ATTACHMENT A

Feasibility Study: Community Choice Aggregation for the City of Stockton

Prepared by:

With:

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EBP-US

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This report was prepared by MRW & Associates. MRW has been working on CCA issues since they were authorized by the California State Legislature in 2002. MRW has prepared and critiqued numerous CCA feasibility plans and is providing rate forecasting and other ongoing support to CCAs throughout the state.

The following firms provided specialized expertise:

> ***Tierra Resource Consultants*** prepared Chapter 7. Energy Efficiency, Demand Response, and Distributed Generation Options
>
> ***EBP-US*** prepared Chapter 8. Macroeconomic Impacts

This Study is based on the best information available at the time of its preparation, using publicly available sources for all assumptions to provide an objective assessment regarding the prospects of CCA operation in the City. It is important to keep in mind that the findings and recommendations reflected herein are substantially influenced by current market conditions within the electric utility industry and state regulations, both of which are subject to sudden and significant changes.

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List of Acronyms

AB	Assembly Bill
BNI	Binding Notice of Intent
CAP	Climate Action Plan
CAISO	California Independent System Operator
CalCCA	California Community Choice Association
CAM	Cost Allocation Mechanism
CARB	California Air Resources Board
CCA	Community Choice Aggregator/Aggregation
CCEA	California Choice Energy Authority
CEC	California Energy Commission
COS	Cost to Serve
CPA	Clean Power Alliance
CPE	Central Procurement Entity
CPM	Capacity Procurement Mechanism
CPUC	California Public Utilities Commission
CRR	Congestion Revenue Right
DA	Direct Access
DEG	Distributed Energy Generation
DOE	Department of Energy
DR	Demand Response
ECN	Energy Communications Network
EDI	Electronic Data Interchange
EE	Energy Efficiency
ELCC	Effective Load-Carrying Capacity
ESP	Energy Service Provider
EV	Electric Vehicle
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GIS	Geographic Information System
GTSR	Green Tariff Shared Renewable
GTSR-GR	Green Tariff Shared Renewable - Green Rate
GWh	Gigawatt Hour
IOU	Investor-Owned Utility
IRP	Integrated Resource Plan
JPA	Joint Powers Authority
kWh	Kilowatt Hour
LMP	Locational Marginal Price
LSE	Load Serving Entity
MT	Metric Ton
MW	Megawatt
MWh	Megawatt Hour
NEM	Net Energy Metering

OTC	Once-Through Cooling
PA	Public Advisor
PCIA	Power Charge Indifference Adjustment
PG&E	Pacific Gas & Electric
PPA	Power Purchase Agreement
PV	Photovoltaic
RA	Resource Adequacy
REC	Renewable Energy Credit
RFO	Request for Offer
RFP	Request for Proposal
RMR	Reliability Must-Run
RPS	Renewable Portfolio Standard
SB	Senate Bill
SC	Scheduling Coordinator
PG&E	Southern California Edison
SJCE	San Jose Clean Energy
SVCEA	Silicon Valley Clean Energy Authority
TAC	Transmission Access Charge

Executive Summary

Main Findings

The general conclusions of this study are as follows:

1. The analysis performed here suggests that a Community Choice Aggregation (CCA) program is financially feasible for Stockton. That is, the CCA would likely be able to offer Stockton residents and businesses power that is priced at or a few percent lower than that offered by Pacific Gas & Electric (PG&E).

2. While feasible, CCA formation is not without risks. The CCA would be participating in a competitive power market and subject to evolving state requirements and regulation. This could combine to result in some, likely isolated, years where the CCA might not be able to beat PG&E's rates.

3. Simply forming a CCA does not guarantee greenhouse gas (GHG) savings. Achieving GHG reductions requires the CCA to do more than just meet the state renewable requirements; it requires the CCA to either acquire energy from large hydroelectric facilities (which are carbon-free but do not qualify as "renewable" under State law) or increase the renewable content of its electricity supply beyond that required by the State.

4. A CCA would be well-positioned to provide additional energy services to its businesses and residents. Our analysis suggests there is significant untapped potential for increased energy efficiency in the City, which the CCA could help realize through new state-funded programs administered by the CCA. Additionally, the CCA would be in a position to advance Stockton's contribution to meeting the State's vehicle and building electrification goals.

