechanisms	Create an improved Property-Assessed Clean Energy (PACE) or On-Bill Financing (OBF) program for residents to finance projects.
	Financial Incentives	Provide financial incentives to fill gaps in project viability.
	Diversify Funding Streams	Monitor and apply for regional, state, federal and foundation grants.
City Facility	Energy Assurance Plan	Create and implement an energy assurance plan to ensure electrical reliability at critical facilities.
Outreach and Advocacy	One-Stop Shop	Support a county-wide resource and education center to raise awareness and act as a hub for advertising energy programs.

ES.5 – Call to Action

The need for increased resiliency and better emergency preparedness for Carpinteria's energy system was a primary driver and objective of this project and has been echoed by strong calls from community stakeholders. Successful achieving this objective will not happen naturally but it can be accomplished through commitment from the City across the outlined program areas and through the development of healthy partnerships among residents, businesses, and other local jurisdictions undertaking renewable and stored energy projects.

Chapter 1 – Introduction

1.1 – Benefits of a Strategic Energy Plan (SEP)

In December 2017, the City of Carpinteria (City) and the surrounding communities were severely impacted by the Thomas Fire. On January 9, 2018, mud and debris flows struck Montecito, Carpinteria, and other surrounding unincorporated areas of the County of Santa Barbara, shutting down access to large sections of the southern county. These combined disasters claimed 2 lives, destroyed hundreds of structures, caused hundreds of millions of dollars in property damages, and led to power outages for over 20,000 residents in the region. Carpinteria was left with decreased power supply for nearly a month.

Prior to that, the City of Carpinteria had chosen to join the County of Santa Barbara and the City of Goleta in developing a strategic energy plan (SEP) to further the City's renewable energy goals by creating a roadmap to increase electricity reliability and resiliency for its residents and businesses. Following the events of late 2017 and early 2018, the need for such a plan to also incorporate emergency preparedness was evident to the participating agencies.

Natural disasters are not the only drivers for the City's desire for increased emergency preparedness. In the wake of the Thomas Fire and other wildfires across California, the state's three investor-owned utilities (IOUs), including Southern California Edison (SCE), announced Public Safety Power Shut-off (PSPS) protocols. These protocols are designed to pre-emptively reduce wildfire risk by shutting down sections of transmission electricity lines in dangerous weather conditions such as high-wind events. These PSPS events are likely to create periodic power outages even in non-disaster situations.

Power outages result in a loss of economic production, impacting the community financially as well as increasing safety hazards. These hazards and costs are particularly felt at critical facilities, such as hospitals and water distribution systems. Increasing the reliability and resiliency of the electricity system would serve to stimulate local economic growth in several ways. Increasing reliability by encouraging renewable energy development will create local jobs in a burgeoning industry and help decouple economic development and greenhouse gas emissions (GHGs), allowing the economy to grow while reducing emissions.

A comprehensive SEP is consistent with the movement of local and state governments to encourage local renewable energy development. As of May 2019, at least 105 cities and 11 counties across the country have made commitments to transition to 100% renewable energy by or before the year 2050, including the cities of Goleta and Santa Barbara. Locally sited renewable energy is one method to achieving these goals, with an alternative method being the purchase of Renewable Energy Certificates (RECs).

RECs are tradable market-based commodities that represent the intangible renewable attribute of renewable electricity without the electricity itself.[3] Purchasing RECs would likely be the cheapest method for the City to procure renewable electricity for the community, but REC purchases are more likely to result in the reshuffling of renewable electricity from one section of the grid to another, as opposed to additional renewable electricity being installed. Furthermore, RECs will not help Carpinteria meet its resiliency goals, since they will be created from renewable electricity generated outside the region.

[3] US EPA, 'Renewable Energy Certificates (RECs)', 2018 <https://www.epa.gov/greenpower/renewable-energy-certificates-recs> [accessed 10 April 2019].

In addition to helping the City meet resiliency and local clean energy goals, adopting and implementing an SEP enables Carpinteria to more effectively help meet state renewable electricity and emission reduction targets. Through SB100[4] and AB32,[5] California legislation set goals of 100% carbon-free electricity by 2045 and emission reductions of 80% below 1990 levels by 2050. Given the lack of developable land in Carpinteria for utility-scale installations, the best option for the City to encourage renewable energy development is to support residential and commercial distributed electricity installations. Bold action by every municipal government is needed over the next 25-30 years to achieve these goals and deliver the broad economic, environmental, and community benefits of renewable electricity.

1.2 – Current City Actions Supporting Energy Development

1.2.1 – City Policies and Plans

The City adopted a Sustainable Community Policy in 2014 that set out broad goals for increasing sustainable practices, including reducing GHG emissions and promoting alternative energy sources,[6] but the City does not currently have an adopted GHG emission reduction goal. A strategic energy plan would build upon the Sustainable Community policies. As the City develops its SEP, it is important to take stock of other climate-adjacent plans that the City has already implemented to understand how to best integrate these plans and coordinate actions arising from them.

In 2016, the City developed an Energy Action Plan, which focused specifically on energy efficiency at municipal facilities. It involved undertaking a comprehensive audit of City facilities and outlining strategies to achieve a 15% energy reduction goal by 2020. These strategies included LED retrofits throughout all facilities and upgrading HVAC and lighting controls. These retrofits were planned to be funded through on-bill financing (OBF) through SCE when possible to reduce up-front cost requirements.[7] All projects incorporated into the Energy Action Plan have either been completed or are currently in construction.

In 2018, the City released a draft Coastal Vulnerability and Adaptation Project, a technical assessment of the vulnerabilities associated with sea level rise in Carpinteria and potential adaptation strategies to mitigate various levels of sea rise. This study serves as a guidance document for future policy and program development.[8] While actions taken by the City will not lower global sea-level rise, Carpinteria can adopt strategies to mitigate risk to critical facilities targeted for renewable energy installations, such as the Carpinteria Sanitary District's wastewater treatment facility.

1.2.2 – City Programs and Projects

The City has undertaken several energy projects to reduce municipal electricity consumption and support the community. The foremost of these is transitioning all city-owned street and parking lot lights to LEDs, as well as working with SCE to transition utility-owned lights to LEDs. Given the much higher efficiency of LEDs, this has resulted in large energy and cost savings for the City.

Furthermore, the City worked with the Community Environmental Council (CEC) and Santa Barbara County Air Pollution Control District (APCD) as part of the Central Coast Charge Ahead Program. The City

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[4] California Senate, *SB-100 California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases.* (Senate, 2018) <https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100> [accessed 10 April 2019].
[5] California Air Resources Board, 'Assembly Bill 32 - California Global Warming Solutions Act', 2014 <https://www.arb.ca.gov/cc/ab32/ab32.htm> [accessed 12 April 2019].
[6] City of Carpinteria, 'A Resolution of the City Council of the City of Carpinteria Establishing a Sustainable Community Policy', 2014.
[7] City of Carpinteria, *Energy Action Plan*, 2016.
[8] City of Carpinteria, *Coastal Vulnerability and Adaptation Project* (Carpinteria, 2018).

used these regional grants in 2012, 2014, and 2016 to install public electric vehicle (EV) charging stations at City Hall and City Public Parking Lots 1, 2, and 3. As a result, there are 12 dedicated parking spots for use by electric vehicles using EV charging stations.[9]

1.2.3 – City Collaborative Efforts

The City participates in several regional and state partnerships that serve as a venue to share best practices for developing and implementing energy programs and projects.

One key regional partnership that the City participates in is the Clean Energy Working Group (CWEG), a collaboration with the County of Santa Barbara and the cities of Santa Barbara and Goleta. One of the most important collaborative efforts of the CWEG has been to explore the possibility of a county-wide Community Choice Aggregation (CCA). In 2018, the County commissioned a study to analyze the rates that a CCA could offer in the northern and southern parts of Santa Barbara County, and how those would compare to current IOU rates.[10] However, in 2018, the California Public Utilities Commission (CPUC) allowed IOUs to recalculate the Performance Charge Indifference Adjustment (PCIA) that they were charging CCAs for the loss in customers, which may reduce the viability of new CCAs. The County has already re-commissioned the study with the new PCIA rates, the results of which are expected in summer 2019.

Until 2019, the City also collaborated with the County of Santa Barbara and the cities of Santa Barbara and Goleta to run the emPower SBC program, which partnered with local utilities and banks to give low-interest energy efficiency loans to homeowners.[11] However, this program was shut down due to low participation. With a multitude of partner entities administering the program, there were too many administrative hurdles for residents to overcome and too many overlaps with other programs such as the Home Energy Upgrade Program. Additionally, due to utility participation, there were very strict guidelines on eligibility placed by the CPUC, and many businesses either could not participate or were dissuaded from even applying.

The City also partners with the County of Santa Barbara and the cities of Santa Barbara and Goleta, as well as SCE and Southern California Gas Company (SoCal Gas), to run the South County Energy Efficiency Partnership (SCEEP). The SCEEP focuses on municipal energy efficiency project implementation, as well as promoting other energy programs (including direct install), certifications, and training seminars and workshops. Unfortunately, this partnership also ends in 2019, with local government partnership in the program sunsetting.[12]

1.2.4 – City Departments

There is currently no identified organizational department specifically dedicated towards sustainability, environmental and/or energy services, but the Public Works Department Engineering Division administers these types of services. The Public Works Department is currently studying the feasibility of creating a

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[9] City of Carpinteria, *Council Agenda Staff Report*, 2016 <http://carpinteria.granicus.com/MetaViewer.php?view_id=2&clip_id=254&meta_id=21234> [accessed 12 April 2019].
[10] Pacific Energy Advisors, *Technical Feasibility Study on Community Choice Aggregation: All Santa Barbara County Scenario*, 2017 <https://doi.org/10.1142/9781860949371_0008>.
[11] emPower SBC, 'EmPower Central Coast', 2019 <https://www.empowersbc.org/> [accessed 10 April 2019].
[12] South County Energy Efficiency Partnership, 'South County Energy Efficiency Partnership', 2018 <https://www.sceep.org/> [accessed 10 April 2019].

separate organizational division which would include an easily identifiable division name indicating the City's commitment to sustainability and the environment.

1.3 – Currently-Installed Renewable Capacity

1.3.1 – Projects at City Facilities

There are currently no renewable energy projects installed at City-owned facilities, although there are existing plans to install solar at the Carpinteria City Hall. The Carpinteria Valley Water District has taken strong action by installing solar carports and undertaking LED lighting retrofits at its headquarters. The Water District is also in discussions to install solar projects near its reservoirs and critical sites, a strong example of how renewable energy can produce savings while increasing reliability.

1.3.2 – Installed Community Renewable Energy Capacity

Figure 1.1 shows the current total installed distributed renewable energy capacity by sector in Carpinteria, as per NEM Interconnection data released by California Distributed Generation Statistics.[13]

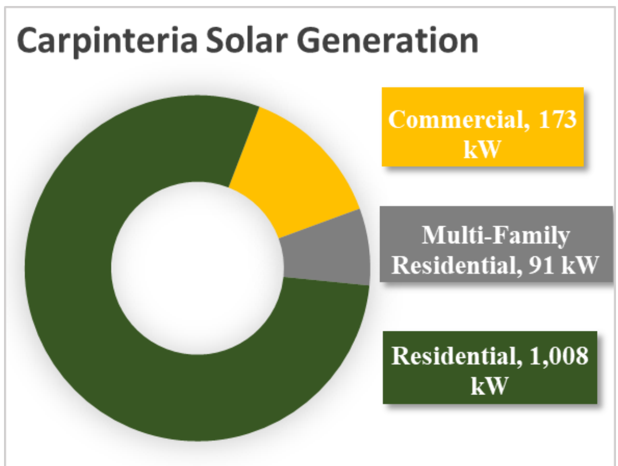

Figure 1.1: Distributed Energy Capacity in Carpinteria

The approximately 1,300 kilowatts (kW) of combined solar capacity in Carpinteria has resulted in roughly 300 metric tons of CO_2 being reduced annually, equivalent to approximately 60 cars being taken off the road. Most of the renewable energy installations have been on residential buildings, similar to other cities in Santa Barbara County. This is understandable in Carpinteria due to a proportionally smaller number of commercial buildings compared to nearby cities such as Goleta. Carpinteria also has a relatively high number of multi-family solar projects, with a higher installed capacity than Goleta despite having roughly 1/3rd the population. The renewable energy potential in Carpinteria will be discussed in more detail in Chapter 2.

[13] California Distributed Generation Statistics, 'CaliforniaDGStats', 2019 <https://www.californiadgstats.ca.gov/downloads/> [accessed 21 March 2019].

1.4 – Carpinteria Electrical Grid

One of the unique energy and resiliency challenges in Carpinteria is caused by the city's location close to the end of the SCE distribution grid. As a result, Carpinteria is heavily dependent on a few key transmission lines, as shown in Figure 1.2 on the following page.

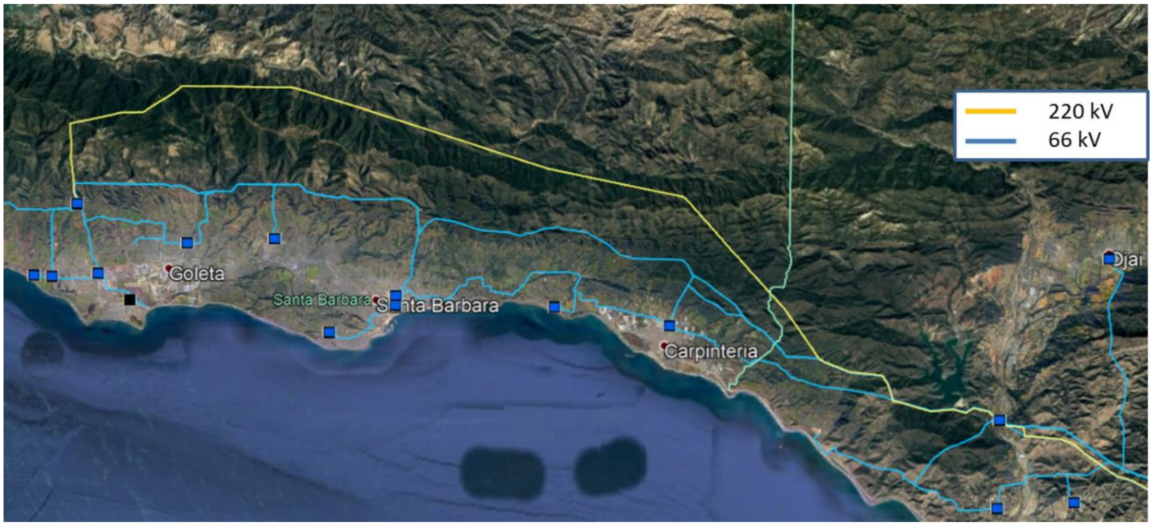

Figure 1.2: Southern Santa Barbara County Electricity Transmission Grid

Carpinteria, along with the rest of southern Santa Barbara County, is dependent on the 220 kilovolt (kV) transmission line going through the mountains. If that line is shut off, the transmission capacity in the lower capacity 66 kV lines coming into Carpinteria may not be enough to serve the remaining load in southern Santa Barbara County.

The 58-megawatt (MW) Ellwood Natural Gas power plant serves as backup for southern Santa Barbara County. Due to the ability of natural gas power plants to run at full capacity at all times, this power plant can serve close to the entire load in the area. However, during the power outages caused by the Thomas Fire and Montecito Debris Flows, it did not turn on due to damage to the lines connecting it to load centers. SCE recently released a Request for Proposals (RFP) to attempt to solve the resiliency issue in southern Santa Barbara County, but the process was expedited and did not provide additional value for high renewable content of generation. As such, many local renewable energy developers felt that they did not have enough time to submit strong renewable-focused applications under the guidelines set out by SCE. The only applications that were accepted through the RFP had stand-alone batteries, with no accompanying renewable energy generation.

Chapter 2 – Distributed Solar Resource Potential in Carpinteria

2.1 – Introduction

The purpose of this chapter is to assess the availability of renewable energy generation within the City of Carpinteria. There are five types of power generation eligible under California's Renewables Portfolio Standard (RPS): solar, wind, biomass/biogas, small hydroelectric, and geothermal.[14] This chapter primarily focuses on distributed solar photovoltaic (PV) potential because the remaining types of renewable generation require large amounts of space or access to natural resources such as rivers or high wind and are not possible within City limits. Attention will also be devoted to energy efficiency and battery storage as methods of reducing the need for renewable generation and shifting it to needed times, respectively.

This chapter serves the following purposes:

1. Estimate the quantity of distributed solar energy resource that can realistically be developed in Carpinteria in the next 5-10 years;
2. Categorize the potential solar energy resource by customer segment to enable City of Carpinteria (City) staff to better target its policy and programmatic solutions;
3. Identify the geographical locations in Carpinteria with the greatest availability of potential solar energy resource; and
4. Document the technical and administrative barriers to meeting this potential.

2.2 – Current Solar Projects in Carpinteria

Carpinteria has a strong history of rooftop solar installations, particularly on single-family and multi-family residential buildings. Examining this history enables a comparison with other local jurisdictions.

Approximately 1.3 MW of distributed, net-metered solar PV has been installed to date in Carpinteria, with over 1 MW on single-family residential rooftops and the remaining distributed between commercial and multi-family residential rooftops. Over the past 3 years, roughly 150 – 250 kW of distributed capacity has been added on average each year across Carpinteria. Although residential structures greatly outnumber commercial and industrial structures, these buildings are much smaller and therefore have much less rooftop space available, as summarized in Table 2.1. This data is estimated by the statistical solar distribution analysis performed for the City, which will be described in further detail in Section 2.3.

Table 2.1: Estimated Carpinteria Building Data

Building Type	# of Estimated Structures	Amount of Estimated Rooftop Space (acres)
Residential	~3,000	~100
Commercial	~1,100	~90
Large Commercial / Industrial	~100	~50

Additionally, there is much less available rooftop space on residential buildings than on commercial and industrial buildings due to the roof angle on most single-family residential homes. As such, there is more potential on commercial properties in Carpinteria, and therefore a greater opportunity for renewable

[14] Christina Crume and Lynette Green, *RPS Eligibility Guidebook, Ninth Edition*, 2017.

energy projects in the commercial sector. However, solar development on commercial buildings also has greater constraints, which will be discussed in Chapter 3.

2.3 – General Statistical Analysis Method

Given the magnitude of the total number of rooftops and parking lots in the City, it was not possible to individually measure the solar potential at each property. As such, a statistical analysis was conducted for both rooftops and parking lots to determine the estimated solar generating potential. In each case, the total available area was reduced based on relevant exclusions until only likely-viable space was remaining. Following that, industry standard "rule-of-thumb" solar siting principles, such as rooftop fill factors and solar production efficiencies, were used to calculate the potential in representative samples of the available space. These principles are discussed in further detail in Appendix A. The potential in these samples was then scaled to determine the total potential. The exact challenges and constraints of solar development on each type of land use will be discussed below, as well as how these constraints informed the relevant exclusions and siting principles.

2.4 – Solar Potential

Solar installations in urban areas occur primarily on rooftops and on parking lot canopies. Although undeveloped urban land can be used for solar power, doing so often conflicts with other uses such as recreation and housing. Further, undeveloped land not already designated for another use (like public park space or open field agriculture) is extremely limited in Carpinteria. Therefore, undeveloped urban land was not considered for the statistical modeling.

Table 2.2 summarizes the key similarities, differences, and challenges for wholesale and on-site use projects.