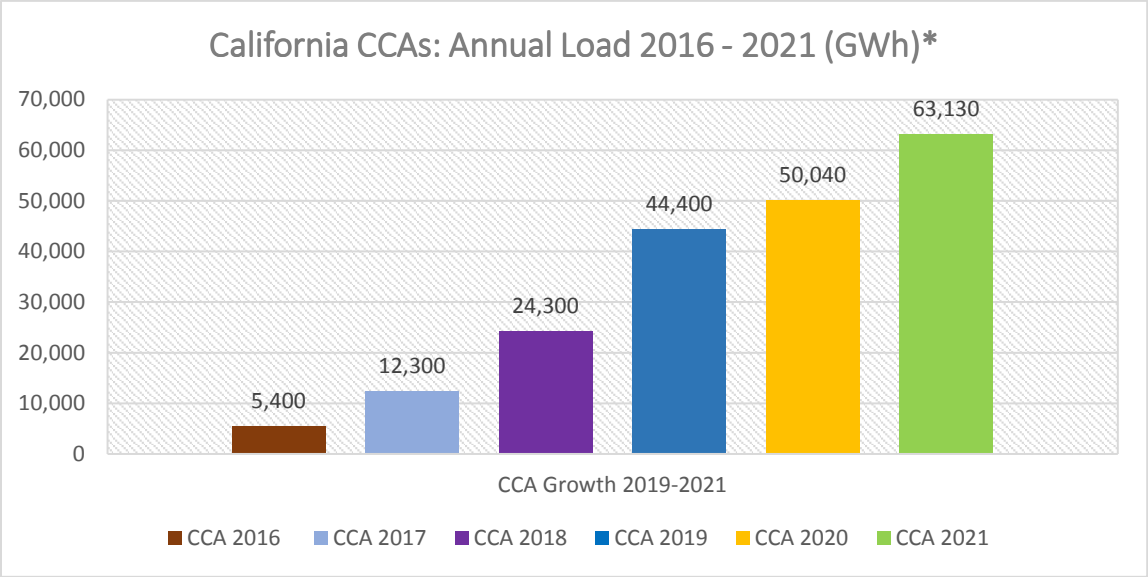
5. A Stockton CCA can provide economic and employment benefits to the region. This would occur from lower rates, local solar or other renewable development, and the implementation of energy efficiency programs. Our analysis finds that the CCA could create and induce over 300 jobs in the Stockton area and add over $30 million to the area's economy.

CCA Background

California Assembly Bill 117, passed in 2002, established Community Choice Aggregation in California, for the purpose of providing the opportunity for local governments or special jurisdictions to procure and provide electric power for their residents and businesses. Under existing rules administered by the California Public Utilities Commission (CPUC) an investor-owned utility (IOU), such as Pacific Gas and Electric (PG&E), must use its transmission and distribution system to deliver the electricity supplied by a CCA in a non-discriminatory manner. That is, it must provide these electricity delivery services at the same price and at the same level of reliability to customers supplied by a CCA as it does for its own full-service customers.

CCAs are now quite common in California. There are currently 23 CCAs providing power in the State, with at least another half-dozen planning on doing so in the next two years. As shown in Figure ES-1, CCAs are expected to serve over 63 gigawatt-hours (GWhs) by the end of 2021 (25% of California's total electricity load), with some projecting that by the mid-2020s between 50 to 80 percent of the load in the three main IOU service territories will be served by non-utility entities (CCAs and Direct Access providers).

Figure ES-1. California CCA Load Growth



*Source: Cal-CCA. Values for 2020 and 2021 are estimates.

Stockton's Electric Loads

Table ES-1 shows that the City's total annual electric load is about 1,980 GWh. This load is spread across almost 111,000 accounts.

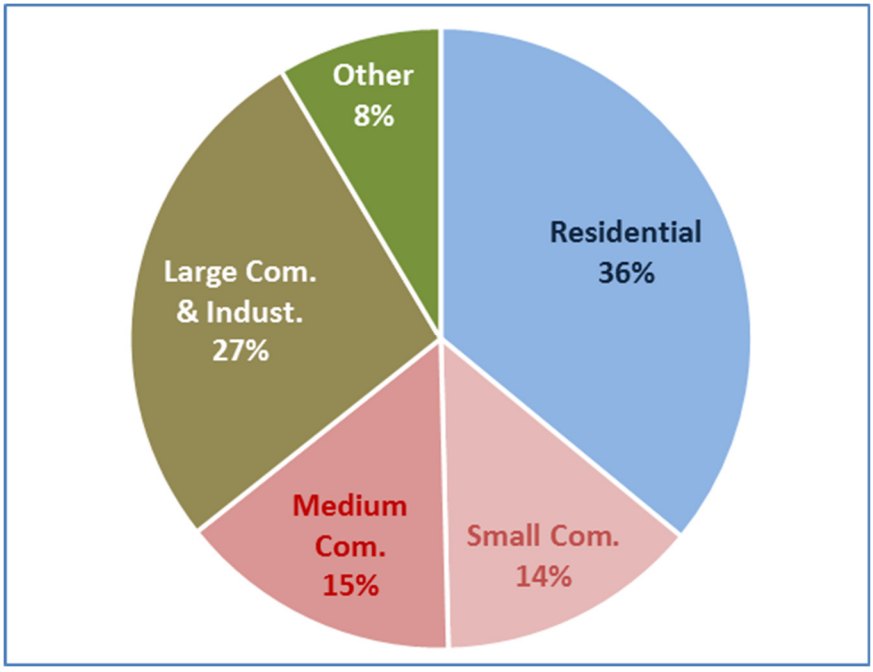
Table ES-1. Potential Stockton CCA Customers and Associated Load

	Customers	Annual Load (MWh)
Residential	95,910	676,464
Small Commercial	1,413	256,687
Medium Commercial	546	276,810
Large Commercial & Industrial	28	509,970
Other*	8,381	160,828
Total	**106,279**	**1,880,759**

*e.g., streetlights, traffic control, agriculture/pumping.

As shown above and in Figure ES-2 below, the residential load is only slightly higher than that of large commercial and industrial customers, with each making up about a third of the total. This is unusual; most other CCAs have only modest large commercial and industrial loads.

Figure ES-2. Stockton Load Distribution



CCA Power Supply and Load Scenarios

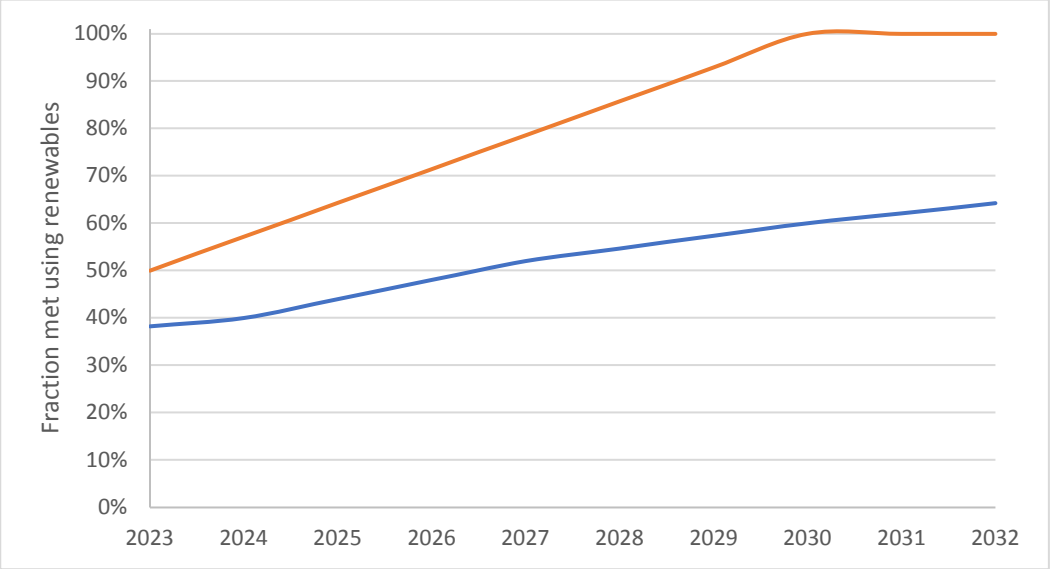
Two hypothetical power supply scenarios were developed for this analysis:

Supply Scenario 1, in which the CCA is assumed to meet, but not exceed California's Renewable Portfolio Standard (RPS) requirements and adds other non-GHG emitting resources so that the CCA's GHG emission rate is no greater than PG&E's.