Table 2.2: Comparison Between Urban Solar Arrays for Wholesale and On-Site Use

<table>
<tr><th>Consideration</th><th>Wholesale Projects</th><th>On-site Use Projects</th></tr>
<tr><td>Electricity Off-taker</td><td>Utility distribution grid</td><td>On-site use</td></tr>
<tr><td>Site-owner Revenue Stream</td><td>Rooftop lease to system owner</td><td>Electricity bill reductions</td></tr>
<tr><td>Electrical Concerns</td><td>Costly electrical upgrades may be necessary if utility distribution transformer or feeder is at full capacity</td><td>Costly electrical upgrades may be necessary if utility distribution transformer or feeder is at full capacity</td></tr>
<tr><td>Load Concerns</td><td>California utilities do not allow wholesale generation on a feeder (a section of the grid) if it would exceed total feeder load</td><td>SCE Net Energy Metering rules do not allow on-site generation to exceed on-site consumption</td></tr>
<tr><td>Rooftop Availability</td><td colspan="2">Constrained by roof orientation and HVAC equipment</td></tr>
<tr><td>Shading Concerns</td><td colspan="2">Generation reduced by nearby trees and buildings</td></tr>
<tr><td>Structural Concerns</td><td colspan="2">Costly roof replacement may be necessary, based on rooftop age and material</td></tr>
<tr><td>Geotechnical Concerns</td><td colspan="2">Parking lot canopy may need added structural design if soil is unstable</td></tr>
</table>

Most of the challenges with urban solar development are similar regardless of whether the generated electricity is used on-site or sold to the utility or CCA through the electric grid. However, not all these concerns can be determined through visual imagery. Figure 2.1 shows how viable solar potential is determined by narrowing down from the total urban area, applying each concern individually:

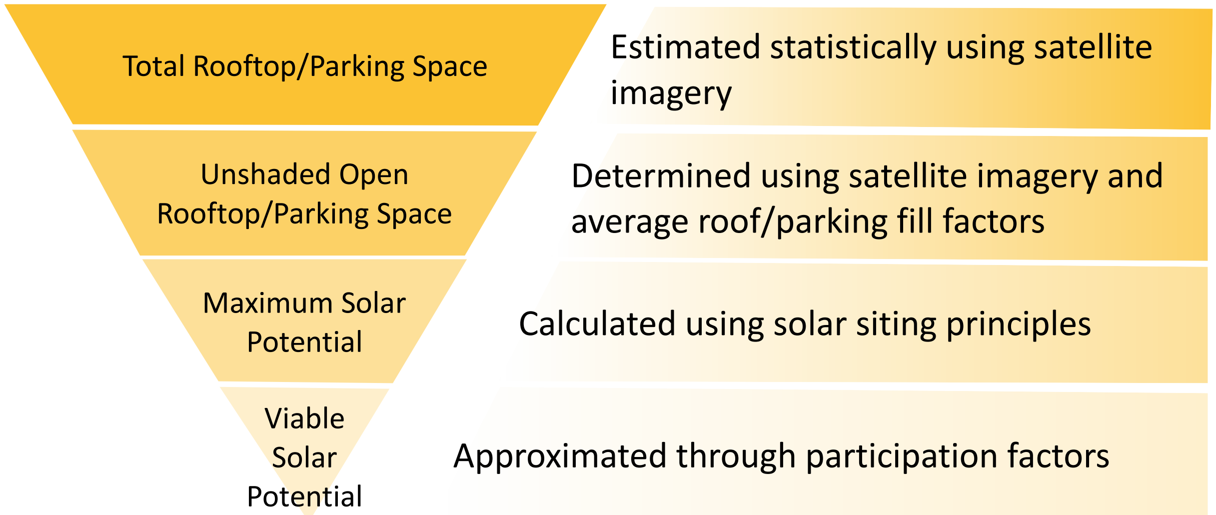

Figure 2.1: Process for Determining Carpinteria Solar Potential

The City of Carpinteria was split into two "zones" that were similar in building density, use, and geographical location. The total rooftop and parking lot space, as well as concerns that could be determined visually, such as shading, were determined by taking representative samples from each zone, and then scaling up to the size of the whole city. This available area was converted into maximum solar potential based on typical solar efficiencies, and then narrowed further into a technically viable solar potential estimate through participation factors that accounted for issues that could not be determined visually, such as structural, geotechnical, electrical, and load concerns. This analysis is explained in greater detail in Appendix A. It is shown in Figure 2.2:

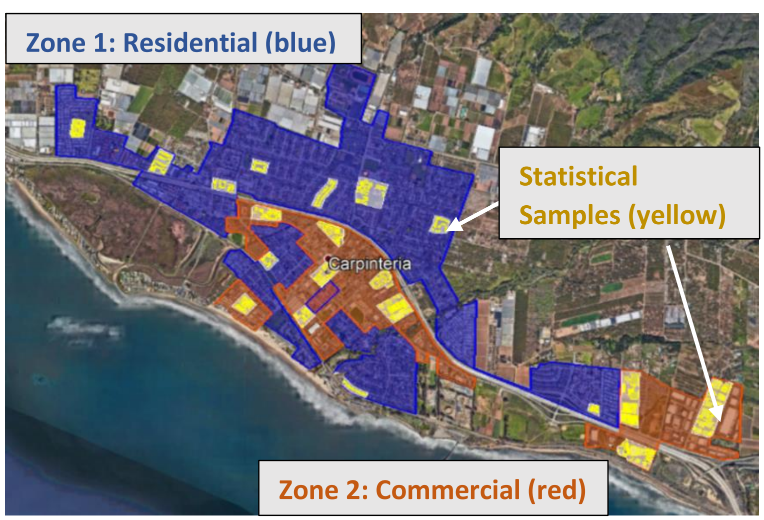

Figure 2.2: Statistical Solar Analysis for Carpinteria

The two zones included one residential and one commercial zone, with 10 samples taken of each zone. These zones do not correspond exactly with the boundaries of Carpinteria, in order to leave out undeveloped urban land.

The total potential capacity, by MW, is summarized in Table 2.3. Estimated urban solar energy generation, as measured in gigawatt-hours (GWh, equal to 1 million kilowatt-hours, or kWh), is shown in Table 2.4. The range of the solar power potential calculation is caused by the variance in the statistical estimation and the uncertainty in the participation factor. The energy potential has a slightly larger range due to the additional small variance in solar yield caused by different orientations. It should be noted that due to participation factors, this represents a conservative estimate of solar potential, particularly for residential installations.

Table 2.3: Summary of Carpinteria Solar Capacity

Building Sector	Rooftop Generation Capacity (MW)	Parking Lot Generation Capacity (MW)	Total Generation Capacity (MW)
Residential	3 – 4	0	3 – 4
Commercial	17 – 22	4 – 5	21 – 27
Large Commercial / Industrial	10 – 13	3	13 – 16
Grand Total	**30 - 39**	**7 – 8**	**37 - 47**

Table 2.4: Summary of Potential Annual Carpinteria Solar Generation

Building Sector	Rooftop Generation Capacity (GWh)	Parking Lot Generation Capacity (GWh)	Total Generation Capacity (GWh)
Residential	5 – 6	0	5 – 6
Commercial	23 – 31	5 – 6	28 – 37
Large Commercial / Industrial	14 – 19	3 – 4	17 – 23
Grand Total	**42 – 56**	**8 – 10**	**50 – 66**

2.5 – Energy Efficiency Potential

Energy efficiency is a valuable resource that will undoubtedly be used by the community as a precursor to installing renewable energy. The building number and size distribution estimated as part of the statistical analysis was used to determine the potential energy reduction due to widespread LED retrofits. It was estimated that there is approximately 12,000 – 14,000 MWh in total energy reduction potential across all customer sectors.

However, it should be noted that since net-metering solar generation is capped at electricity consumption, energy efficiency potential and solar generation potential are not mutually exclusive. Undertaking efficiency projects increases the load constraints on solar potential and/or reduces the value of existing generation if developed after solar PV installation.

2.6 – Battery Storage Potential

Although battery storage does not directly increase renewable generation on the grid or decrease load requirements, it can still play an important role by enabling greater local penetration of solar generation in particular. Additionally, it can help meet the City's resiliency goals for its community by enabling solar power to generate during outages. While there have been concerns regarding the safety and reliability of battery energy storage, strong work has been done both on the state and federal levels to address these concerns. Support resources include the U.S. Department of Energy's Energy Storage Safety Strategic Plan[15] and best practices for energy storage installation developed by Santa Clara County.[16]

Unlike solar potential, battery storage does not carry significant constraints due to available space and other site characteristics such as shading, though ventilation and spill management requirements may limit site locations for installations of batteries. In comparison to solar, battery storage requires a relatively smaller footprint and can be placed anywhere on-site that meets the requirements noted above. However, battery storage constraints do exist, namely from the financial perspective. Although battery storage costs are reducing rapidly, financial feasibility is still variable and is heavily dependent on the range of services being performed by the battery. These services can range from utility bill reductions to performing utility services contracts. California utilities and regulators are still in the process of determining how to value some potential grid services available through battery systems, so risk and volatility in these markets remain fairly high. As penetration of batteries onto the electrical grid and into the public consciousness increases, prices will continue to drop and additional value streams will continue to be developed.

2.7 – Conclusion

The City of Carpinteria has a strong history of residential solar installation, with more than 25% of the viable residential solar potential already reached. Due to the 10% participation factor used for residential installations, this indicates that roughly 1 in 40 residential buildings with solar exposure has a solar installation. However, in comparison, less than 1% of the viable commercial and industrial potential has been reached. Tapping into this potential could provide more reliable electricity during both emergency and non-emergency scenarios, and support a cleaner, more resilient future.

[15] Conrad Eustis, Imre Gyuk, and US DOE, *Energy Storage Safety Strategic Plan*, 2014.
[16] County of Santa Clara, 'Interconnection of Batteries', 2015.

Chapter 3 – Obstacles and Opportunities for Distributed Energy Resources

This chapter discusses the various obstacles for renewable energy development that are most important and unique to Carpinteria. One or more potential solutions or opportunities to address each obstacle are identified and analyzed. This list of barriers and solutions was developed by working closely with City officials, public agencies, community environmental advocacy groups, and local residents and businesses.

3.1 – Property Ownership, Structural, and Locational Barriers

3.1.1 – Split Incentive for Landlords and Tenants

Obstacle

One of the key obstacles to solar development, particularly in commercial and multi-family residential buildings, is that the site owner is often different from the site user. In rental situations, while the landlord often has final say over capital improvements such as solar or energy efficiency projects, the tenant is often responsible for paying utility bills. Therefore, while the tenant has the incentive to lower their electricity consumption through energy projects, the landlord does not. Even if the tenant pays for the project, the landlord may have to take on the associated structural risks for no perceived additional benefit. This creates a situation where the landlord does not take any energy-saving actions even when a project would be financially viable for the tenant. Additionally, large buildings often must stay flexible to changing tenancy patterns (i.e., be able to switch from one large tenant to several smaller tenants).

Solutions

There are three main ways through which the City can try to resolve this issue:

1) Facilitate "green leases", whereby the tenant pays a higher rent per square foot to account for lower utility bill costs due to actions taken by the landlord;
2) Institute energy benchmarking requirements for large commercial building owners; and/or
3) Institute feed-in tariffs either through a CCA or by lobbying SCE.

The first solution is geared towards bridging the split incentive by having tenants and landlords share the benefits of energy projects, while the other solutions aim to avoid the issue entirely by requiring action from building owners independent of tenants, additional to AB802 requirements. AB802 requires commercial buildings greater than 50,000 square feet (ft^2) to disclose energy consumption data to the California Energy Commission (CEC), but does not require any actions to be taken.[17] However, these solutions do not have to be mutually exclusive. Green leases can be a method through which landlords benefit from mandatory, energy benchmarking requirements.

The third solution would enable property owners to sell solar generation to the local utility at a rate higher than the wholesale rate. However, this generation would be distributed across the entire load served by the utility. Therefore, if the utility is SCE, it would have only a small impact on renewable electricity credited to Carpinteria. However, if a CCA is present, this renewable electricity would be credited only to customers in Santa Barbara County, thereby increasing project impact.

[17] California Assembly, *AB-802 Energy Efficiency.* (Assembly, 2015) <https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB802> [accessed 10 April 2019].

3.1.2 – Load Insufficiency and Rooftop Leases

Obstacle

Most distributed solar installations are currently under a net-metering arrangement, where system owners can sell excess generation to the utility at the same retail rate paid by the utility customer and apply the revenues as a credit to energy provided by the utility at other times in the day, when the solar system is not covering all of the building's needs. However, SCE net-metering requirements do not allow residents and businesses to install solar systems for on-site consumption if the expected annual generation of the solar system is greater than the annual load at the site. As a result, many sites with large rooftops and/or large parking lots, but relatively low load, cannot install an equally large system that utilizes all the available space. This results in both lower benefits for the site owner and a lower utilization of available rooftop or land space.

Although rooftop leases are a preferred way for solar developers to use and maximize these sites when an appropriate energy off-taker program is available, leases are not popular among site owners because the payment amount of the rooftop lease is often not high enough for the property owner to justify taking on possible structural risks sometimes associated with installing solar PV.

Solutions

One possible solution is:

1) Create a program where the City partially or fully insures rooftop replacements for commercial property owners with solar rooftop leases.

This solution would enable the City to lower the risk of rooftop leases for property owners. However, it could also result in a large cost outlay in a worst-case scenario, so the City would need to judiciously determine the correct amount of insurance liability to take on. There are no current programs focusing on rooftop insurance for rooftop solar leases, but some commercial property insurance policies do include insurance for solar panels, as do most homeowner insurance policies. It should also be noted that, as with the feed-in tariff discussed in Section 3.1.1, this renewable electricity would be credited to SCE, not Carpinteria customers. As an alternative to an insurance program, a feed-in tariff through SCE or a new CCA would also help resolve the issue of load constraints.

3.2 – Financial and Funding Barriers

3.2.1 – Financing Mechanisms

Obstacle

As noted in Section 1.2.2, there are currently limited financing mechanisms available for residents and businesses. Businesses and commercial property owners do not always have access to additional funding beyond already existing business loans and mortgages, while residential homeowners do not always have access to low loan rates. This is particularly the case for solar projects, which are not as well supported by utilities as energy efficiency projects.

Solutions

There is one main recommendation for potential new financing mechanisms to help residents and businesses:

1) Work with private foundations and a local utility district to create a low-interest source of funding for a solar on-bill financing (OBF) program

This involves partnering with a local private foundation or trust to create a low-interest source of funding for residents and businesses, with loans being paid on utility bills. This results in a situation where project owners pay no up-front costs for an installation, and then have unchanged utility bills until the loan has been paid back, after which they begin seeing savings.[18] Another possibility for a funding source is a grant, but no current grants are available for such a program.

On-bill financing is not the only method of energy financing. Property Assessed Clean Energy (PACE) financing has also been used in many places to allow residents and businesses to pay loans on property taxes,[19] including the cities of Santa Barbara and Lompoc. However, the Carpinteria City Council voted not to institute PACE in December 2018 because they wanted to wait to see the efficacy of 2018 legislation passed to install protections in an effort to fix historic problems with PACE loan programs.[20]

3.2.2 – Altered Time-of-Use Rate Schedules

Obstacle

Traditionally, as a warm weather state, California has had electricity loads that peak during daytime in the summer with air conditioner usage, which were aligned with solar production. This was a key driver for payback analysis, as solar panels produced energy during times with high economic value. However, with the proliferation of solar PV and personal electronic devices throughout California, electricity loads have shifted to peaking later in the day. Accordingly, as of March 1st, 2019, SCE has released new electricity rate schedule time periods with peak time-of-use (ToU) rates in the late afternoon and evening, which have very little overlap with solar production. This shift causes a drop in value of solar production, thus negatively affecting the payback analysis of solar investments. This shift of ToU periods and the reduced overlap with solar production times is shown in Figure 3.1:

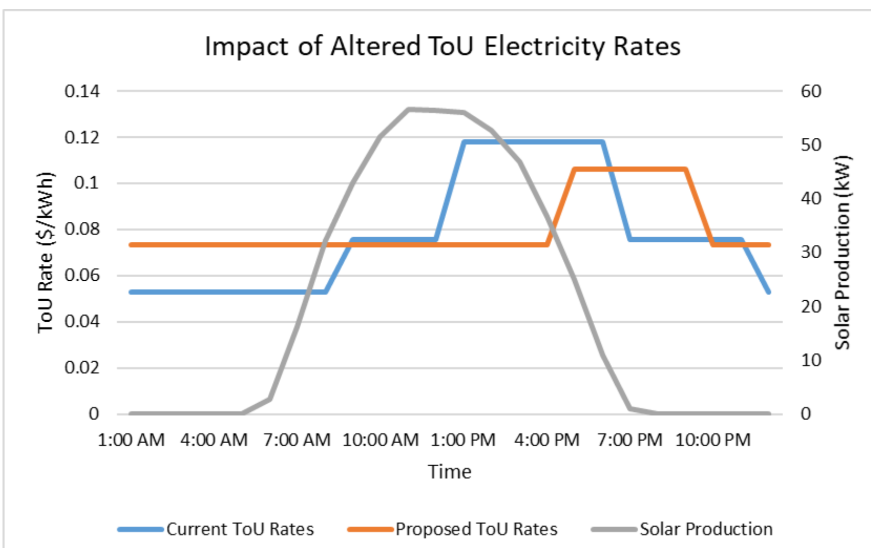

Figure 3.1: Impact of Time-of-Use Rate Changes on Solar Production Value

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[18] Office of Energy Efficiency and Renewable Energy, 'On-Bill Financing and Repayment Programs', 2019 <https://www.energy.gov/eere/slsc/bill-financing-and-repayment-programs> [accessed 10 April 2019].

[19] PACENation, 'PACENation: Building the Clean Energy Economy', 2019 <https://pacenation.us/> [accessed 10 April 2019].

[20] City of Carpinteria, 'City Council Regular Meeting - Dec 10th, 2018', 2018 <https://carpinteria.granicus.com/MediaPlayer.php?view_id=2&clip_id=424&meta_id=39148> [accessed 12 April 2019].

Solutions

There are several ways for the City to improve the economics of solar projects:

1) Host collaborative procurements to bargain for better prices from solar vendors;
2) Streamline permitting requirements to increase the speed of developing projects; and
3) Institute a Performance-Based Incentive (PBI) that rewards combined solar + storage installations.

Recommendations 1 and 2 are aimed at lowering solar PV costs for the system owner. Collaborative procurements receive lower prices by increasing system scale and reducing administrative costs for solar developer. Current permitting requirements for solar installations under Assembly Bill (AB) 2188 and AB546 require residential (<10 kW) solar and solar + storage projects respectively to receive over-the-counter responses to in-person permit applications, with a 3-day turnaround for online permit applications.[21,22] However, there are no specific requirements for larger systems. Recommendation 2 would reduce permitting costs by extending these permitting requirements to slightly larger systems. Meanwhile, Recommendation 3 is aimed at increasing revenues for the system owner by providing incentives.

3.2.3 – Funding Sources

Obstacle

A review of the City's various funding streams for energy-related policies and programs indicated that the City is highly dependent on IOU funds for energy efficiency upgrades and incentives. Figure 3.2 shows the percentage of energy funding the City receives from five main funding streams. It currently receives no federal or private funding, and very little funding from the state and local partners.

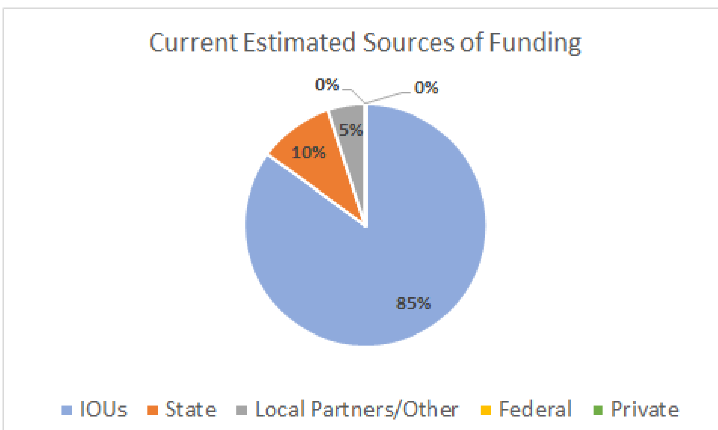

Figure 3.2: City Funding Sources

Dependence on one type of funding can lead to an inconsistent funding stream. For example, the utility Pacific Gas & Electric (PG&E) recently filed for bankruptcy as part of the ongoing lawsuits against it related to wildfire damages. Although already approved programs are unlikely to have their funding revoked, there may be a downturn in future programs as PG&E tries to regain solvency. While SCE does not

[21] California Assembly, *AB-2188 Solar Energy: Permits.* (Assembly, 2014) <https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2188> [accessed 10 April 2019].
[22] California Assembly, *AB-546 Land Use: Local Ordinances: Energy Systems.* (Assembly, 2017) <https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB546> [accessed 10 April 2019].

currently have this issue, similar fire- or disaster-related lawsuits or judgments are possible in the future. A reduction in the funds the City receives could reduce its ability to implement and administer programs and policies.

Solutions

There are several ways for the City to diversify its funding sources:

1) Aggressively pursue new federal, state, and private foundation funding sources;
2) Continue to work closely with the CPUC and existing IOUs to maximize the City's share of existing and future renewable program funding;
3) Partner with other nearby local and regional governments to create energy programs;
4) Earmark a portion of the recently passed sales tax increase towards supporting renewable energy programs; and
5) Continually monitor the costs and benefits of a potential CCA to determine viability.

Various programs and funding opportunities that are currently available for the City to pursue under Recommendation 1 are discussed in the Appendices. Recommendations 2 and 3 are aimed at maximizing IOU funding, either directly or bypassing IOUs altogether. Recommendation 4 involves appropriating a portion of a new City funding source that has not yet been allocated. Lastly, a CCA would be able to take on some of the responsibility for running energy programs and would be able to directly gather funding from ratepayers, reducing the need for funding for the City.

3.3 – Institutional City Barriers

3.3.1 – Energy Assurance Plan (EAP)

Obstacle

The goal of energy assurance planning is to improve the robustness, security, and reliability of energy infrastructure by creating plans to protect key sites so that they continue to operate in the event of any emergency situation or electricity outage, ensuring the ability to restore services as rapidly as possible. EAPs are therefore a key step in building a resilient local electricity grid.

As more and more aspects of the transportation and building sectors are electrified, with fossil fuel reliance being reduced or eliminated, the importance of having a resilient electricity grid is magnified. For example, the Santa Barbara Metropolitan Transit District (MTD) recently announced a goal to fully electrify its fleet by 2030. In this scenario, an electricity outage in southern Santa Barbara County could result in major disruption to regional mobility.

In addition to long-range planning for hazards due to sea level rise, the City was a part of the Multi-Jurisdictional Hazard Mitigation Plan developed to ensure that staff are trained regularly for managing emergency scenarios. The City has also developed a draft Emergency Action Plan that is currently under City Council review. Traditional emergency preparedness methods have included purchasing diesel generators for electricity backup at important facilities. Although diesel generators are inexpensive, they do not offer any benefit during non-emergency scenarios. Additionally, diesel generators contribute to GHG emissions when in operation.