Supply Scenario 2 assumes that the CCA goes beyond the State-mandated RPS requirements and utilizes increasingly greater amounts of renewable power. Specifically, Supply Scenario 2 assumes that the CCA will start at 50% renewable content in 2023 and achieve net 100% renewable supply by 2030.

Both scenarios assume that half of the new renewable generation projects that the CCA creates are located in the Stockton region.

Figure ES-3. Supply Scenario Renewable Content



Financial Results

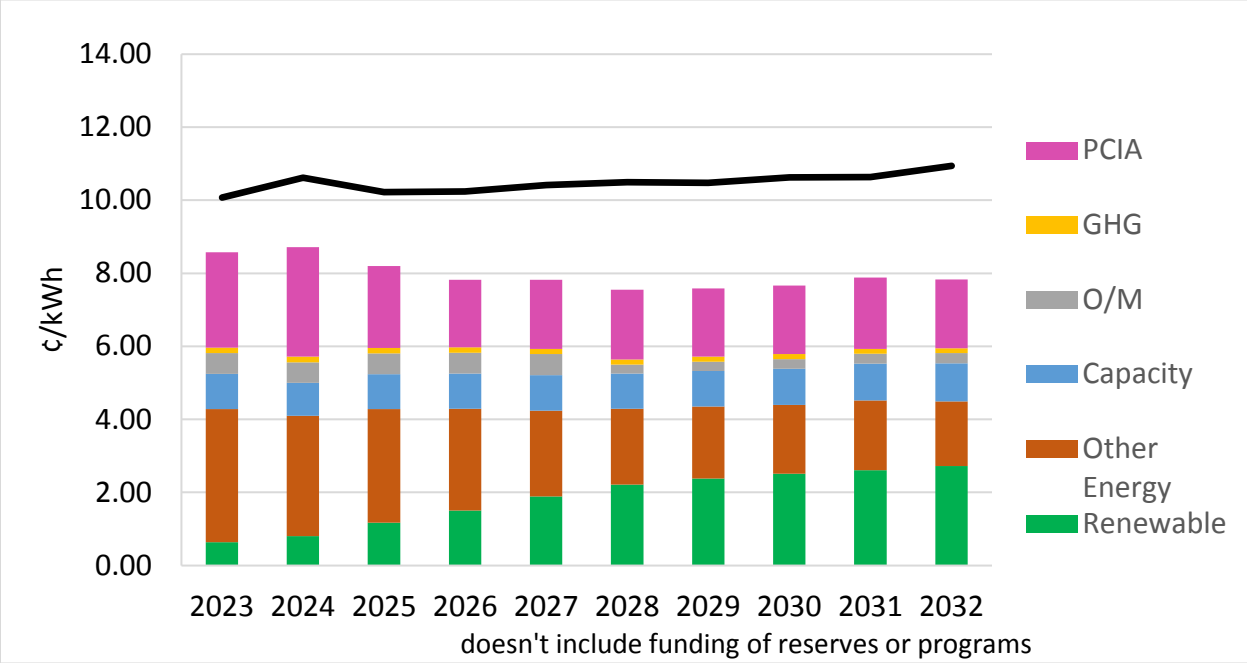
Figure ES-4 shows the forecast of average CCA costs and PG&E's generation rates assuming CCA Supply Scenario 1. The bars in the chart show the forecasts of the major cost components of CCA operation, while the single line shows the forecast of PG&E's generation rate. When the bars are below the black line, the CCA's average operating costs will be below the PG&E generation rate; meaning that it can offer power to customers at a rate lower than or competitive with PG&E, be able to fund energy-related program, or both. As is clearly seen in the figure, the average cost of power provided by the CCA is consistently below the PG&E generation rate.