Solutions

There are two main recommendations:

1) Undertake a formal EAP process to evaluate each existing and planned critical site and its current level of emergency preparation, adding backup power capabilities where possible; and
2) Evaluate opportunities to supplement diesel generators with battery storage.

The goal of both recommendations is not to replace current diesel backup, but to supplement it where possible with solar and battery storage, where the battery storage can be used daily to achieve electricity bill reductions while also providing backup capacity for shorter outages. Battery storage can achieve these savings in two ways: by shifting solar generation and export to the grid to more valuable time periods (also known as energy arbitrage) or reducing charges related to the maximum electricity demand.

3.3.2 – Regional Collaboration

Obstacle

While the City has frequent communication with the other local agencies in south Santa Barbara County regarding energy and climate plans, the patchwork nature of the many special districts and public agencies has resulted in a lack of a formal regional framework for collaboration on climate and resiliency projects. To date, the only formal collaboration around energy issues other than the SEP process has been CCA exploration and SCEEP, a collaboration between the County, the cities of Carpinteria, Goleta and Santa Barbara, and the energy and gas utilities. However, this partnership focuses only on energy efficiency issues and is expected to sunset at the end of 2019.

Recently, the County has begun efforts to form a Regional Climate and Energy Collaborative to coordinate climate mitigation and adaptation (or action) efforts across several sectors, including transportation and waste. Electric reliability and resiliency, along with emergency preparedness, have also been identified as priorities under this effort.

Solutions

The main recommendation to increase regional collaboration is to:

1) Continue collaboration with the County and other cities around the County's efforts to create a regional energy and resiliency working group.

3.4 – Educational and Public Awareness Barriers

3.4.1 – Cost Awareness of Renewable Energy

As solar PV is still a relatively new technology, the costs of purchasing equipment and installation decrease every year with falling module and inverter costs and greater competition. Figures 3.3 and 3.4 on the following page show historical trends in costs for residential and commercial projects, with data taken from National Renewable Energy Laboratory (NREL) cost benchmarking studies:[23]

[23] Ran Fu and others, *U . S . Solar Photovoltaic System Cost Benchmark : Q1 2017 U . S . Solar Photovoltaic System Cost Benchmark : Q1 2017*, 2017.

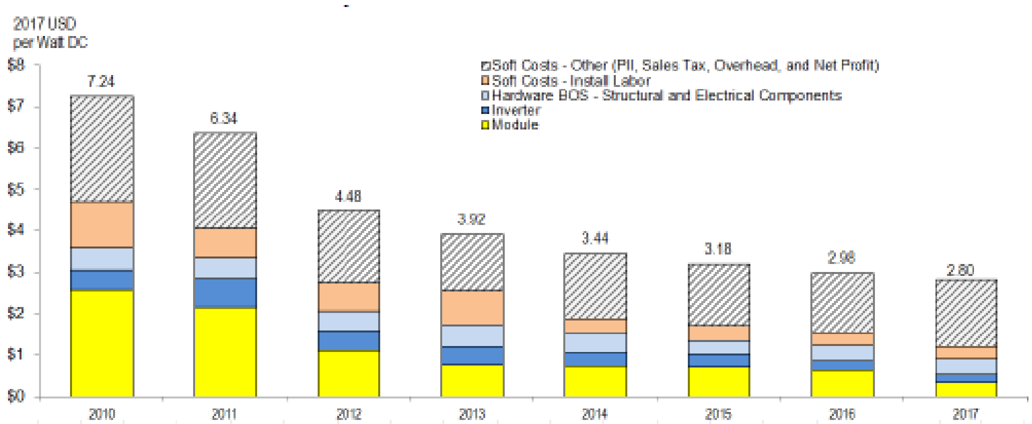

Figure 3.3: History of Residential Solar PV Cost

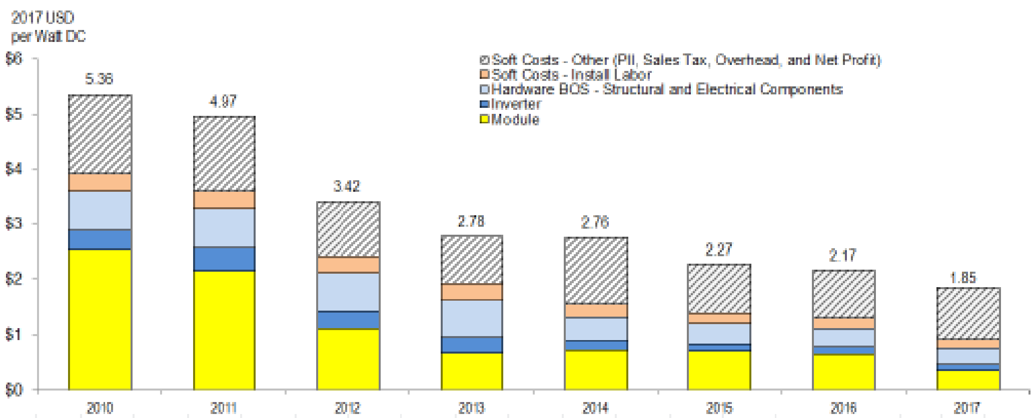

Figure 3.4: History of Commercial Solar PV Cost

Although costs are not decreasing as quickly as they did from 2010-2012, they are still falling 5-10% annually. However, potential customers rarely re-evaluate the economics of a project at their site on an annual basis, and therefore their knowledge of PV costs can lag behind current conditions. Furthermore, they may not be aware of changes in state and federal policies and incentives such as the reduction in the investment tax credits (ITC), which provides 30% of the system value back to the owner through an income tax credit, but which is scheduled to step down to 26%, 22%, and then 10% or 0% over the coming years (See Section 3.7.1 for more details related to the ITC).

Solutions

The main recommendation is:

1) Develop and support, in partnership with other local agencies, a County-wide "One-Stop Shop" resource center to provide current educational information to the public and act as a trusted advisor to citizens and businesses looking to undertake energy actions.

A One-Stop Shop can increase knowledge about the falling costs of solar and energy efficiency projects, as well as the value of having backup storage and resiliency. A One-Stop Shop could also serve as a hub to advertise other programs led by the City, such as a Performance-Based Incentive (PBI) or share the benefits of a potential CCA. Lastly, a One-Stop Shop can provide neutral and trusted advice for customers negotiating with energy developers.

3.5 – Regulatory Barriers and Solutions

3.5.1 – SCE Resiliency Procurement Process

Obstacle

In 2018, SCE released a Request for Proposals (RFP) to procure additional backup power and resiliency in the Goleta-Moorpark transmission area, which represents southern Santa Barbara County. Developers felt that there was insufficient time to submit strong applications. Additionally, the "Least-Cost Best-Fit" (LCBF) methodology used by SCE to rank projects does not give higher scoring to renewable generation projects unless the procurement is specifically seeking renewable generation, which was not the case in 2018. The LCBF methodology provides benefit to projects that can generate power at on-peak periods.[24] Due to the abundance of solar generation, solar generation no longer aligns with SCE's defined on-peak periods.

Solutions

There is one recommendation:

1) Work with SCE, the County, and the CPUC to design a longer procurement process with an explicit carve-out for renewables

Given increasingly high RPS requirements for renewable generation, procuring additional amounts of non-renewable generation purely for outage scenarios is short-sighted. Although fossil fuel generation sometimes has lower cost than renewable generation, since renewable generation can be run year-round and will eventually need to be procured under the RPS, the value of renewable content should be properly accounted for in an RFP.

3.6 – Technical/Infrastructural Barriers

3.6.1 – Distribution Grid Interconnection Capacity

Obstacle

SCE recently released Interconnection Capacity Analysis (ICA) maps that show which areas of the distribution grid have additional electrical capacity for high-amperage wholesale connections and which do not. Figure 3.5 on the following page shows an example of such an ICA map for the Carpinteria area. The intent of releasing these IC maps is to simplify the interconnection process by enabling developers to target areas that are more likely to be approved. These maps show that there are potential constraints in some parts of Carpinteria, particularly downtown Carpinteria. These constraints can be technical in nature, such as related to thermal or short circuit limits on the wires, but are often due to a lack of load on the feeder. This map can be seen in Figure 3.5.

[24] California Public Utilities Commission.

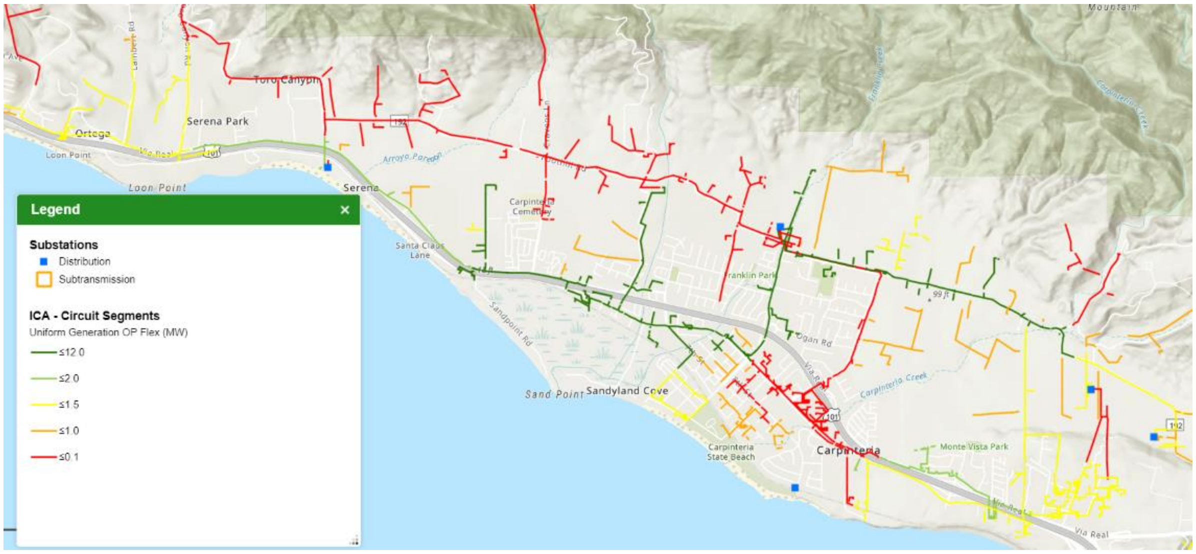

Figure 3.5: SCE ICA Map for Carpinteria

Solutions

There are several potential solutions to resolve this issue:

1) Focus energy efficiency initiatives in distribution-constrained areas;
2) Provide larger energy efficiency incentives to residents and businesses who have been denied applications due to distribution-level limits; and
3) Approach SCE to upgrade or add additional feeders in the area to increase renewable energy potential.

Recommendations 1 and 2 are geared towards energy projects that do not have interconnection processes, while Recommendation 3 would increase capacity. Recommendations 1 and 2 would be much more cost effective and easier than Recommendation 3, but given that low load is often the limiting constraint on renewable generation in ICA maps, it could further limit the amount of available generation capacity.

3.6.2 – Solar Automatic Shut-Off

Obstacle

Most solar installations use low-cost inverters that are tied to the grid and depend upon the grid to provide a reference voltage to operate. Therefore, these grid-tied inverters shut off during power outages, preventing the solar panels from providing power to the building during critical times. As a result, although many solar PV owners believe they can be self-sufficient during outages, their system is unavailable.[25]

Solutions

There are several methods for solar owners to power themselves during outages:

1) Supplement solar PV with battery storage backup;
2) Install secure power backup inverters for critical circuits; and
3) Supplement solar PV with a diesel or propane backup generator.

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[25] Energy Sage, 'Solar Power Systems: What Are Your Options in 2019?', 2019 <https://news.energysage.com/solar-power-systems-options/> [accessed 12 April 2019].

Inverters used for installations with battery storage are more expensive and allow the power from solar panels to alternate between supplying the grid, the battery, and the building. The battery inverters also come equipped with surge current capability, allowing the battery to power equipment that briefly needs a high start-up power, such as refrigerators. Additionally, battery storage provides savings even in non-emergency scenarios by allowing owners to shift consumption from peak periods to off-peak periods.

In comparison, secure backup inverters do not allow complete operation of a building, and do not have surge current capabilities. However, they can provide a critical outlet for operation of one or two loads, such as internet, and are cheaper than battery storage. Finally, although renewable generation is the goal of this SEP, small backup fossil fuel generators are also much cheaper than batteries and would also allow full operation. However, they can lead to poor air quality if used for prolonged periods of time, and they are a disturbance for neighbors.

3.7 – State and Federal Policy Barriers

3.7.1 – Federal Investment Tax Credit (ITC)

Obstacle

The federal ITC currently allow the owner of a renewable energy system to take 30% of the value of the system as a tax credit on income taxes. The ITC is extremely critical to renewable energy development by essentially reducing the cost of systems by 30% if the owner has a large enough tax burden, and the ITC is responsible for pushing many projects to financial viability. This is a key driver for residential solar developers in particular, as an important part of their business model involves improving financial return by being large enough to take on the tax credit for site owners that could otherwise not take advantage of it. However, the ITC is set to begin phasing down after the end of 2019 according to the schedule in Table 3.1.

Table 3.1: Federal Investment Tax Credit Schedule

Year	Residential Systems	Commercial and Utility Systems
2019	30%	
2020	26%	
2021	22%	
2022 and beyond	0%	10%

Although this will be detrimental to commercial and utility systems, the elimination of the ITC will be particularly harmful for residential systems. Given the residential-leaning demographics of Carpinteria, maintaining and extending the ITC will be important.

Solutions

Recommended solutions are as follows:

1) Support the renewable energy industry in advocating for a continuation of the current ITC beyond 2019; and
2) Work with the State of California to develop a “Public Power Pool” to aggregate solar projects.

Both Recommendations are advocacy solutions, with Recommendation 1 attempting to extend the current ITC, and Recommendation 2 attempting to take advantage of the current ITC while it lasts if those efforts are unsuccessful, by enabling multiple public agencies to proceed with procurement before the planned ITC step-down. A Public Power Pool would involve the state bundling together a large number of spread-out projects into power purchase agreements (PPAs) that can be rolled out quickly, similar to a collaborative procurement for commercial projects but on a much larger scale.

Chapter 4 – Recommended Sites for Development

4.1 – Introduction

The purpose of this chapter is to provide a detailed technical assessment, financial analysis, and discussion of the next steps toward development of potential solar photovoltaic (PV) project development opportunities at sites owned by the City of Carpinteria (City).

Additionally, a secondary focus of Carpinteria's SEP is identifying viable private-sector renewable energy generation projects within city boundaries. These opportunities were analyzed outside of this report in discussions with private site owners and City staff. A table of identified sites and their potential has been included at the end of the table covering City-owned sites. Due to privacy concerns, these sites have been anonymized while City staff works with site owners to determine the viability and likelihood of development.

This chapter summarizes:

1. The best sites for solar PV installations, from both technical and economic perspectives;
2. Recommended solar PV system sizes and design characteristics;
3. Next steps for pursuing the recommended options with a timeline for implementation; and
4. Analysis methodology.

Based on information collected during pre-screen assessments and in-person site visits, high-potential sites for solar PV deployment have been identified. Figure 4.1 summarizes the projects' total potential economic and environmental impact over a 25-year analysis period, assuming a PPA financing structure. PPAs will be discussed further in Section 4.4.

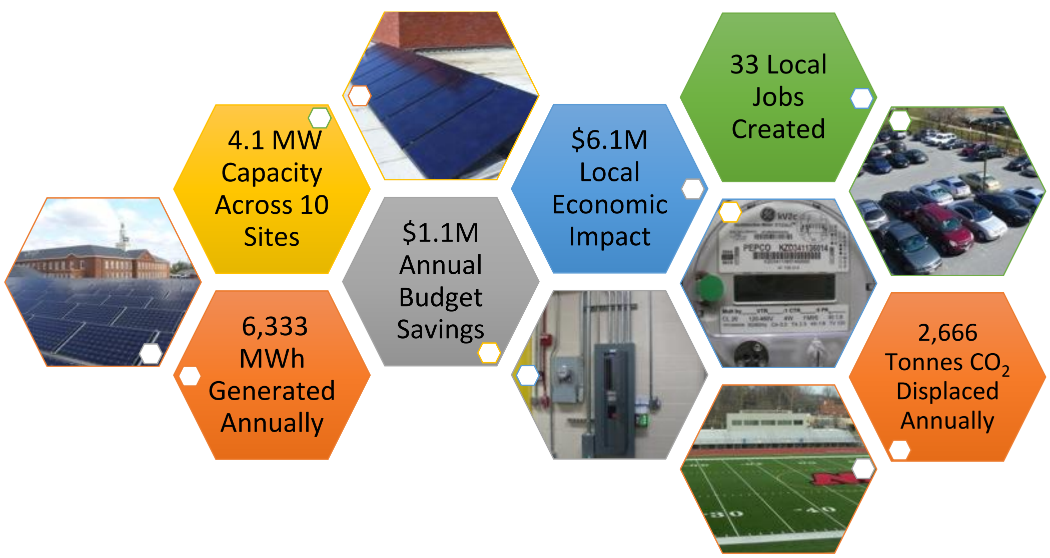

Figure 4.1: Economic and Environmental Impact of Proposed Sites

4.2 – Site Summary and Evaluation Methodology

Using information collected during pre-screening discussions and in-person site visits, viable sites on rooftops, parking lots, and open land have been selected and mapped out using a modular approach to provide system and project design flexibility. Based on the area available for solar at each site, the maximum possible solar PV system capacity has been estimated at 137 kW to be installed across City facilities, which are limited to Carpinteria City Hall. Installing the maximum solar PV capacity at City Hall would offset 99% of current facility electricity use. Table 4.1 summarizes each site and whether the systems are expected to be interconnected behind-the-meter and net-metered for on-site consumption or interconnected as front-of-the-meter systems to sell directly into the wholesale electricity grid.

Table 4.1: Site Summary

ID	Name	Priority Score	Site Type	Interconnection	System Size (kW-DC)	Energy Output (kWh/year)
Carpinteria Municipal Potential Solar Site(s)						
1	Carpinteria City Hall	A	Municipal Roof / Carport	Behind meter	137.2	221,664
	Total Maximum PV Production at Municipal Site(s)				**137.2**	**221,664**
	Total Recommended PV Production for Municipal Site(s) (A+B)				**137.2**	**221,664**
Carpinteria Community Potential Solar Sites						
2	Public – Commercial 1	A	Rooftop	Behind Meter	105.7	163,000
3	Public – Commercial 2	A	Rooftop	Behind Meter	165.2	252,000
4	Public – Commercial 3	A	Rooftop / Carport	Behind Meter	1,090.0	1,720,000
5	Public – Commercial 4	A	Rooftop	Behind Meter	403.9	651,000
6	Public – Commercial 5	B	Rooftop / Carport	Behind Meter	173.6	270,000
7	Public – Commercial 6	C	Rooftop / Ground-Mount	Behind Meter	32.2	52,000
8	Private – Commercial 1	A	Rooftop	Behind Meter	632.5	948,000
9	Private – Commercial 2	B	Rooftop	Front of Meter	776.7	1,160,000
10	Private – Commercial 3	A	Rooftop / Carport	Behind Meter	426.0	653,200
11	Private – MF Residential 1	A	Rooftop / Carport	Behind Meter	175.0	294,000
	Total Maximum PV Production at Community Sites				**3,980.8**	**6,163,200**
	Total Recommended PV Production for ALL Sites (A+B)				**4,085.8**	**6,332,864**

In addition to confirming the physical space available for solar PV systems, planned energy and structural renovations and other site-specific issues were assessed. For rooftop sites, existing roof age, condition, and material were evaluated, as well as additional limitations such as the presence of HVAC equipment, parapets, surrounding vegetation, skylights, and conduits—all of which cannot be easily relocated. For parking lot or parking structure solar carport systems, the main site selection issues are the availability of space for construction, surrounding vegetation, and distance to the electrical interconnection point. The potential challenges were rated on a scale from *None* (no issues) to *High* (likely to require extensive review or remediation). Table 4.2 on the following page provides a description of each criterion.

Table 4.2: Technical Feasibility Criteria

Criterion	Description
Shading	Survey the surroundings of the usable areas to identify obstructions that could potentially cast shadows on the solar modules and reduce output, such as rooftop HVAC equipment, rooftop access penthouses, antennas, trees, lampposts, and neighboring buildings. Even minor shading can have a profound negative impact on system performance. In order to assess the amount of direct sunlight available at each usable area, the annual sun path is plotted at various points using industry standard tools and software.
Electrical	Inspect electrical rooms for main breaker and switchgear amperage and voltage ratings, as well as availability of space for additional electrical equipment such as inverters. The location of the utility electrical meter(s) is important, as the distance between the solar modules and the point of connection must be minimized to reduce voltage drop, reduce costs, and increase system efficiency.
Structural	Potential challenges such as roof and structural integrity are evaluated, including the age, condition, and material of the roof as well as the building and building layout. Potential shading sources include tall trees, rooftop mechanical equipment, and surrounding buildings.
Geotechnical	Geotechnical issues pertain to the surrounding area of the overall site such as soil conditions, water table levels, and presence of fault lines.
Environmental	Environmental criteria relate to environmental impact report requirements and other such considerations. In California this is primarily focused on site characteristics that will trigger review under the California Environmental Quality Act (CEQA).

Table 4.3 summarizes this technical analysis for each City-owned site. To maintain privacy, construction considerations for non-City sites have been omitted.

Table 4.3: Technical Feasibility Site Summary

ID	Name	Shading	Electrical	Structural	Geotech.	Enviro.	Comments
1	Carpinteria City Hall	Medium	Low	Low	Low	None	A geotechnical study would need to be conducted for the carport. The line of trees at the south end of the parking lot needs to be cut down, but doing so will result in maintenance savings. There is enough electrical capacity on the switchgear. No apparent structural issues from site visit.

Based on this technical feasibility, each evaluated site was prioritized and scored with a letter grade, with an "A" ranking, being most feasible and ready for immediate solar deployment, to a "C" ranking, which would require heavy modifications for solar deployment to be feasible. On the following page is a more detailed description of each ranking category.

Table 4.4: Project Development Priority Ranking

Score	Description
A	Sites with an "A" score have excellent solar potential and current conditions support immediate deployment. Generally, these projects have roofs that are less than five years old and/or have minimal to no shading or other technical feasibility concerns.
B	Sites with a "B" score also have solar potential and could be developed immediately, but have minor site-specific challenges related to roof condition, shading, or other. Generally, these projects have roof layers that are 5-10 years old, experience minimal shading and/or may have issues related to all other technical feasibility criteria, such as the potential need for minor electrical equipment upgrades. Sites with no technical feasibility concerns (and would otherwise be given an A priority ranking) but only allow for a small system size are placed in this category.
C	Sites with a "C" score have high-risk technical issues or are otherwise troublesome sites. While a PV system may still be feasible, it is unlikely that these systems will be able to provide economic savings to justify the cost of the systems at this time. In the event of any near-term procurement, these sites will not be included.

4.3 – Financial Structure Details

4.3.1 – Behind-the-Meter Projects

A cost/benefit analysis was conducted based on the review of the City's historical energy usage and privately-owned sites, where available. This allows for a detailed projection of potential avoided energy and demand costs. Financial modeling has been performed for both primary ownership options: a direct purchase and a power purchase agreement. The results are presented within the detailed section for each site. The analysis includes only arrays with development priority scores of "A" which are recommended for immediate deployment.

Avoided costs from energy and demand charges provide the primary financial benefit of a behind-the-meter solar PV system. The key drivers to ensure maximum avoided costs are a proper system design, which affects system production and long-term operations, as well as the utility rate schedule, which determines the value for the energy produced. The financial analysis assumes the solar output reduces kWh energy charges at the retail rate, which is the valuation structure under a net metering tariff in SCE territory. As for demand charges[26], it is possible for a solar PV system to reduce the maximum demand in a given month and/or year. However, the demand reduction percentage is difficult to reliably predict in any given month due to the variability of energy usage and solar output and no guarantee that they will be coincident, among other factors. This financial analysis assumes a conservative estimate of 10% demand reduction from solar PV – that is, utility demand charges will be reduced by 10% of the PV system nameplate size.

Additional financial analysis and explanation of financing options and incentives is included in the next section.

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[26] Demand refers to the amount of energy being used at a specific point in time. Charges based on a facility's maximum demand is a factor in most electric rate tariffs for commercial buildings.

Direct Purchase Option

With the Direct Purchase option, the municipal agency or facility owner would use existing cash reserves to purchase the system outright (or finance the purchase through a loan). Under this scenario, the site owner is responsible for all ownership concerns, including operations and maintenance (O&M), regular system cleaning, insurance, and monitoring of system production. This requires a significant up-front capital expenditure and on-going operational costs.

Third-Party Ownership - Power Purchase Agreement

Under this option, the municipal agency or facility owner (site host) would enter into a contract (typically 20 years) with a third-party to purchase all energy produced by a solar PV system installed on the property in question. This third-party would own the solar PV system and be fully responsible for all ownership costs, including financing, O&M, insurance, and system output. This structure enables site owners to receive electricity from a solar PV system at no upfront costs and allows the tax incentives for solar installations to be monetized by the third-party. This is particularly important for economic viability when the site host is a public agency or non-profit that cannot take advantage of the tax benefits.

The site host pays a fixed rate for the electricity produced by the solar array. Ideally, this rate is lower than the current cost for electricity supply. PPA's typically have a yearly price escalator of between 0 and 3%. The value of this escalator relative to the rate at which utility prices increase (assumed as 3% in this analysis) will affect the savings in future years. To lower this contracted PPA rate, the site host can also pre-pay a portion of the project at the beginning. This allows site hosts to use up-front capital while allowing a third-party to take advantage of the ITC if they cannot.

In general, the Direct Purchase option provides the greatest savings over time for an entity with a tax appetite but requires a significant initial project investment and ongoing O&M for the systems. The third-party option typically provides the greatest savings for tax-exempt entities and is thus appealing for local governments. Monthly payments tend to be lower than current or projected utility bills starting on day one.

Hybrid Purchase Options

Hybrid purchase options also exist to allow local governments in particular to take the best of the cash purchase and PPA options. Site hosts that have a small amount of up-front capital, but not enough to purchase the whole system, can buy down a portion of the system to lower the PPA rate for the duration of the contract. This enables the third-party developer to still take advantage of the tax credits, while reducing annual costs.

Alternatively, site hosts with no up-front capital but a desire to own the system for greater flexibility and control can sign PPA contracts with buy-out clauses. Buy-out clauses allow the site host to buy the system at a specific later point in time, typically six to eight years after development. This allows the site host to take ownership of the system after the full tax benefits have been exercised.

Table 4.5: Applicable Utility Solar Programs and Tariffs in Carpinteria

Type	Description
Net-metering[27]	*Overview:* California requires its utilities to offer a net-metering tariff that allows customers to receive the full retail value for solar generation that exceeds their facility's real-time demand. *Project Size-limit:* Projects are limited to the equivalent of 100% of the customer's annual load. *Net-Excess Generation:* If net-excess generation exists at the end of a billing cycle, it is rolled over and credited to the next billing cycle at the retail rate. If net-excess generation exists at the end of a 12-month period, the customer can opt to roll over the credit indefinitely at the retail rate or receive a payment for that generation at a rate equivalent to the average wholesale spot market price of electricity (between 7am and 5pm) during the year that the excess electricity was generated. *Renewable energy credits (RECs):* The customer retains the RECs associated with their solar generation unless they choose to receive a payment for their net excess generation, in which case the utility gains the rights to the RECs.

Table 4.6: Applicable Solar Incentives in Carpinteria

Type	Description
Federal	Investment Tax Credit (ITC): Allows site owner to take 30% of the project value as a credit on their federal taxes. Accelerated Depreciation: Allows the entire system to be depreciated over the first year.
State	Self-Generation Incentive Program (SGIP): Provides rebates for distributed energy systems, particularly with energy storage. Multifamily Affordable Solar Housing (MASH): Provides a rebate to qualifying multi-family housing tenants (currently a waitlist for new applicants).
Local	On-bill financing (OBF): Allows owners to finance energy projects through loans that are paid back on utility bills; currently only available for energy efficiency projects.[28]

4.3.2 – Wholesale Projects

The available generation at some of the sites, particularly at commercial buildings, may be much greater than the load. Projects that generate more than load demands, also called wholesale projects, are interconnected directly to the distribution grid and are built with the intention of selling power directly to the utility, or another off-taker such as a CCA, or into the wholesale electricity market. In either case, the site host would lease their land (typically for a 20 or 30 year period) to a renewable energy developer to design and build the project.

In most cases, the developer is responsible for finding a project off-taker or determining if it is financially viable to bid the project's capacity into the wholesale electricity market. In the case of the projects considered in this analysis, the opportunities and solutions discussed in the SEP document are designed, in part, to assist developers in overcoming the challenges of determining a financially-viable project structure.

[27] More information: http://programs.dsireusa.org/system/program/detail/276, https://www.sce.com/residential/generating-your-own-power?from=/customergeneration/customer-generation.htm
[28] Office of Energy Efficiency and Renewable Energy.

4.4 – Site Evaluations

4.4.1 – Carpinteria City Hall

Site Overview

Address: 5775 Carpinteria Ave, Carpinteria, CA 93013

Utility Provider:	SCE	Electricity Tariff:	TOU GS-2 D + TOU EV-4 -> TOU GS-2 E
Annual Energy Usage:	224,698 kWh	Monthly Demand Peak:	51 – 99 kW

PV System Overview

System Size:	137.2 kW	Electricity Offset:	99%
Expected Year 1 Output:	221,662 kWh	Expected GHG Reduction:	35 tons/yr

Battery Energy Storage System (BESS) Overview

System Size:	57 kW	System Duration:	4 hrs

Financial Summary

PPA Rate:	$0.17/kWh	Simple Payback Period:	22.6 yrs

PV System Summary

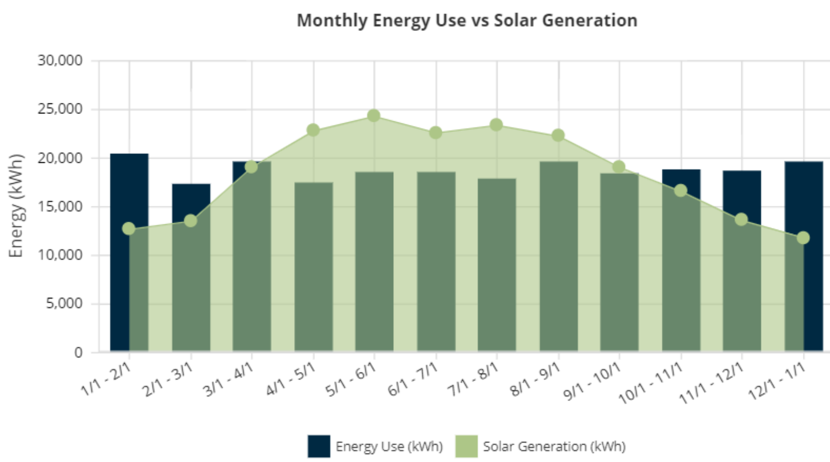
There are many potential locations at Carpinteria City Hall for solar siting: the roof, the main parking lot, parking lot at the Public Works yard, and the parking strip along the southern tree line. Due to load constraints, the proposed installation was sited on only the roof and the parking lot at the Public Works yard. That parking lot was chosen because its production most closely matched the maximum generation allowed at this site, but another carport location would be equally valid.

There are no expected issues with rooftop integrity or electrical capacity, but shading will be an issue at this site. The eucalyptus trees to the south of City Hall are extremely tall and would shade both the rooftop and any parking lot and would need to be cut down. However, doing so would reduce maintenance and cleanup costs related to leaves dropped by the trees, which would help justify the cost of tree removal.

To take advantage of tax credits, the project is shown as financed through a zero-escalator PPA. The modeled $0.17/kWh PPA is comprised of a $0.14/kWh PPA for the solar system, with an extra $0.03/kWh for the battery system. Due to the recent change in time-of-use electricity rates, a $0.17/kWh PPA will initially be more expensive than current electricity costs. However, as time passes, rising utility rates will surpass the flat PPA rate, leading to savings after 12 years. It should be noted that the load of City Hall was modeled using an office building load profile. However, the presence of Santa Barbara MTD electric buses charging at City Hall could potentially result in additional peak evening load compared to a traditional office building, which could result in higher savings.

The 23-year payback period could also potentially be improved by reducing the size of the PV system so that less generation is exported to the grid. However, a fully-sized system was chosen to help the City be self-sufficient for a longer period of time during an emergency scenario, assuming battery storage to store excess solar generation. The battery storage system was found to be cost neutral in this scenario, as the payback period was the same with and without the battery system. As such, batteries are included in the recommendation in order to unlock the associated resiliency benefits.

Energy Use and Solar Generation Profile



Proposed Solar PV Design Layout

4.5 – Next Steps

The SEP represents the final step in the solar feasibility assessment process and now requires internal review by City stakeholders. The next steps differ based on the ownership of each assessed site. For sites owned by the City the project timeline is shown in Figure 4.2 below:

Figure 4.2: Next Steps in Site Development

If the City decides to move forward with an RFP for selected City-owned sites, the steps identified in Figure 4.3 are necessary to move the project along quickly and achieve the desired impact on cost reduction and renewable energy production before available federal solar incentives decrease.

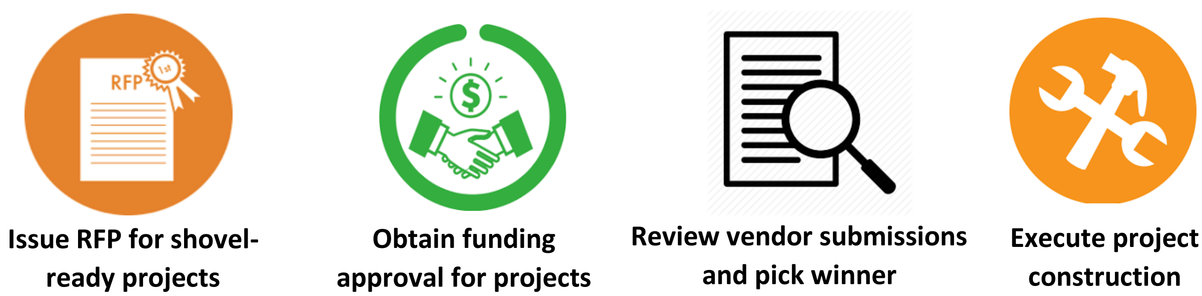


Figure 4.3: RFP issuance and execution

For the private sites assessed in this report, the next step is to continue the outreach process and engage site owners around the findings of this analysis. Outreach has been initiated by the project team in order to raise awareness and gather necessary information to complete the SEP. The City can build on the relationships established to catalyze development.

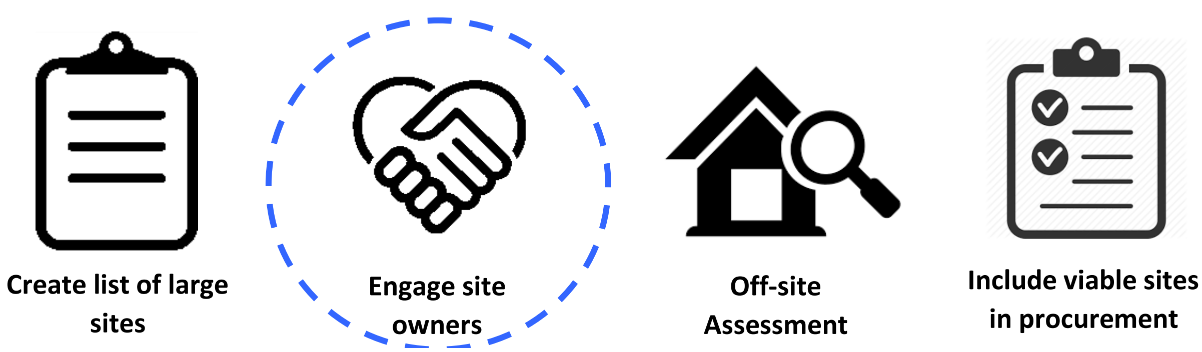


Figure 4.4: Private Site Outreach

4.6 – Methodology

Technical Assessment Methodology Used in this Report:

- A proprietary approach to performing a solar site technical analysis was used, which involves dynamic scenario creation and evaluation processes along with publicly and privately developed software and tools to determine all the relevant variables and trade-offs between options. These tools may include Helioscope, PVsyst, Measure Map Pro, Google Earth, AutoCAD, and others.
- Solar access is defined as the availability of direct sunlight that reaches the photovoltaic panels. A higher solar access percentage reflects fewer shading obstructions. Shading obstructions may include surrounding buildings, mechanical and other equipment on rooftops, architectural features of the building, tall trees, and other surrounding vegetation. To calculate available space at each site, the site is visited, where possible, with available areas compared to aerial views from Google Earth. Shading analysis is performed using Solmetric SunEye.
- Optony uses industry standard tools as well as proprietary financial modeling software with local utility rate schedules and typical meteorological year (TMY) 3 data, and neutral to conservative inflation, renewable energy certificate/credit and Investment Tax Credit assumptions in all financial modeling. This approach allows Optony to present the client with realistic forecasting that reduces risks and estimates realistic project returns.
- Project timing is very important in the overall economics of a solar system installation due to the time-sensitive nature of the various federal, state, utility, and local incentives. Projects have been analyzed based on construction beginning in 2019.

Financial Assumptions Used in this Report:

The assumptions and price points used in the financial modeling are based on current local market conditions in southern Santa Barbara County as of January 2019, for a mid-range scenario. While conservative and aggressive scenarios have also been analyzed, the results are not included in this report.

- **Utility Supply and Delivery Rates:** Obtained from customer's electricity bills and/or utility tariff.
- **Utility Escalation Rate:** 3% per year. While difficult to predict on a year-to-year basis, 3% is the long term (50+ year) historical average.
- **O&M Cost:** $3/kW/yr.
- **O&M Escalation Rate:** 0%.
- **Panel Degradation Rate:** 0.5% per year. This is the industry average for well-maintained systems.
- **Discount Rate:** A discount rate of 6.5% was used.

Chapter 5 – Specific Recommended Actions and Timeline

The recommendations listed in Chapter 3 were compiled and organized into a small number of strategies, divided into 5 key program areas. Not every recommendation is described in further detail, such as those already being undertaken as part of the SEP, and those which were deemed to be relatively straightforward to implement with pre-existing City precedents, such as continuing to support regional collaboration.

5.1 – Regulatory Program Area

5.1.1 – Update Residential and Commercial Solar and Solar + Storage Permitting Procedures

Strategy Description

The goal of this strategy is to turn the City into a desirable area for solar installers to operate by greatly reducing permit barriers. There are two key steps to updating residential and commercial ordinances for standalone solar systems and combined solar and storage systems, to take the City beyond what is purely required by state regulations:

1) Implement electronic submission for energy storage permitting; and
2) Update Carpinteria Municipal Code section 15.29 – Solar Energy Permitting to streamline permitting for larger sized systems, up to anywhere between large residential (<20 kW) to small commercial systems (<100 kW), with a checklist of planning and zoning requirements that must be, and typically are, met to make projects eligible for the streamlining.

It should be noted that the larger commercial systems become, the more difficult the permitting process becomes. Larger projects tend to have greater constraints and other zoning requirements that can add complexities to permit processing. The increased threshold for faster permitting therefore needs to be chosen carefully to ensure that there is enough staffing capability to support faster permitting up to that level.

Other potential methods to streamline permitting beyond current requirements are listed below:

1) Enable online permit submissions and over-the-counter permits for larger systems;
2) Pilot solar design software for solar developers that only creates designs that are already permit-approved; and
3) Enable virtual safety inspections for solar installations.

Currently, AB2188 requires over-the-counter permit approval and a 3-day turnaround for online submissions for all systems under 10 kW. Table 5.1 shows how much further potential would be targeted by an expansion of this threshold.[29]

[29] Data based on statistical solar potential estimates based on building sizes.

Table 5.1: Solar Potential by Streamlining Threshold

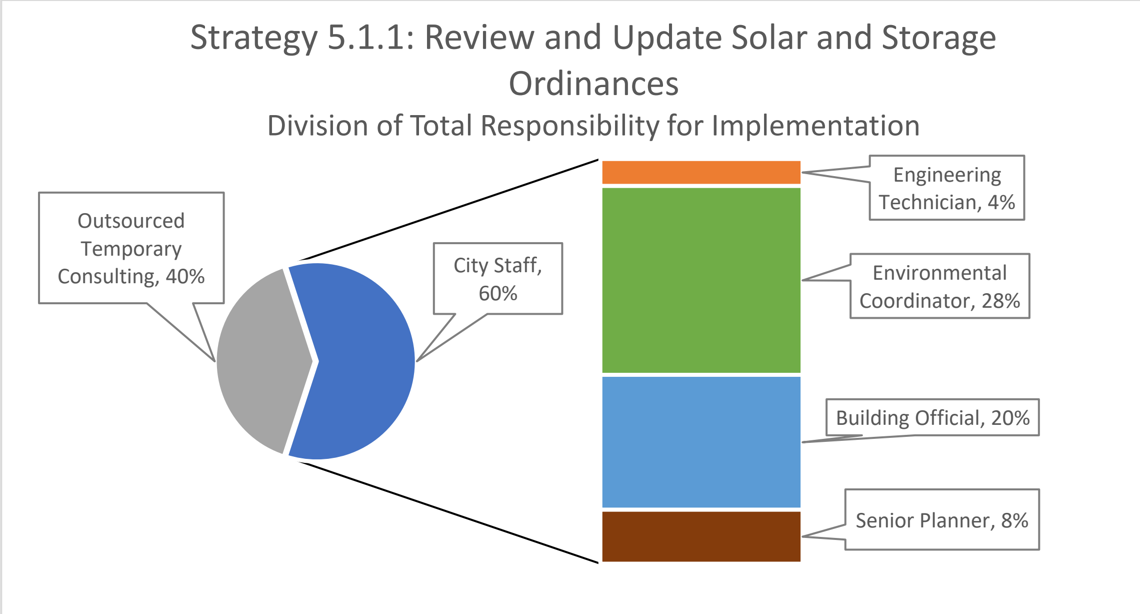
Solar Streamlining Threshold	Cumulative Additional Solar Capacity (MW)	Cumulative % of Total Commercial and Industrial Solar Capacity
< 20 kW	7 – 9	19%
< 30 kW	16 – 20	42%
< 40 kW	18 – 22	46%
< 50 kW	19 – 24	51%
< 60 kW	21 – 26	56%
< 70 kW	23 – 29	61%
< 80 kW	24 – 29	63%
< 90 kW	24 – 30	64%

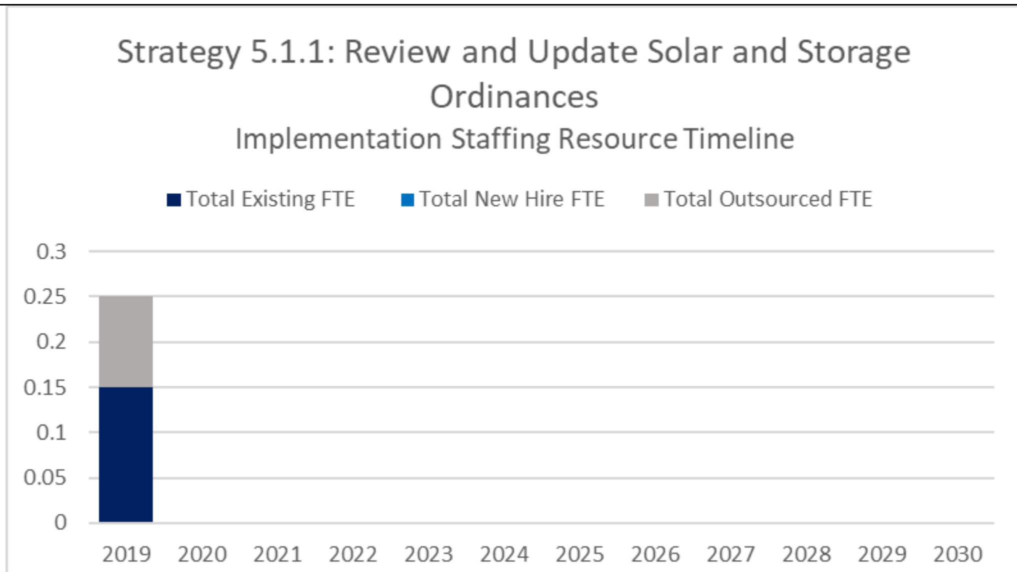
Strategy impacts are currently shown for a 40-kW threshold for streamlined expansion, to target almost half of the commercial potential. Almost half of Carpinteria's commercial solar potential falls in the "small commercial" range of 10 – 40 kW, with nearly a quarter of the entire solar potential falling in the 20 – 30 kW range. In comparison, only approximately one third of Goleta's commercial potential is below the 40-kW threshold. Therefore, expanding this threshold would have a proportionally greater impact in Carpinteria than in many other cities.