The bottom-most green segment represents the cost of renewable power to the CCA. The brown segment is for the costs of non-renewable, wholesale market power. This segment slowly decreases, as renewable power increases. The light blue segment is for capacity. That is, by State law the CCA must demonstrate that it has the generating capacity (in megawatts) to ensure that it can serve all its load. The gray segment is for debt service, operations, franchise fees and uncollectibles. The yellow segment is for carbon cap and trade allowances. Note that for practical purposes, the cost of carbon cap-and-trade allowances would be built into the purchase price of natural gas-fired market resources. However, because it is an important variable on its own, the costs are shown separately.

The top-most pink segment is for the Power Charge Indifference Adjustment (PCIA), a fee paid to PG&E to ensure that the operation of the CCA does not strand PG&E's remaining bundled customers with costs associated with power purchased on behalf of customers who have shifted to the CCA.

The black line represents PG&E's average generation rate. To forecast PG&E's generation rates, the comparison model used information regarding PG&E's utility-owned generation, power contracts, power market costs, and by closely tracking changes in PG&E revenues and costs through its filings in several CPUC proceedings. In particular, it takes the most recent PG&E filing of generation rates and applies the known and anticipated changes to the wholesale power market prices and PG&E's power purchase contracts.

Figure ES-4. Supply Scenario 1 Average CCA Cost Projection versus PG&E Generation Rate



Sensitivity Analysis

The results shown in the scenarios above reflect expected market conditions and outcomes with variations only in the amount and type of renewable generation. However, it is unlikely that the conditions assumed in these scenarios will occur exactly as assumed. In order to evaluate the robustness of the analysis, the key variables were identified, and analyses conducted with other assumptions for those key variables to "stress test" the assumptions. The five variables with the greatest potential impact on the overall average cost of the CCA were investigated:

(1) Higher Renewable Supply Costs
(2) Higher Wholesale Market Prices
(3) Higher PCIA
(4) Lower PG&E Rates
(5) High Opt-Out

Other than the variable being tested, all other assumptions are from Scenario 1.

Table ES-3 shows the average margin between PG&E's generation rate and the average CCA cost. (These margins do not include contributions to the CCA's rate reserves or any programmatic funding.) As the table shows, none of the cases caused the margins to be negative (i.e., CCA average costs greater than PG&E's rates). The case with the greatest impact on the rate margin is when PG&E's rates are 10% lower than what is in the base forecast, which consistently reduces the margin between the CCA and PG&E by 1¢/kWh.

Table ES-3. Sensitivity Cases Implications

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh*		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
High Renewable Prices	1.4	1.9	2.3
Higher Wholesale Prices	1.2	2.0	2.6
Higher PCIA Rates	0.9	1.6	2.1
Low PG&E Generation Rates	0.5	1.0	1.5
High Opt-Out	1.5	2.0	2.5
*Margins do not include rate savings, contribution to reserves or program funding.			

Risks and Risk Management

The primary risk faced by a CCA is that it cannot provide power to its residents and businesses at a competitive price. (Many of the factors that can impact the CCA's price position are explored in the sensitivity analysis). This risk is caused not only by changes to the power market but also changing regulatory requirements that impact not only the CCA but also PG&E. The primary way that a CCA can address these risks is to use sound power procurement and risk management practices. While complex, these practices are well known.

The risk to the City's general fund is minimal. A stand-alone Stockton CCA would be organized as an independent enterprise, with its assets and liabilities separate from that of the City. The primary financial risk to the City itself would occur in the first few years, where it would have to provide a ~$1 million short-term loan to the CCA enterprise and provide collateral and a guarantee to the bank or other financial institution that provides the start-up capital to the CCA.

Distributed Energy Resources Potential

Distributed Energy Resources (DERs) are programs and activities that a CCA can provide besides retail electricity. These include:

- energy efficiency
- demand response - short-term changes in customer electricity usage during the very highest demand periods
- distributed generation – small scale generation such as rooftop solar
- distributed energy storage – often batteries that are combined with rooftop solar
- increasing electrification of buildings and transportation

There are many opportunities for DER support in Stockton. Of particular note is energy efficiency. Compared to the rest of the state, Stockton lags in investments in energy efficiency, particularly in lower-income homes. The CCA would be well-positioned to address this shortfall by providing locally targeted programs to improve the efficiency of these homes and save the residents money.