Action Plan - Project

2019

1. Explore funding strategies for municipal projects.
2. Compile outstanding questions and list of necessary RFP materials for inclusion in a scope of work for site assessment consultants.
3. Conduct review of residential and small commercial solar and solar + storage permitting processes of other cities.
4. Use the results of the SEP statistical analysis to identify solar potential at each new system size threshold (e.g., MW potential < 10 kW, < 20 kW, < 30 kW, etc.).
5. Work with Chief Building Official and other members of the Community Development Department to draft revised ordinances for solar and solar + storage.
6. Circulate draft ordinance to all relevant City stakeholders for written feedback.
7. Obtain approval from City Council.





Total FTE Requirement	***Year 1:*** *0.25 FTEs (~500 hours)*
FTE Position Breakdown	***Year 1:*** *Engineering Technician: 20 hours/year* *Environmental Coordinator: 140 hours/year* *Building Official: 100 hours/year* *Senior Planner: 40 hours/year* *Outsourced Consultant: 200 hours/year*

Estimated Annual Staffing Cost	***Year 1:*** *$20,000*
Estimated Annual Capital and Consulting Costs	***Year 1:*** *$10,000*
2030 Annual Electricity Impact	*2 GWh (~700 households)*

Case Study: Streamlined Permitting through Virtual Inspections

Los Angeles County has recently launched a virtual inspection program for residential photovoltaic installations. This program is not mandatory and must be agreed to by the building inspector. The process requires the applicant have an active valid permit for the work, a flashlight, and an approved application for a video call such as Skype or Facetime. As opposed to examining the system in person, the inspector instructs the applicant to show the important aspects of the system virtually. Then, the inspector sends a copy of a correction notice within 30 minutes and updates inspection records as necessary. The program is expected to achieve reductions in soft costs for both applicants and safety inspectors. The program is set up to be evaluated a few months after implementation to determine inspectors' comfort level towards virtual inspections, as well as their efficacy compared to in-person inspections.[30]

5.1.2 – Institute Energy Benchmarking Policy for Large Commercial Buildings

Strategy Description

While state-wide building codes are aimed at making new construction more energy-efficient, energy benchmarking is aimed at reducing the energy use of already constructed buildings. Energy benchmarking involves comparison of how much energy buildings use, normally specified per square foot so that it applies to buildings of different sizes. Depending on the implementation, it can be either voluntary or mandatory. Currently, AB208 requires all buildings greater than 50,000 ft^2 to have benchmarked their energy consumption by June 1st, 2018.[31]

The state can levy fines against those who do not comply, although no specific levels are stated. Benchmarking policies can also penalize building owners who do not meet certain energy thresholds per square foot, or reward buildings who do meet them.[32] Impacts currently assume a mandatory requirement operating along the schedule in Table 5.2:

Table 5.2: Proposed Energy Benchmarking Intensity Schedule

Year	% Over Average Usage	Energy Intensity Benchmark (kWh/ft^2)
2022	50%	9.6
2023	45%	9.2
2024	40%	8.8
2025	35%	8.3
2026	30%	7.9
2027	25%	7.4
2028	20%	6.9
2029	15%	6.4
2030	10%	5.8

[30] LA County, *LA County Virtual Inspection Program*, 2019.
[31] California Assembly, *AB-802 Energy Efficiency*.
[32] California Energy Commission, 'Building Energy Benchmarking Program', 2019 <https://www.energy.ca.gov/benchmarking/> [accessed 10 April 2019].

Energy benchmarking is generally only applied to buildings of a certain size. The lower the threshold for applicability, the more buildings are included, and therefore the more impact this policy can have. However, as more buildings are included, administrative burdens also increase. Additionally, since larger buildings use more energy than smaller buildings, they comprise a proportionally larger amount of Carpinteria's energy use. Table 5.3 shows how many buildings and how much square footage would be included under various applicability thresholds:

Table 5.3: Carpinteria Commercial Building Data

Energy Benchmark Threshold	% of Commercial Buildings	% of Commercial Square Footage
> 5,000 ft^2	74%	98%
> 10,000 ft^2	54%	97%
> 15,000 ft^2	38%	91%
> 20,000 ft^2	25%	86%
> 25,000 ft^2	20%	76%
> 30,000 ft^2	17%	73%
> 35,000 ft^2	15%	69%
> 40,000 ft^2	12%	62%
> 45,000 ft^2	12%	61%
> 50,000 ft^2	11%	60%

Although only roughly 1/10th of commercial buildings are greater than 50,000 ft^2, these buildings comprise 60% of the total commercial building space, and therefore roughly 60% of the total commercial energy use. Modeled impacts from this strategy are currently shown with a threshold of 20,000 ft^2. A higher threshold would decrease impact but also bring lower administrative costs.

Action Plan - Project

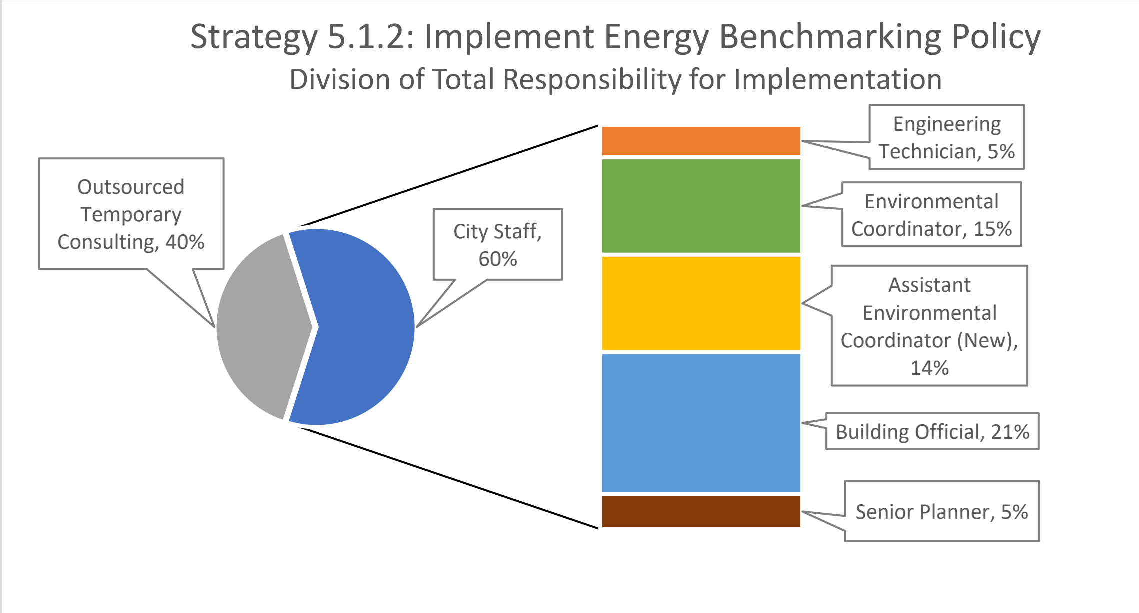
2020

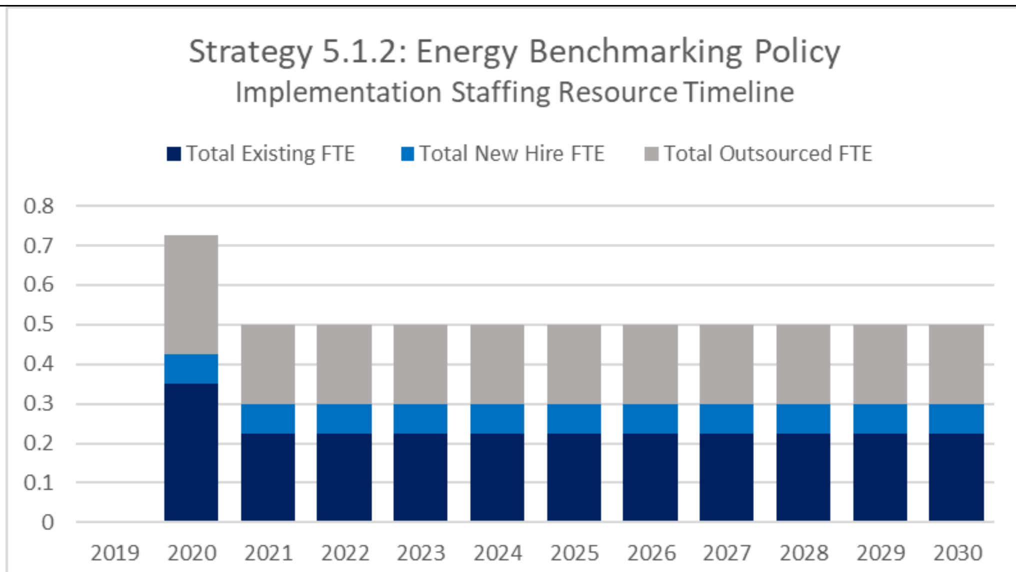
1. Assemble an internal team with the Chief Building Official to review current and potential energy disclosure policies and best practices.
2. Engage local realtor associations and large commercial property owners to gather feedback on implementation.
3. Formulate draft disclosure and benchmarking policy based on best practices review.
4. Circulate draft disclosure and benchmarking policy to relevant stakeholders for feedback.

2021

5. Create ordinance template based on feedback.
6. Present template to relevant commissions and subcommittees.
7. Present ordinance to Council for approval.

Funding Requirements, Staffing Requirements, and Energy Impacts





Total FTE Requirement	***Year 1:*** *0.725 FTEs (~1,450 hours)* ***Continuing:*** *0.5 FTEs (~1,000 hours)*
FTE Position Breakdown	***Year 1:*** *Engineering Technician: 50 hours/year* *Environmental Coordinator: 150 hours/year* *Assistant Environmental Coordinator (new): 150 hours/year* *Building Official: 400 hours/year*

	Senior Planner: 100 hours/year *Outsourced Consultant: 600 hours/year* ***Continuing:*** *Engineering Technician: 50 hours/year* *Environmental Coordinator: 150 hours/year* *Assistant Environmental Coordinator (new): 150 hours/year* *Building Official: 200 hours/year* *Senior Planner: 50 hours/year* *Outsourced Consultant: 400 hours/year*
Estimated Annual Staffing Cost	***Year 1:*** *$35,000* ***Continuing:*** *$25,000*
Estimated Annual Capital and Consulting Costs	***Year 1:*** *$30,000* ***Continuing:*** *$20,000*
2030 Annual Electricity Impact	*2 GWh (~750 households)*

Case Study

Several cities have instituted energy disclosure and benchmarking policies, including Berkeley, CA and Boulder, CO. Berkeley's Building Energy Saving Ordinance (BESO) has required disclosure and reporting for buildings greater than 25,000 ft^2 starting July 1st, 2019.[33] However, there is no requirement to meet any targets. In comparison, Boulder's Building Performance Program initially requires only disclosure and reporting but will begin requiring lighting upgrades and retro-commissioning[34] from 2021 – 2023 and implementation of retro-commissioning from 2023 – 2027, with smaller buildings having more time to comply. It does not specify exact targets to hit, only that these actions are taken.[35]

5.2 – Utility Program Area

5.2.1 – Backup Inverter Program

Strategy Description

This program aims to promote backup inverters to bridge the gap between the low up-front costs and high emissions of a backup generator and the high up-front costs and lack of emissions from battery storage. Backup inverters provide a small amount of power from solar panels while they are active, but as with solar panels without batteries, do not provide power during the night. There is currently only one

[33] City of Berkeley, 'BESO Benchmarking Buildings', 2019 <https://www.cityofberkeley.info/benchmarking_buildings/> [accessed 10 April 2019].

[34] Retro-commissioning is the application to existing buildings of the commissioning process of ensuring that all installed systems are properly functional.

[35] City of Boulder, 'Boulder Building Performance', 2019 <https://bouldercolorado.gov/sustainability/boulder-building-performance-home> [accessed 10 April 2019].

commercially widespread backup inverter, the SMA Sunny Boy Secure Power Supply.[36] The City would need to avoid pushing a specific vendor or solution, but if the City releases an RFO for vendors to provide solutions, they may receive more applicants.

Action Plan - Project

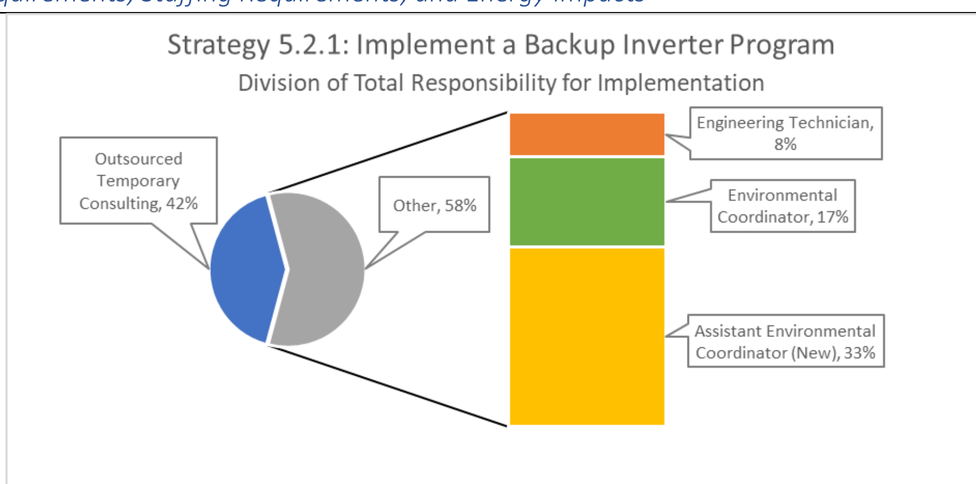
2019

1. Conduct research on possible solutions and vendors for backup power supplies.
2. Create draft RFO with request for solar + backup inverter standard offers, with specifications including amount of backup power and cost.
3. Circulate to vendors and internal stakeholders for feedback.
4. Revise draft RFO based on feedback and present to Council for approval.

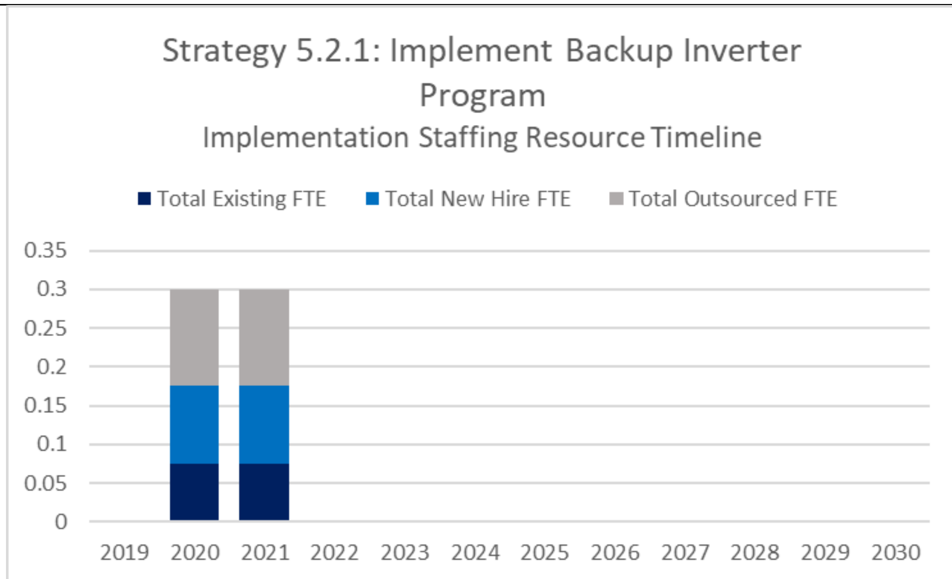
2020

5. Release RFO for vendor bids.
6. Review bids and select shortlist of winners.
7. Create website advertising standard offers from selected bids.

Funding Requirements, Staffing Requirements, and Energy Impacts



[36] LLC SMA America, *Secure Power Supply - Technical Description*, 2013 <http://files.sma.de/dl/18726/EPS-US-TB-en-11.pdf> [accessed 12 April 2019].



Total FTE Requirement	***Years 1-2:*** *0.3 FTEs (~600 hours combined)*
FTE Position Breakdown	***Years 1-2:*** *Engineering Technician: 50 hours/year* *Environmental Coordinator: 100 hours/year* *Assistant Environmental Coordinator (new): 200 hours/year* *Outsourced Consultant: 250 hours/year*
Estimated Annual Staffing Cost	***Years 1-2:*** *$15,000*
Estimated Annual Capital and Consulting Costs	***Years 1-2:*** *$10,000*
2030 Annual Electricity Impact	*1 GWh (~350 households)*

5.2.2 – Work with IOUs to Develop a Community Solar Project

Strategy Description

Community solar projects are solar projects sized similarly to large commercial installations, in the 1-3 MW range. However, these projects can be subscribed to by residents and businesses that cannot install solar PV on their own facilities due to either technical constraints or a lack of financial capability. They also provide other important benefits to the community by being locally sited, such as resiliency and jobs for the local solar industry. Local siting also reduces reliance on transmission by adding a large project to the local distribution grid.

A community solar project could be developed in partnership with IOUs or through a CCA. Although a CCA would provide more control, an IOU-controlled project would be developed earlier. SCE has a current pathway for community solar programs, but due to the high administrative burdens placed on the project developer, no community solar projects have proceeded to date. SCE is currently asking for funding from the CPUC to develop an alternative community solar program, to begin in 2020. Due to the uncertainty of a CCA moving forward, the action plan below is geared towards participating in the proposed SCE program.

The proposed SCE program also requires an entity such as a City, or a group of entities, to act as "project anchors" to agree to purchase at least 80% of the system output, which greatly reduces the potential for this strategy to meet community goals. Therefore, a CCA would be the preferred implementation option for this strategy.

The proposed SCE program contains the following steps:

1. City partakes in SCE Request for Information (RFI) to assess community requirements such as resiliency and location and find a suitable site host.
2. City identifies co-anchors if necessary.
3. SCE issues RFP for development of project and selects a winner.

City collaborates with developer to ensure smooth project installation and program launch.

Action Plan - Project

2020

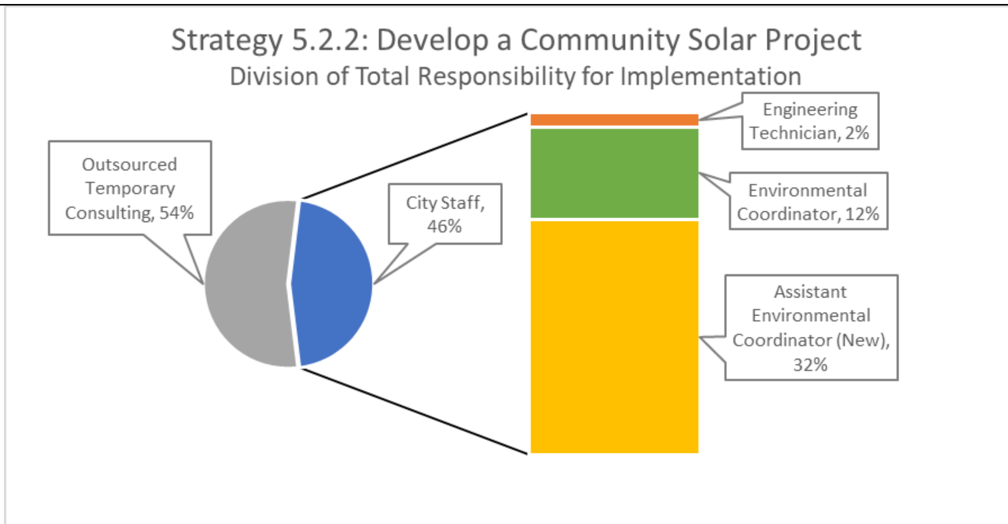
1. Assign a City staff member and team to lead project development and review status of SCE Community Renewables program.
2. Conduct an analysis of large City-owned sites and approach other public agencies and large commercial property owners to potentially act as an anchor client and/or site owner for the solar project.
3. Conduct outreach to residents and businesses neighboring the project to educate them about the need for solar development in that area.
4. Offer assistance to SCE to help with outreach and enrollment in the project.
5. Respond to SCE RFI with site details and proceed through process as directed by SCE.

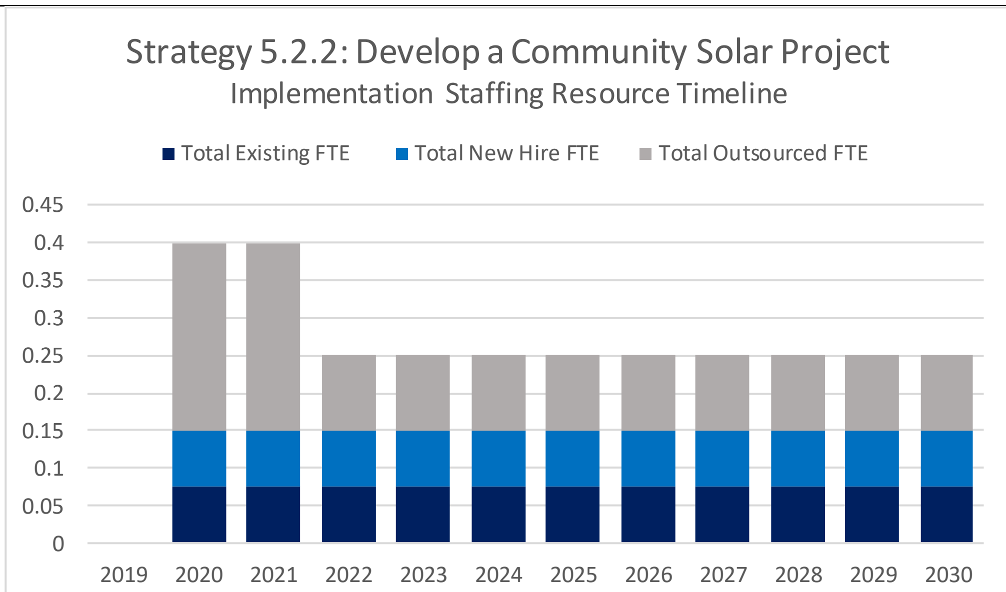
2021

6. Obtain approval for participation in SCE Community Renewables program from City Council.
7. Return to Council as necessary for additional contract approvals.
8. Begin and monitor project construction.

2022

9. Complete construction and interconnection of project and launch program.





Total FTE Requirement	***Years 1-2:*** *0.4 FTEs (~800 hours combined)* ***Continuing:*** *0.25 FTEs (~500 hours)*
FTE Position Breakdown	***Years 1-2:*** *Engineering Technician: 50 hours/year* *Environmental Coordinator: 100 hours/year* *Assistant Environmental Coordinator (new): 150 hours/year*

	Outsourced Consultant: 500 hours/year ***Continuing:*** *Environmental Coordinator: 50 hours/year* *Assistant Environmental Coordinator (new): 150 hours/year* *Outsourced Consultant: 200 hours/year*
Estimated Annual Staffing Cost	***Years 1-2:*** *$15,000* ***Continuing:*** *$10,000*
Estimated Annual Capital and Consulting Costs	***Years 1-2:*** *$25,000* ***Continuing:*** *$10,000*
2030 Annual Electricity Impact	*1.4 GWh (~500 households)*

5.3 – Financial and Funding Program Area

5.3.1 – Create New Financing Mechanisms for the Community

Strategy Description

The goal of this strategy is to enable residents and businesses without the available funding to buy solar projects up-front. There are two possible pathways for the City to achieve this:

1) Work with private foundations or government agencies to create a low-interest source of funding for a community solar OBF program; and
2) Work with private foundations or government agencies to create a low-interest source of funding for a community solar PACE program.

A partnership with a private foundation or bank could allow the City to use a loan loss reserve, as the County did with the emPower program. By using its money only to insure its partner against bad loans, rather than providing loans directly, the City can effectively help write many more loans than it would be able to otherwise with its limited funding.

Solar OBF programs have few case studies, since OBF traditionally focuses on energy efficiency. As such, a solar OBF program would likely have to begin as a pilot and would require coordination with a public agency such as the Carpinteria Valley Water or Carpinteria Sanitary Districts, since the City does not administer its own utility bill. However, OBF programs allow residents and businesses to pay for projects with smaller monthly payments, rather than a larger annual payment, which appeals to many.

In comparison, PACE programs allow residents and businesses to finance energy projects through property tax payments in larger annual payments. There is a much more established pathway to permitting PACE, and it would require less active management than an OBF program. The City has rejected allowing PACE financing in the past but is planning on revisiting the issue in January 2020.

Action Plan - Project

2020

1. Assign OBF staff lead.
2. Contact managers of existing OBF programs to gather advice and best practices.
3. Explore OBF programs not operated by IOUs, focusing on regulatory and legal requirements for running OBF on non-electricity bills such as waste and water.
4. Work with Finance Department to investigate ability to replicate loan loss reserve used in County emPower program.
5. Conduct outreach to available funding partners.
6. Decide upon a funding partner and program structure regarding whether to use traditional or non-profit capital.
7. Conduct outreach to residents and businesses neighboring the project to educate them about the need for solar development in that area.
8. Establish most important program components for the Carpinteria's needs, such as technology eligibility (e.g. solar PV, solar thermal, etc.) and amount of focus on low-income customer segments.

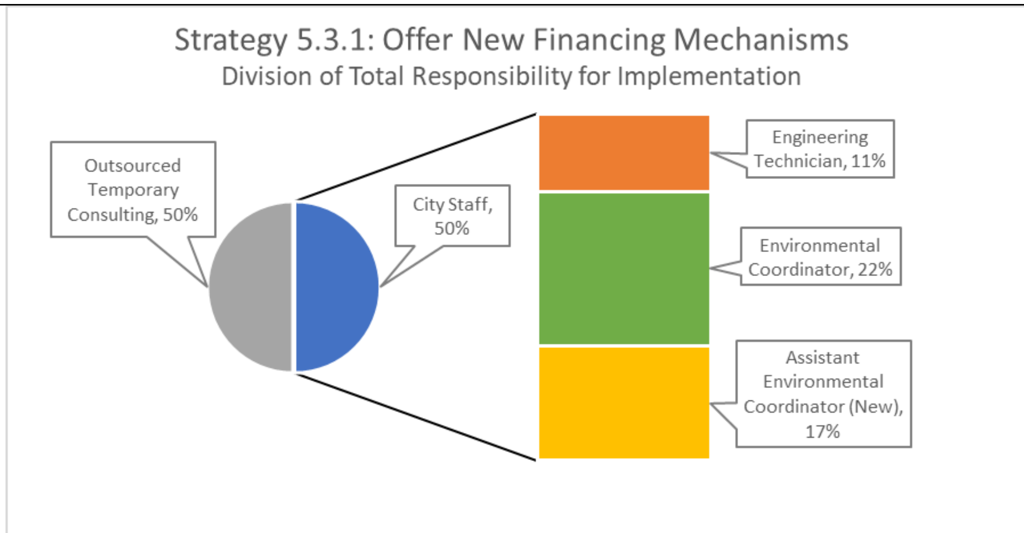
2021

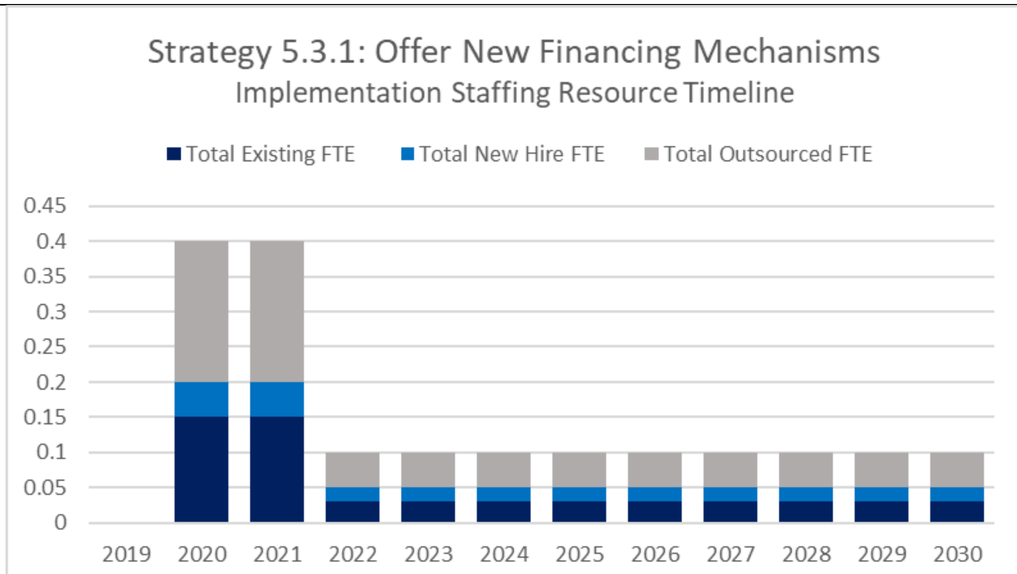
9. Conduct community outreach to gather feedback on program design and iterate upon it.
10. Work with 3rd party funding partner and program manager to design parameters of a pilot.
11. Work with either Water or Sanitary districts to establish process for including charges on water or waste bill.
12. Launch pilot program.

2022

13. Adjust program based on pilot results.
14. Launch full program.

Funding Requirements, Staffing Requirements, and Energy Impacts





Total FTE Requirement	***Years 1-2:*** *0.4 FTEs (~800 hours combined)* ***Continuing:*** *0.1 FTEs (~200 hours)*
FTE Position Breakdown	***Years 1-2:*** *Engineering Technician: 100 hours/year* *Environmental Coordinator: 200 hours/year* *Assistant Environmental Coordinator (new): 100 hours/year* *Outsourced Consultant: 400 hours/year* ***Continuing:*** *Engineering Technician: 20 hours/year*

	Environmental Coordinator: 40 hours/year *Assistant Environmental Coordinator (new): 40 hours/year* *Outsourced Consultant: 100 hours/year*
Estimated Annual Staffing Cost	***Years 1-2:*** *$20,000* ***Continuing:*** *$5,000*
Estimated Annual Capital and Consulting Costs	***Years 1-2:*** *$20,000* ***Continuing:*** *$5,000*
2030 Annual Electricity Impact	*1 GWh (~400 households)*

Case Study: Lafayette Low-Interest On-Bill Financing Pilot

Lafayette, Colorado is currently running a 6-year pilot project where residents can apply for 1.5% fixed APR loans for energy efficiency improvements through Boulder County's Energy Smart Program. Participants can pay loans over a 1, 3, or 5-year period through their municipal water utility bill, depending on the loan amount.[37] The program was kickstarted by a $30,000 contribution towards Lafayette's Energy Efficiency and Renewable Energy Revolving Loan Fund from Energy Outreach Colorado.

5.3.2 – Introduce Financial Incentives to Increase Economic Payback

Strategy Description

Performance-Based Incentives (PBIs) can directly fill the loss in economic value from ToU rate changes. Rather than an up-front rebate or credit, they provide money only per-kWh generated, which prevents paying incentives to systems that underproduce or stop working entirely and promotes maintenance. To help achieve the City's other resiliency goals, the PBI can be set higher for projects that also have battery storage.

Due to capital cost requirements, PBIs are recommended as a later-stage strategy. This would provide the City with more time to gather a funding source and would allow the PBI to be adjusted based on progress towards meeting city-wide solar targets. Impacts currently assume a 1 cent per kilowatt-hour (c/kWh) PBI for projects without battery storage, and a 2 c/kWh PBI for projects with battery storage. It is assumed that the program lasts for 3 years, with a 5-year duration for the incentive.

[37] City of Lafayette, *Low Cost Opportunity for Home Energy Improvements* (Lafayette, 2018) <https://cityoflafayette.com/DocumentCenter/View/22643/On-Bill-Flyer_100118> [accessed 10 April 2019].

Action Plan - Project

2024

1. Create a program development team to lead the strategy.
2. Identify most important customer segments (e.g. single-family residential, commercial, multi-family residential, etc.) and property types to target with the incentive.
3. Establish DER target for the incentive program.
4. Conduct outreach to local solar installers and other DER vendors to gather their opinions on important program requirements.

2025

5. Create program guidelines, including project eligibility, length of program, length of incentive, type of incentive, reporting requirements, and amount of incentive to be offered.
6. Assess potential risks and legal protections for the City.
7. Determine estimated capital needs.
8. Identify gaps in City expertise for implementation and program design.
9. Finalize program design based on consultant advice.
10. Present draft guidelines to vendor community for feedback.
11. Obtain City Council approval for required funding.

2026

12. Publish guidelines and conduct outreach campaign to advertise PBI to residents and businesses.
13. Launch program city-wide.

Funding Requirements, Staffing Requirements, and Energy Impacts

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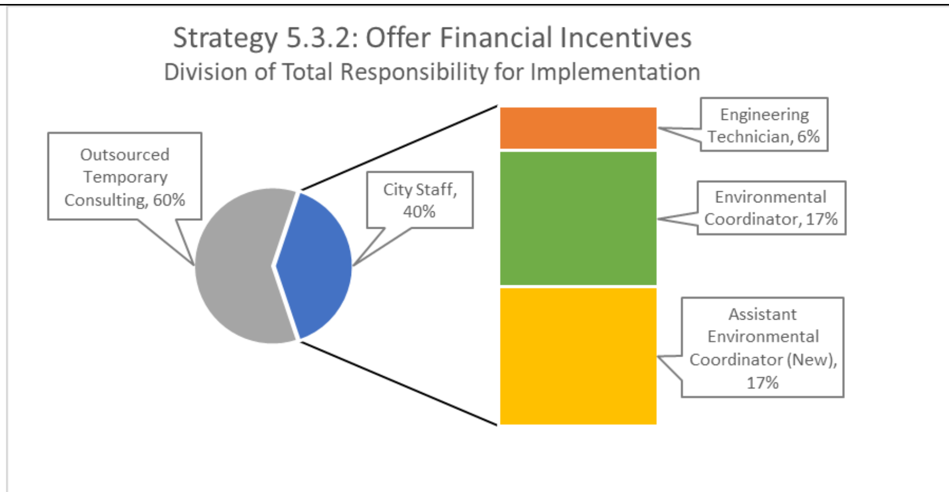
<tr><td colspan="2">
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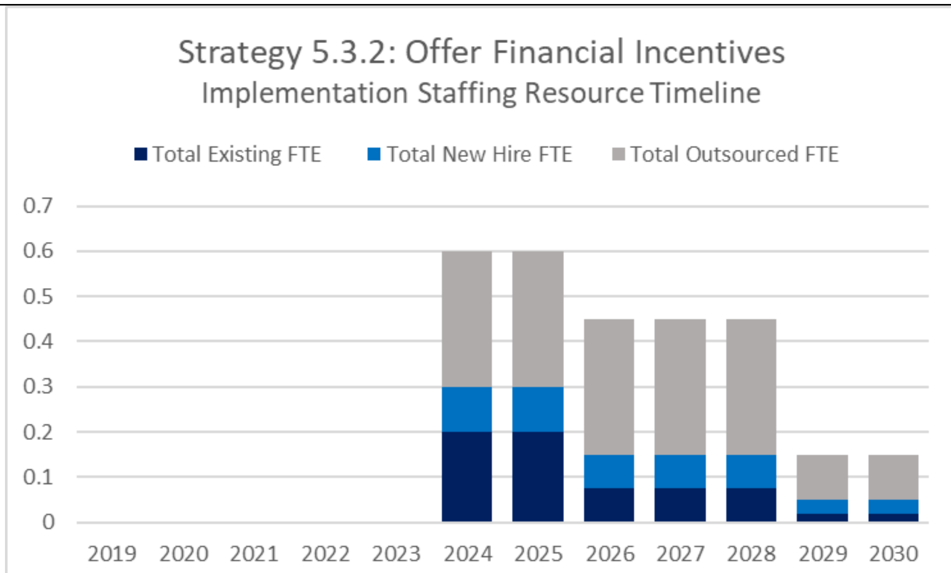
<tr><td colspan="2">
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<tr><td>Total FTE Requirement</td><td>Years 1-2: 0.6 FTEs (~1,200 hours combined for design)
Years 3-5: 0.45 FTEs (~900 hours combined for operation)
Continuing: 0.15 FTEs (~100 hours for wrap-up)</td></tr>
<tr><td>FTE Position Breakdown</td><td>Years 1-2:
Engineering Technician: 100 hours/year
Environmental Coordinator: 300 hours/year
Assistant Environmental Coordinator (new): 200 hours/year
Outsourced Consultant: 600 hours/year
Years 3-5:</td></tr>
</table>

	Engineering Technician: 50 hours/year *Environmental Coordinator: 100 hours/year* *Assistant Environmental Coordinator (new): 150 hours/year* *Outsourced Consultant: 600 hours/year* ***Continuing:*** *Environmental Coordinator: 40 hours/year* *Assistant Environmental Coordinator (new): 60 hours/year* *Outsourced Consultant: 200 hours/year*
Estimated Annual Staffing Cost	***Years 1-2:*** *$30,000* ***Years 3-5:*** *$15,000* ***Continuing:*** *$5,000*
Estimated Annual Capital and Consulting Costs	***Years 1-2:*** *$30,000* ***Years 3-5:*** *$100,000* ***Continuing:*** *$75,000*
2030 Annual Electricity Impact	*8 GWh (~2900 households)*

Case Study: Connecticut Green Bank PBIs

The Connecticut Green Bank was formed by the Connecticut legislature in 2011. It uses a relatively low amount of public investment to achieve a multiplier effect by supporting private lenders rather than directly subsidizing clean energy. For every $1 of public funding, $6 of additional private funding comes from the CT Green Bank.

Through its Residential Solar Investment Program (RSIP), CT Green Bank offers both an ongoing Performance-Based Incentive and an up-front Expected Performance-Based Buydown (EPBB), depending on whether the homeowner is purchasing the system directly or paying for it through a PPA. The CT Green Bank also offers C-PACE for commercial customers and energy efficiency financing options to spread out overhead costs across a larger number of programs.[38]

5.3.3 – Diversify City Funding Streams

Strategy Description

Diversifying funding streams is extremely important to ensuring the City has a stable funding stream that is not dependent on any one source. Below are proposed methods for the City to diversify its funding stream:

1) Aggressively pursue new federal, state, and private foundation funding sources;

[38] Connecticut Green Bank, 'Green Energy Solutions in Connecticut', 2017 <https://www.ctgreenbank.com/programs/all-programs/> [accessed 10 April 2019].

2) Continue to work closely with the CPUC and SCE to maximize the City's share of existing renewable program funding; and
3) Partner with other nearby regional governments to create energy programs.

Continuing to work with the CPUC and SCE would allow the City both to maximize its intake from a utility funding stream that may decrease, and to receive CPUC funding that would otherwise go to utilities to administer local programs.

One method the City could use to directly receive this funding is to increase its involvement in the County's new partnership with the Counties of San Luis Obispo and Ventura as part of the Tri-County Renewable Energy Network (3C-REN). The 3C-REN is currently planning on providing residential and multi-family energy efficiency programs, codes and standards compliance programs, and workforce education and training programs.[39] This scope could be expanded to include a community solar program. SCE recently applied for $5M from the CPUC to manage these and other programs such as green tariffs. If approved, it may set a precedent for the County to ask for similar funding on behalf of the City, given that the City has a more direct relationship with local residents and businesses.

Additionally, the City of Carpinteria could use a portion of the new funds from the 1.25% local sales tax increase that was passed in November 2018, Measure X. This increase, slated to take effect in April 2019, is expected to generate $1.8M annually for the City's General Fund.[40] Sustainability measures were listed as a potential use of these increased funds. To effectively implement the measures proposed within this SEP, the City should ensure that a portion of these funds are earmarked for energy and resiliency programs and projects in the upcoming budget cycle.

Action Plan - Project

2019

1. Request a portion of the expected sales tax revenue in the upcoming budget.

Ongoing

2. Monitor federal, state, IOU, and private foundation grants and funding programs for applicability to the City.
3. Monitor approval progress of IOU requests for funding, particularly the Community Renewables Program.
4. Identify best opportunities for the County to request funds from CPUC on behalf of the City to replicate IOU role through 3C-REN.