Macroeconomic and Job Impacts

Establishing a Stockton CCA can potentially result in economic and employment benefits to the City and the region by offering lower rates, directly creating jobs, and causing local renewable energy and other projects to be built. The impacts are the result of five factors:

1) CCA administration and operation spending
2) Net energy bill savings
3) Development and operation of new renewable generation
4) Energy efficiency spending
5) Resulting indirect and induced effects.

The first four effects can directly contribute to local business activity that leads to increased purchases from their suppliers of materials and services (referred to as "indirect effects"). It will also lead to re-spending of the additional worker wages on consumer purchases in the community (referred to as "induced effects"). The growth of any electricity generation or supplier purchases in adjacent areas can also have induced spillover effects as their workers spend additional money in Stockton.

Overall, our analysis suggests that the CCA program could generate over 300 jobs in the Stockton area and contribute over $30 million to the area's economy. Most of those benefits arise indirectly from the assumed rate savings, while assumed local solar construction and energy efficiency spending can directly generate jobs.

Governance and Implementation Options

If it is to pursue CCA, Stockton will have to decide between two primary governance options for the CCA: 1) establishing a city-only CCA or 2) joining an existing Joint Powers Authority (JPA) such as East Bay Community Energy (EBCE) or 3) partnering with other nearby communities to form a new JPA.

In a city-only approach, the City maintains full flexibility—and responsibility—for developing policies and procedures. This means that they can be tailored to and responsive to the City's

stakeholders and constituents and based upon the City's own objectives. The City would be responsible for setting policy priorities in general and making specific decisions about power generation, staffing policies, local economic development activities and strategies, and the formulation of financial and debt policies. Along with greater autonomy, the City would assume all risk, liability and costs associated with operating the CCA. In this case, the likely path would be for the City to establish the CCA as an enterprise fund, and work with appropriate legal counsel to explore options for controls and structural safeguards to insulate it and minimize risk to the City's general fund.

If the city of Stockton decides to join or form a JPA with other jurisdictions, the CCA may be able to leverage scale efficiencies that are created by pooling JPA member resources and authority. A JPA-based CCA can also reduce the risks to the City by further separating its finances from that of the City (and other members). However, the key tradeoffs to the benefits of a JPA are that decision making is allocated amongst the parties and management independence is diminished. This could result in the goals and priorities of the city of Stockton being altered or sidelined for the sake of organizational agreement and harmony.

Chapter 1. Introduction

What is a CCA?

California Assembly Bill 117, passed in 2002, established Community Choice Aggregation in California, for the purpose of providing the opportunity for local governments or special jurisdictions to procure and provide electric power for their residents and businesses.

Under existing rules administered by the California Public Utilities Commission, an investor-owned utility (IOU) must use its transmission and distribution system to deliver the electricity supplied by a CCA in a non-discriminatory manner. That is, it must provide these delivery services at the same price and at the same level of reliability to customers supplied by a CCA as it does for its own full-service customers. By state law, an IOU also must provide all metering and billing services, its customers receiving a single electric bill each month from the IOU, which would differentiate the charges for generation services provided by the CCA as well as charges for IOU delivery services. Money collected by the IOU on behalf of the CCA must be remitted in a timely fashion (e.g., within 3 business days).

As a power provider, the CCA must abide by the rules and regulations placed on it by the state and its regulating agencies, such as maintaining demonstrably reliable supplies and fully cooperating with the State's power grid operator. However, the State has no rate-setting authority over the CCA; the CCA may set rates as it sees fit so as to best serve its constituent customers.

Per California law, when a CCA is formed all the electric customers within its boundaries will be placed, by default, onto CCA service. However, customers retain the right to return to PG&E service at will, subject to whatever administrative fees the CCA may choose to impose—typically $5 for a residential customer and $25 for a non-residential customer.

Possible Stockton CCA Objectives

The feasibility of a CCA program is a function of that program's ability to meet the sponsoring city's or JPA's goals and objectives. This section lays out the typical CCA goals and objectives and how they might apply to Stockton.

Rate Competitiveness and Financial Stability

A City of Stockton CCA would expect to offer rates that are competitive with those offered by the incumbent electric utility, Pacific Gas and Electric (PG&E). If they could not, it is not reasonable to assume that a CCA would be formed. "Competitive" here means that the CCA, over the long run, could offer rates that are equal to or less than those offered by PG&E. It does not mean that in each and every year a specific rate savings is offered. In fact, some early CCAs have had to offer rates slightly higher than those offered by their host utilities during one or more of their first few years. (We note that they did not experience significant opt-outs because of this).