[39] County of Ventura, 'Tri-County Regional Energy Network', 2019 <https://www.ventura.org/environment/tricountyren/> [accessed 10 April 2019].
[40] City of Carpinteria, 'Spring 2019 City Hall Newsletter', 2019 <www.Carp-Pool.com> [accessed 12 April 2019].

Funding Requirements, Staffing Requirements, and Energy Impacts

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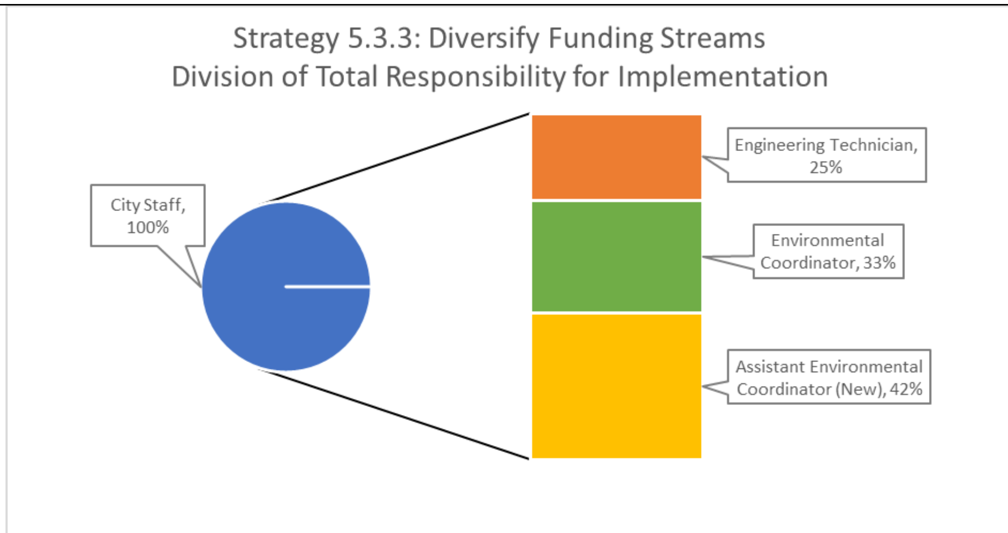
<tr><td colspan="2">
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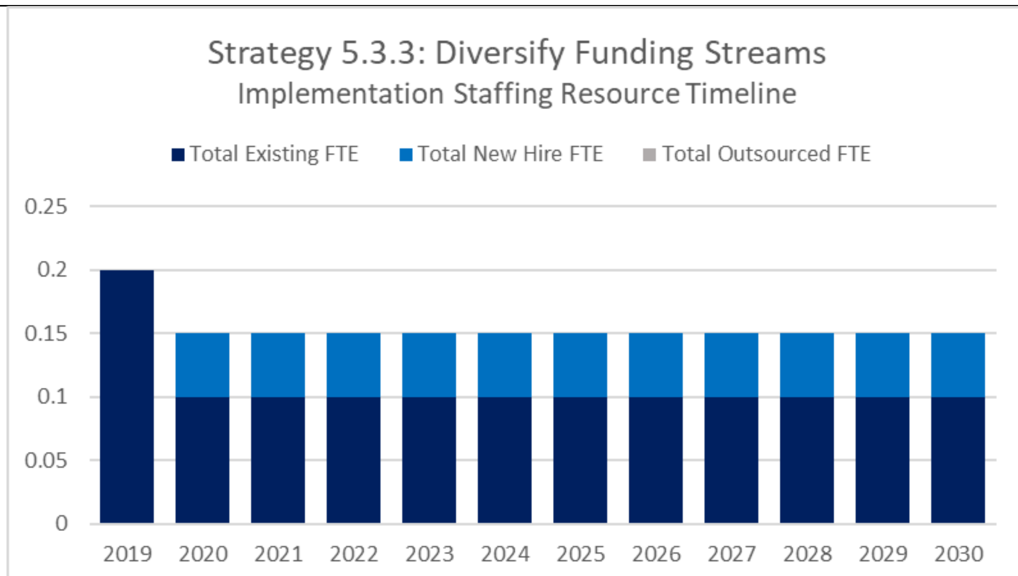
<tr><td colspan="2">
</td></tr>
<tr><td>Total FTE Requirement</td><td>Year 1: 0.2 FTEs (~400 hours)
Continuing: 0.15 FTEs (~300 hours)</td></tr>
<tr><td>FTE Position Breakdown</td><td>Year 1:
Engineering Technician: 100 hours/year
Environmental Coordinator: 300 hours/year
Continuing:
Engineering Technician: 50 hours/year
Environmental Coordinator: 50 hours/year
Assistant Environmental Coordinator (new): 200 hours/year</td></tr>
</table>

Estimated Annual Staffing Cost	***Years 1-2:*** *$15,000* ***Continuing:*** *$10,000*
Estimated Annual Capital and Consulting Costs	***Year 1:*** *$0* ***Continuing:*** *$0*

5.4 – City Facility Program Area

5.4.1 – Create a Formal Energy Assurance Plan (EAPs)

Strategy Description

Energy assurance planning is an important step in improving the robustness, security, and reliability of energy infrastructure by creating plans to protect key sites so that they continue to operate in the event of any disaster or electricity outage. This will increase the reliability of critical services such as water distribution. EAPs are therefore a key step in building a resilient, local electricity grid. The City has already taken several key steps towards assurance planning by conducting an Emergency Action Plan and Hazard Mitigation Plan.

These are the key steps to developing a strong EAP:

1) Use results from Emergency Action Plan to identify the City-owned buildings and facilities that are most critical from a resiliency perspective, such as sites used as emergency operation centers or community gathering spots;
2) Evaluate each critical site, including its current level of emergency preparation from an energy perspective and the renewable energy potential present; and
3) Evaluate opportunities to supplement diesel generators with battery storage.

Action Plan - Project
2019 1. Assemble internal energy assurance team with representation from the Fire District and the County Emergency Services Office. 2. Create mission and vision statements for the Energy Assurance Plan. 3. Conduct external outreach to cities with existing EAPs to gather advice and guidance. 4. Research IOU, state, and federal funding opportunities available for energy assurance support. 5. Work with the Community Development Department to identify existing City plans that could incorporate the EAP. 6. Identify key issues and critical facilities and sites to be covered in an EAP.

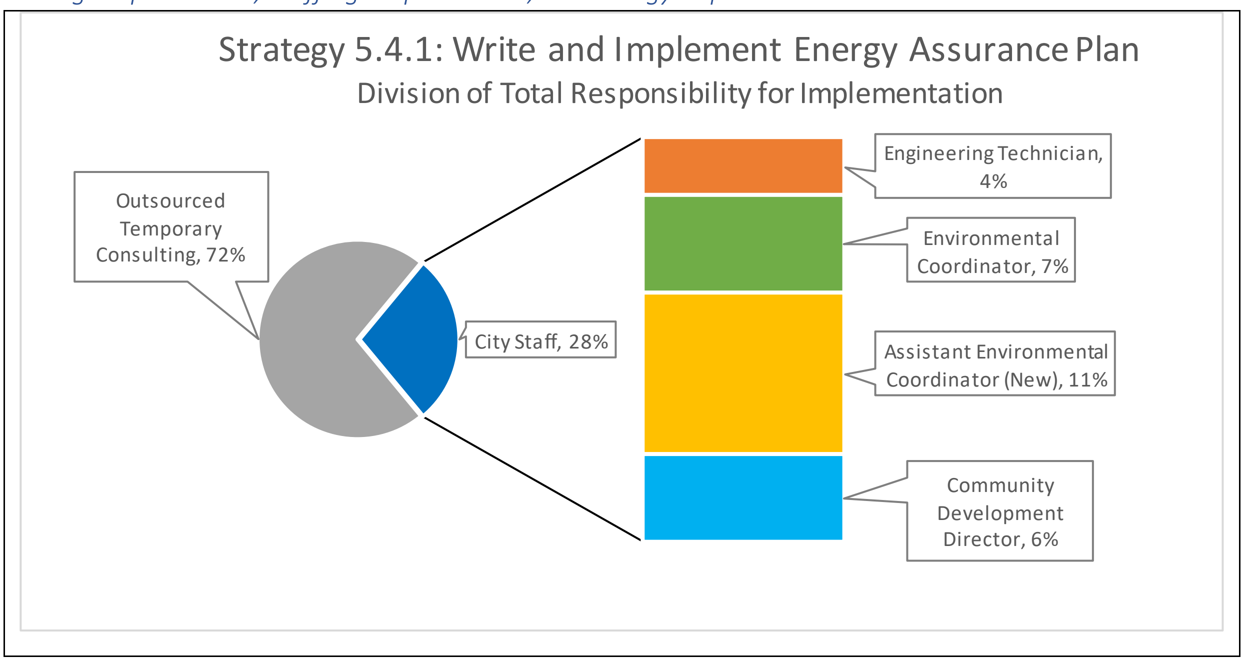
2020

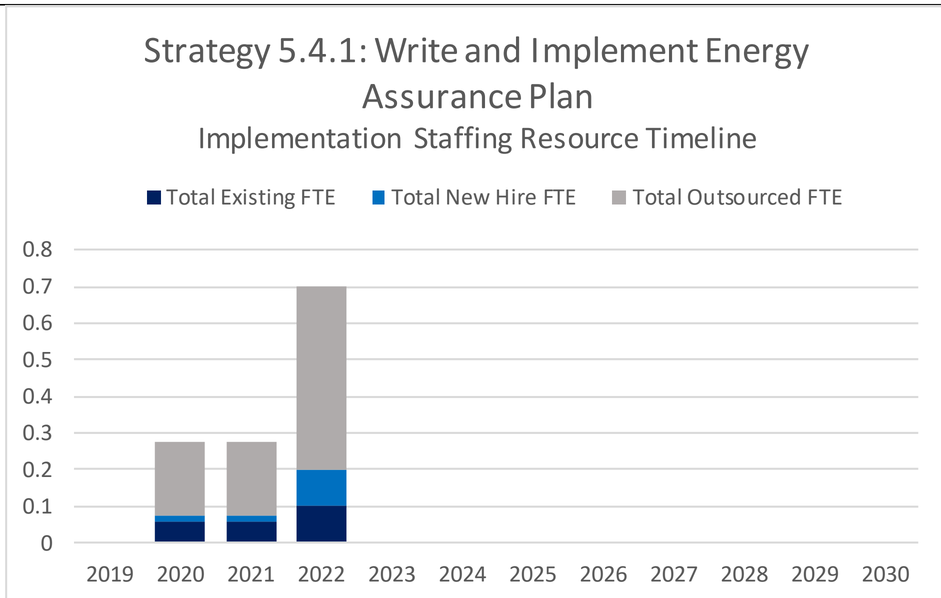
7. Conduct outreach to external community stakeholders for feedback on resiliency issues and challenges faced by the community.
8. Create and release RFP to write the EAP.
9. Review proposals and negotiate contract with winning bid.
10. Obtain City Council approval for contract.
11. Work with consulting team to write draft EAP, focusing on opportunities for renewable energy and battery storage at identified sites.
12. Circulate draft EAP for comments and feedback from internal and external stakeholders and iterate upon it.

2021-2022

13. Implement EAP recommendations.

Funding Requirements, Staffing Requirements, and Energy Impacts





Total FTE Requirement	***Years 1-2:*** *0.275 FTEs (~550 hours combined)* ***Year 3:*** *0.7 FTEs (~1,400 hours)*
FTE Position Breakdown	***Years 1-2:*** *Engineering Technician: 20 hours/year* *Environmental Coordinator: 40 hours/year* *Assistant Environmental Coordinator (new): 40 hours/year* *Community Development Director: 50 hours/year* *Outsourced Consultant: 400 hours/year* ***Year 3:*** *Engineering Technician: 60 hours/year* *Environmental Coordinator: 90 hours/year* *Assistant Environmental Coordinator (new): 200 hours/year* *Community Development Director: 50 hours/year* *Outsourced Consultant: 1,000 hours/year*
Estimated Annual Staffing Cost	***Years 1-2:*** *$8,000* ***Year 3:*** *$28,000*
Estimated Annual Capital and Consulting Costs	***Years 1-2:*** *$20,000* ***Year 3:*** *$50,000 (assumes use of zero up-front cost project financing mechanism such as a PPA)*

2030 Annual Electricity Impact	*0.7 GWh (~250 households)*

5.5 – Outreach and Advocacy Program Area

5.5.1 – Support a County-wide One-Stop Shop to Lead Education Efforts in the City

Strategy Description

A One-Stop Shop would act as the main hub and point of contact for information for all new programs and policies implemented due to SEP recommendations. The One-Stop-Shop would also act as the main method for the City to promote the benefits of certain programs such as a backup inverter program and advertise programs requiring community enrollment or participation such as a Community Solar program or a Performance-Based Incentive program.

It can also increase knowledge about clean energy technologies and the industry as a whole, such as the falling costs of solar and energy efficiency projects, as well as the role that local utility-scale generation and distributed, backup storage can play in increasing resiliency and reliability of the electricity supply.

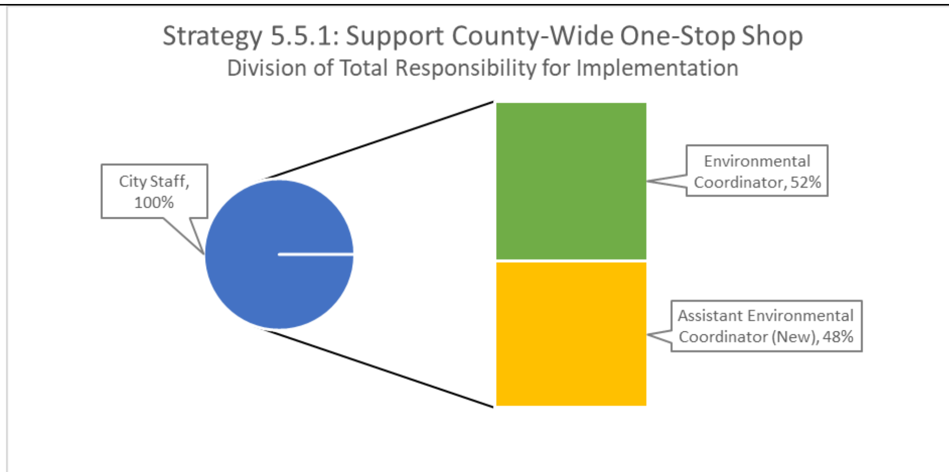
Additionally, representatives from a One-Stop Shop can act as trusted representatives to facilitate energy projects in the following ways:

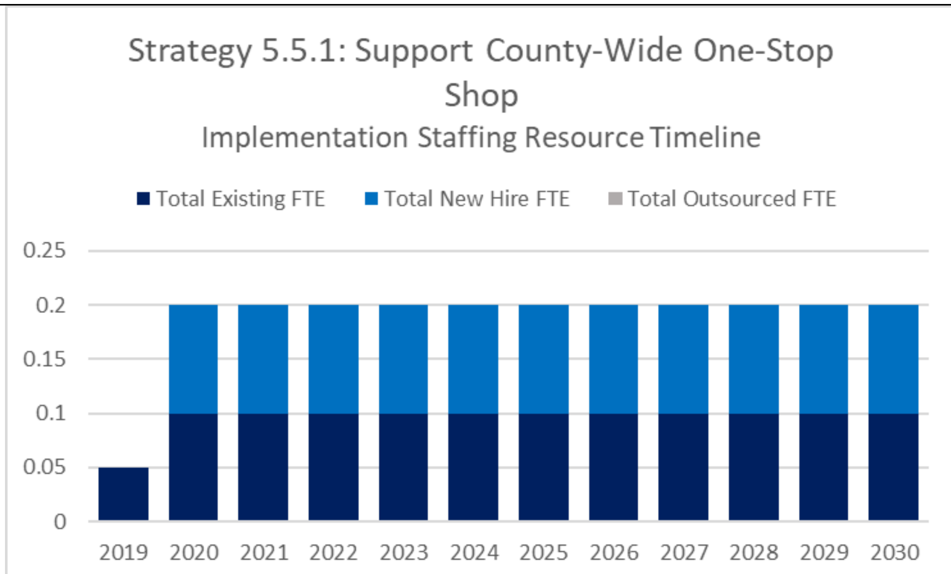
- Provide energy advice and comparisons between wholesale electricity projects and projects for on-site consumption; and
- Support the use of "green" leases that charge higher rates if energy projects are undertaken.

Due to Carpinteria's small size and limited funding, providing support to a County-wide resource center would allow Carpinteria to receive the benefits with less investment in staffing and other resources.

Action Plan - Project
2019 1. Partner with the County to execute initial outreach and promotional campaign through a series of workshops targeted at different customer segments, including special districts and public agencies, commercial property owners, agricultural landowners, and opportunity zone investors and landowners. 2. Continue building relationships with partners across Carpinteria to extend reach of One-Stop Shop. 3. Assemble internal team and hire staff if necessary to provide support for promotional and educational programs, leading if necessary. 4. Compile list of clean energy resources to be included in online resource pages.

Funding Requirements, Staffing Requirements, and Energy Impacts





Total FTE Requirement	***Year 1:*** *0.05 FTEs (~100 hours)* ***Continuing:*** *0.2 FTEs (~400 hours)*
FTE Position Breakdown	***Year 1:*** *Environmental Coordinator: 100 hours/year* ***Continuing:*** *Environmental Coordinator: 200 hours/year* *Assistant Environmental Coordinator (new): 200 hours/year*
Estimated Annual Staffing Cost	***Year 1:*** *$10,000* ***Continuing:*** *$20,000*

Estimated Annual Capital and Consulting Costs	***Year 1:*** *$0* ***Continuing:*** *$0*
2030 Annual Electricity Impact	*0.1 GWh (~25 households)*

5.5.2 – Advocate for City goals at the State and Federal Level

Strategy Description

As a relatively small city, Carpinteria has limited ability to advocate on its own. However, by adding its voice to others such as the County, the City can work to amplify existing advocacy. Some advocacy goals are listed below:

1) Support renewable industry in advocating for a continuation of the current ITC beyond 2019;
2) Support existing efforts at the state level to protect state oversite of streamlined DER interconnection processes, establish a statewide mandate for utilities to remove barriers preventing DERs from participating in the wholesale electricity market and explore the creation of tariffs that value the services DERs can provide; and
3) Work with the State of California to develop a "Public Power Pool" to aggregate solar projects.

The first objective involves supporting existing advocacy groups, to the extent possible, such as the California Solar and Storage Association (CALSSA) in extending the ITC. The planned phase-out of the ITC represents a gap in terms of financial viability that would need to otherwise be filled in by the City for solar projects to continue at the current rate. It should be noted, however, that this level of federal advocacy relies on national, political trends that cannot be relied upon.

In light of this, it also makes sense for the City to explore other ways to maintain a healthy development environment for DERs. Supporting legislative efforts, led by existing groups such as the Solar Rights Alliance, to strengthen residents' and businesses' right to leverage their solar resource, store electricity they generate and, in light of the ITC phasing out, increase the revenue streams available to DERs to address concerns of decreased financial viability is one way to do this. Recent efforts, such as AB 288, have been met with significant opposition from utilities. Preserving and expanding these rights at the state level will enable Goleta residents to effectively support the City in meeting its energy goals.

The second objective involves advocacy for the creation of an aggregated power pool of off-site but in-state renewable projects. These projects could take advantage of the ITC prior to it sunsetting and be bundled together to receive better PPA rates for governments, public agencies and non-taxpaying special districts. Although it is likely too late to implement a Public Power Pool in time for the 30% credit, immediate action could allow implementation prior to the credit reducing to 10%. The recently launched Texas Public Power Pool[41] provides an example of this concept in action and is enabling smaller public entities to leverage their shared buying power to capture the economic benefits of renewables.

[41] PR Newswire. "Texas Power Pool gathering public entities for renewable electricity aggregation", January 7, 2019. https://www.prnewswire.com/news-releases/texas-power-pool-gathering-public-entities-for-renewable-electricity-aggregation-300773960.html [Accessed 20 June 2019]

5.6 – Funding and Staffing Summary

For scheduling purposes, it is important to analyze the cumulative requirements across all program areas and strategies. Figure 5.1 summarizes total year-by-year staffing requirements.

Strong staffing commitment will be required over the first several years to set up new programs, whereas much of the latter stages of the SEP is geared towards maintaining and updating old programs and policies. Figure 5.1 does not show staffing required as part of SEP development. As such, relatively less staff time is used in 2019 since SEP implementation will likely not start until the second half of 2019. Additionally, some time is dedicated towards a new Assistant Environmental Coordinator hire in Public Works to support environmental initiatives across departments, including work in the Community Development Department. This could potentially take the form of a new department focused on energy and other sustainability work to reflect the City's commitment to environmental issues.

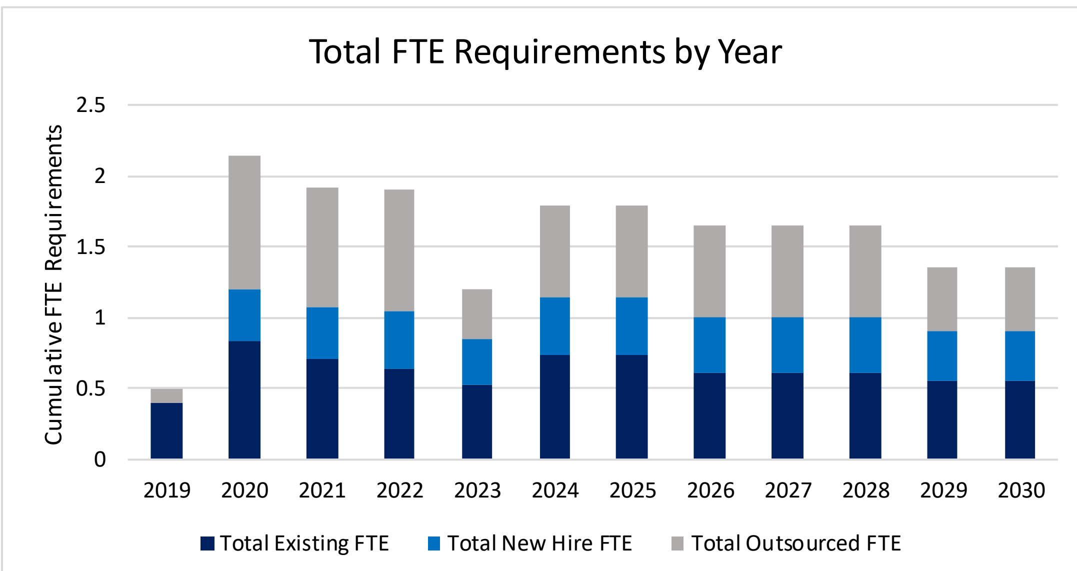


Figure 5.1: Total SEP Staffing Requirements

Appendix A: Detailed Statistical Solar Analysis Description

A ground-up statistical analysis of rooftop solar potential was conducted. A total of 445 such representative rooftops and 91 representative carport locations were measured, and the resulting solar potential scaled to the full city.

To conduct this analysis, the city was divided into 2 zones (residential and commercial) based on geography, zoning types, and building stock. The zones differ in building density, parking lot density, and roof structure. These zones were defined using aerial imaging to visibly confirm boundaries of building type and density.

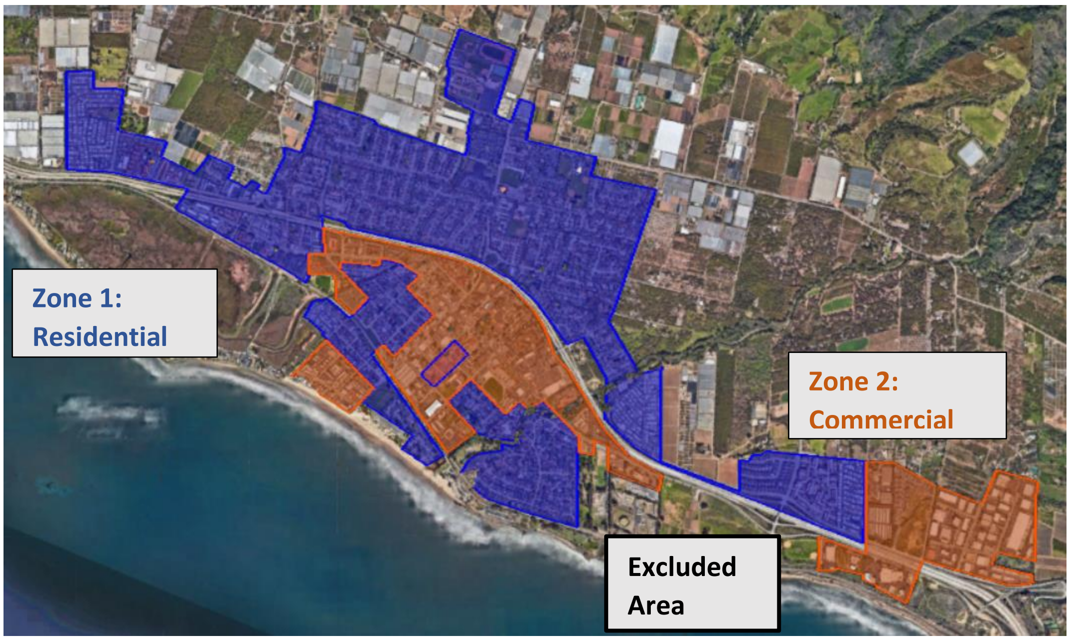


Figure AA.1: Statistical Solar Zones in the City of Carpinteria

Importantly, to exclude areas containing large spaces unusable for solar PV installations, the boundaries of these sample zones did not exactly follow the City limits. Since this methodology scaled PV potential based on the physical size of the zones, including areas with large land area but little realistic solar potential would have resulted in overestimated solar potential for the City as a whole. For example, areas in the southeast of the City were excluded since they are primarily used for public recreational and agricultural purposes. However, where possible to determine, areas that are undeveloped but set to become developed were included. As such, the analysis accounts for future in-City development (but not City boundary growth).

Within each zone, a representative sample of 10 blocks was selected. These blocks were chosen to best reflect both building density and solar access within the entire zone. This is shown in more detail in Figure AA.2.

Figure AA.2: Residential Solar Zone with Statistical Blocks

The blocks varied in both area and the number of buildings. The residential zone was larger in area, but had lower building density, whereas the commercial zone was the opposite, and had much more carport potential. The average block had roughly 22 structures and 5 potential carport locations, whereas the densest block had 47 structures and 25 potential carport locations. Within each block, the physical rooftop and parking space was measured:

Figure AA.3: Statistical Samples in a Block

Table AA.1 provides a summary of the estimated area of each zone and the number of structures:

Table AA.1: Statistical Structural Estimates in Carpinteria

Zone	Area (sq. miles)	Measured Structures	Total Structures (est.)	Measured Carports	Total Carports (est.)
Residential	1.30	241	~4200	13	~200
Commercial	0.59	204	~900	78	~350
TOTAL	1.89	445	~5100	91	~550

The figure below shows the structural distribution by size on a city-wide scale. Small and medium structures dominate, with a long tail of larger structures. Gaps occur in the measured structure data for larger buildings due to smaller sample sizes. This does not necessarily mean that there are no structures of those sizes. Most likely, there would be a re-distribution of the large buildings to fill in those gaps. This increases the potential variance in solar potential for those sizes.

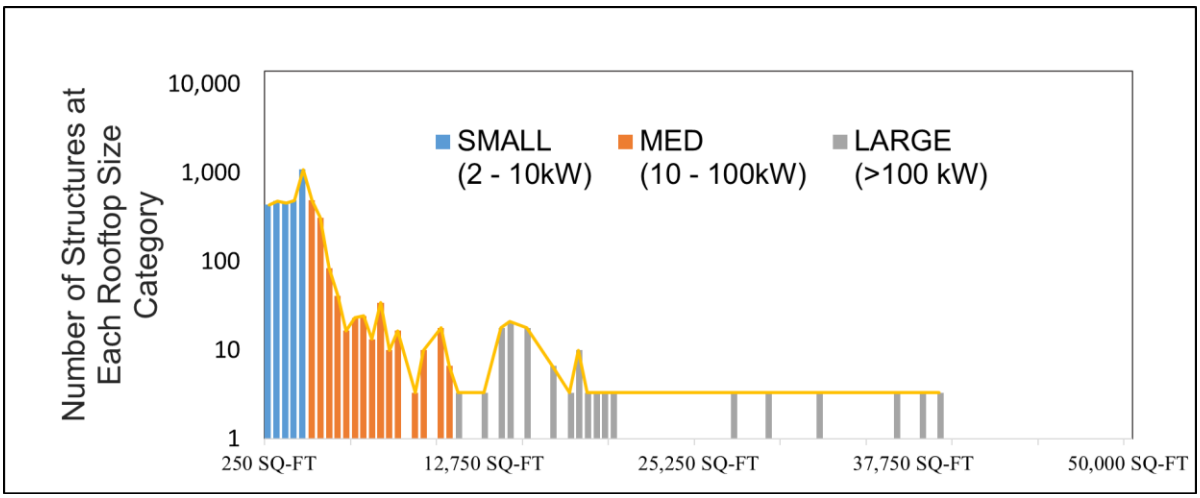


Figure AA.4: Estimated Distribution of Structures by Rooftop Size in Carpinteria

The roof/parking lot area of each structure and the number ill-suited for solar PV systems due to shading or poor roof orientation were catalogued and categorized. After discounting for these losses, the total usable rooftop area of each block was calculated. The usable area from each block was summed, and then scaled up to define the total usable area of the whole zone.

Once the total area was known, the solar potential could be calculated. Fill factors were applied to the roof area to account for the fact that solar cannot cover the entire roof. The fill factors used were based on rooftop size: 10-30% for small roofs (defined as roofs <2,500 ft^2), since residential roofs are typically pitched and have only one face available, 54-66% for medium roofs (<11,000 ft^2), 66-70% for large roofs (>11000 ft^2), and 80% for carports. These fill factors yield a total solar coverage area, and from there, standard efficiency solar modules were assumed in calculating the total solar potential. Within the statistical model, the results were categorized by building area, providing a picture of system size distribution throughout the city:

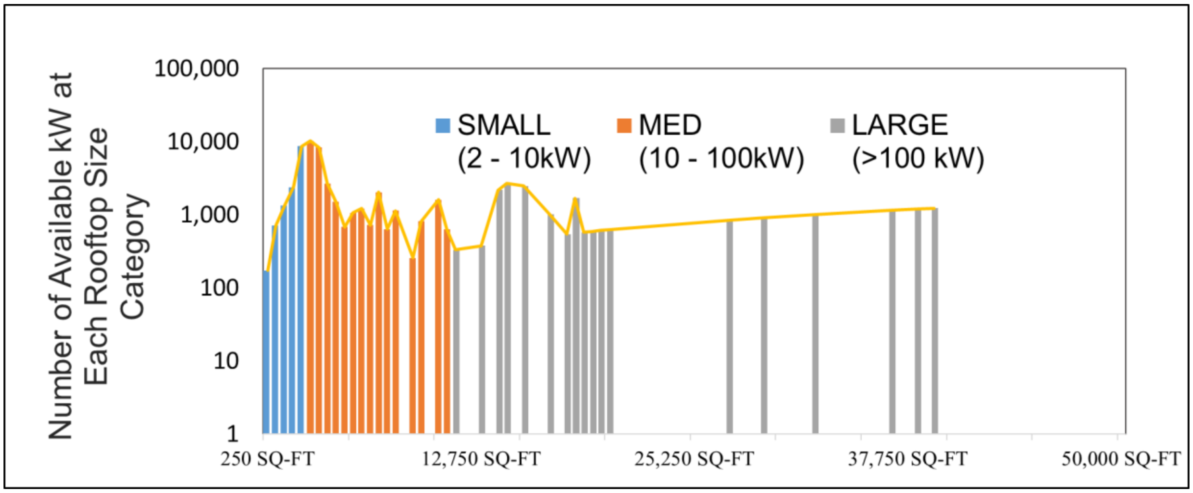


Figure AA.5: Estimated Distribution of Solar Potential by Rooftop Size in Carpinteria

Assuming every viable rooftop and parking lot installed solar PV, total city-wide rooftop solar potential was calculated through this method to be roughly 79 MW, equating to generation potential of 110,600 MWh. The breakdown of potential by sector is summarized below. However, it is important to note that achieving 100% participation is unrealistic. Even among viable rooftops and parking lots, many sites will not be able to install solar due to load, electrical, or structural constraints that cannot be determined through aerial imagery. As such, participation factors have been added that attempt to account for these. Residential systems use much lower participation since they are generally less able to bear electrical or structural upgrade costs.

Table AA.2: Summary of Solar Potential in Carpinteria

	Maximum Potential (MW)	Participation	Final Potential (MW)
Residential	13	25 – 35%	3 – 4
Small Commercial	33	55 – 65%	17 – 22
Large Commercial/ Industrial	20	55 – 65%	10 – 13
Carports	12	55 – 65%	7 – 8
TOTAL	79	50 – 61%	38 – 47

Levelized costs of energy (LCoE) can also be estimated but depend heavily on capital cost assumptions. Different sources report different installation costs. Based on NREL data, avoided utility energy costs, or levelized benefits, exceed levelized solar costs at every size, whereas based on LBNL data, utility energy costs are lower than levelized solar costs for large systems. In contrast, Optony historical data from past consulting experience indicates costs between LBNL and NREL data for medium and large systems, but higher costs for small systems. Figure AA.6 on the following page shows how the LCoE changes by square footage from the various data sources discussed.

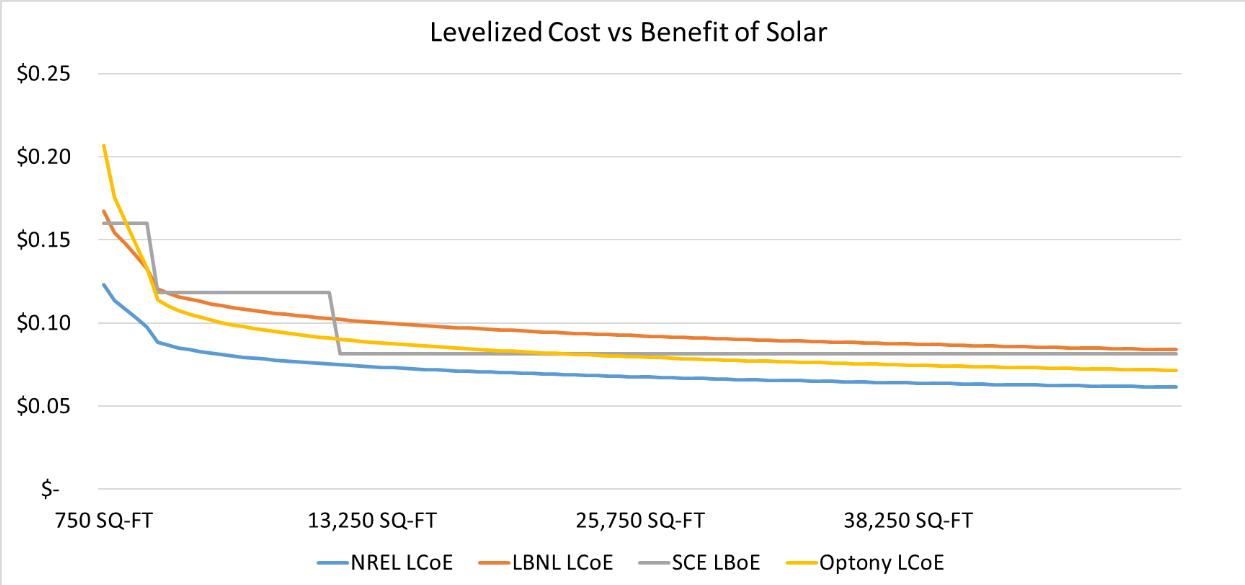


Figure AA.6: Cost vs Benefit of Solar Installations

Lastly, Figure AA.7 shows how local SCE distribution-level feeder renewable energy constraints map onto the various solar zones in Carpinteria. Red feeders have immediate constraints, orange feeders may face constraints in the short-medium term, and green feeders are not expected to face constraints in the short-medium term. Carpinteria does not currently have any constrained feeders.

Figure AA.7: Carpinteria Distribution System Wholesale Renewable Capacity

Some final notes and assumptions associated with the numbers in this report:

- Estimates include only shade-free and correctly-oriented roofs (shaded and north-oriented roofs are counted as unviable in these results).
- This analysis does not account for systems that may need to be downsized for budgetary reasons.
- The solar fill factor on each roof accounts for good design principles. Only south-facing residential roofs are considered, and for larger flat roofs, space is left open for existing equipment and obstructions. A setback from the roof edge is maintained on all structures.
- Does not discount totals for existing solar installations, so this number represents the total realistic rooftop capacity (not incremental additional capacity), including the already existing solar capacity within the city limits.

Appendix B: Key Terms and Definitions

Building Electrification: The conversion of natural gas loads in buildings to electricity loads. It is most commonly achieved by converting furnaces, boilers, and other equipment used for space and hot water heating to electric heat pumps and is a key strategy to reduce emissions. While solar thermal projects also reduce natural gas use, they are generally not included under the umbrella of building electrification as they do not result in a significant electricity load.

California Energy Commission (CEC): Formally the State Energy Resources Conservation and Development Commission headquartered in Sacramento, this agency was created in 1974 to address energy challenges facing the state. They provide technical guidance, stakeholder outreach and coordination, and administer grant funding.

California Solar Rights Act: The California Solar Rights Act was originally passed in 1978 and is a combination of California Civil Code Sections 714 and 714.1, California Civil Code Section 801, California Civil Code Section 801.5, California Government Code Section 65850.5, California Health and Safety Code Section 17959.1, California Government Code Section 66475.3, and California Government Code Section 66473.1. It limits codifies a citizen's right to solar access and right to install a solar system by limiting installation restrictions placed on solar systems.

Community Solar: A large, or community-scale, solar installation or set of installations that residents and businesses can subscribe to for the purposes of receiving local solar electricity even if their own sites are unsuitable for solar development. It can also provide other community benefits such as resiliency if connected at the appropriate point in the distribution system and if other features such as battery storage are present.

Community Choice Aggregation (CCA): A form of electric power procurement, enabled in 2002 under Assembly Bill 117, in which a city or county (or joint powers agency) serves residents, businesses and municipal facilities within its jurisdiction by removing the responsibility of aggregating electricity supply from the existing Investor Owned Utility.

The California Public Utilities Commission (CPUC): The state regulatory agency that sets rules and performs oversight on privately-owned public utilities and some aspects of CCA, including approval of formation.

Design Integrated Permitting: This is a form of permitting where solar designs that adhere to a preset of pre-approved design parameters and conditions are automatically eligible receive a municipal permit, thereby reducing permitting time and costs. These designs can potentially also be integrated into commercially available solar design software, which would ensure permit approval by preventing vendors from creating project designs that do not adhere to the guidelines.

Distributed Energy Resources (DERs): Small renewable energy and energy efficiency devices that are interconnected to the grid in a decentralized manner and provide more local energy control and reduce reliance on the utility. The category of DERs can also include services such as Demand Response (DR), when many electrical loads are aggregated and reduced in response to a grid signal.

Energy Benchmarking: A policy or program for comparing energy use of buildings or appliances with the goal of achieving reductions in usage. On a building scale, it is typically defined on a square foot basis to allow larger buildings to use more energy.

Energy Storage: A technology that can store energy to be used at a later point in time. It is particularly useful when paired with renewable energy sources, since many renewable energy sources are intermittent.

Full-Time Equivalent (FTE): Staffing by the number of hours a full-time employee would work over the course of a year. This is taken to be approximately 2,000 hours.

Grid Assistive Design: Grid assistive design refers to the ability of properly controlled DERs to provide services in support of the electricity grid, both during normal operation and emergency situations. Usually, DERs, such as rooftop solar, are load-following and automatically power themselves down when the grid is deenergized. Resources designed to island will automatically disconnect from a deenergized electricity grid and continue operating. Grid assistive design allows DERs to function in either of these modes and to be dispatched or automatically provide responsive support and services to the grid during both normal operation and a period of emergency.

Home Energy Score: Developed by the US Department of Energy, it is a measure that provides home owners, renters, and prospective buyers with a score that credibly indicates the energy use of a home. The calculation of this score is standardized to enable direct comparison between various different homes, similar to fuel efficiency ratings for cars.

Interconnection: The process through which an energy resource is connected to the grid according to applications, permissions, approvals, inspections etc. as required by utility procedures.

kV: A unit of voltage that describes the electric potential at a given point. A traditional wall outlet provides 120 V. 1000 volts (V) equals 1 kilovolt (kV). When multiplied by the electricity current, it provides power.

kW/MW: A unit of power that describes the amount of energy being used at any given moment in time. A traditional incandescent lightbulb uses approximately 60-100 W. 1000 watts (W) equals 1 kilowatt (kW), and 1000 kW equals 1 megawatt (MW).

kWh/MWh: Units that describe the energy used by load or produced by a generator over a given period of time. For example, 1 kilowatt-hour (kWh) is the energy consumed by a 1 kW load over 1 hour. 1000 kWh equals 1 megawatt-hour (MWh).

Microgrid: A miniature electric grid consisting of DERs that can connect or disconnect to and from the utility grid as necessary. This enables buildings and loads served by the microgrid to operate independently of the utility grid in power outage events if there are sufficient energy resources on the microgrid.

Public Safety Power Shutoff: A new utility protocol enabling utilities to proactively turn off transmission lines in advance of dangerous weather, such as high winds, to protect against forest fires and other natural disasters. This policy could result in blackouts for customers served by these transmission lines.

Reliability: In the context of electricity, the consistency in providing high-quality energy at all times, in terms of both voltage and frequency, as required by applicable regulatory standards.

Regional Energy Network (REN): Partnerships of county and local governments who deliver or coordinate energy efficiency programs, often for hard-to-reach populations. RENs are approved, regulated, and largely funded by the CPUC.

Resilience: In the context of electricity, the ability of an electricity system–whether on a local or utility scale–to maintain reliable service for the purposes of public safety by withstanding disruptions, responding to faults, and recovering rapidly from failures.

Water-energy nexus: The connection between the resources and equipment that deliver water and those that deliver electricity. For example, water is used to create electricity through hydroelectric power; and electricity is used to treat, convey, and create potable water. The resiliency, reliability, and cost of electric resources affect sites in the water distribution system which require substantial amounts of electricity to operate; thus, the price and availability of one resource is inseparably linked to the price and availability of the other resource.

Zero-net-energy (ZNE): Used to describe a building that generates as much or more energy as it uses. Achieving ZNE is primarily focused on reducing energy use and serving the remainder through renewable energy.

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