In addition, the CCA would be committed to providing equitable treatment of all classes of customers without undue discrimination in setting rates. At the same time, the rates would have to generate sufficient revenue to the CCA, so all liabilities are covered in a manner consistent with an investment-grade entity. The CCA should not move forward unless there is confidence that both rate competitiveness and financial stability can be achieved.

The CCA would also intend to offer long-term rate stability to its customers as well as maintain its own financial condition. This could be accomplished through conservative phasing in of customers and projects; establishing and maintaining appropriate lines of credit and financial reserves; and contracting with only experienced and financially solid providers of goods and services.

CCA and PG&E Rates

A CCA provides only generation services: the actual power that CCA customers use. The incumbent utility, PG&E, would still deliver the power to the home or business, even though the CCA is providing the power.

Therefore, the CCA customer would still pay the PG&E delivery rates, but instead of paying PG&E's generation rates, they would pay the CCA's generation rates. CCA customers also pay an additional fee so that the remaining PG&E customers are not harmed by the CCA (the "PCIA" charge).

Because a customer pays the same delivery rates no matter who provides their power, the rate comparisons here focus on the CCA rate (plus the PCIA charge) versus PG&E's generation rate.

Contribute to Climate Action Plan Objectives

The City of Stockton adopted a Climate Action Plan (CAP) in August 2014 that, among other things, provides a guide to the city to address its greenhouse gas (GHG) emissions. The City is currently considering the adoption of a revised CAP in the future. As discussed later, a CCA, if is it financially able and so chooses, can contribute to the City meeting its CAP objectives.

It must be noted that California is also moving toward a similar carbon-free electricity policy. Senate Bill 100, which was signed into law by Governor Brown on September 17, 2018, increases the renewable power content requirement of all retail power providers, including utilities and CCAs, from 50% to 60% by 2030. The bill also says, "that it is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers by December 31, 2045," and that all state agencies regulating electricity build this goal into their planning. This effectively means that the difference between the electricity carbon content of the CCA following the City's CAP and remaining with status quo utility service may not be significant.

Additional Objectives

While maintaining rate competitiveness, financial stability, and contributing to the City's CAP are non-negotiable objectives, a CCA can also serve as a vehicle to pursue other objectives that

benefit the City, its residents, and businesses. Examples of additional objectives could include the following:

Economic development. A CCA can potentially contribute to local economic development in two ways. First, if the CCA offers reduced electricity rates, additional dollars can flow into the local economy as households and businesses spend their incomes on items and services other than electricity. Second, the CCA can offer programs that allow households and businesses to reduce their power consumption, such as energy efficiency and distributed energy resources.

Local jobs and employment. Beyond the potential jobs that could result from the economic stimulus of possibly lower rates, the CCA can more directly incent and support local job creation. This includes employing residents in CCA administration, using local contractors for energy efficiency programs and distributed energy generation (e.g., rooftop solar installers and maintainers). The CCA can also partner with local community colleges and/or trades apprenticeship programs to support quality local job opportunities.

Prioritization of renewable power development. Beyond support of locally sited distributed energy generation ("DEG," e.g., rooftop solar), a CCA may prioritize siting larger, grid connected DEG and utility-scale renewable project locally.

Local citizen input and participation. A primary purpose of a CCA is to better reflect its community's interests and values than an investor-owned utility like PG&E can. This is illustrated in the CCA's objective of supporting the City's CAP. However, it can go beyond this; the CCA can commit to providing opportunities for citizens to provide input into its programs and policies, such as having a citizens' advisory board or having a non-voting at-large community seat on the CCA's board of directors.

Assessing CCA Feasibility

In order to assess whether a CCA is "feasible" in Stockton, the local objectives must be laid out and understood. Based on the specifications of the initial request for proposals and input from the City, this study:

- Quantifies the electric loads that an Stockton CCA would have to serve;
- Compares the rates that could be offered by the CCA to PG&E's rates;
- Analyzes various renewable energy supply scenarios and achieving California RPS compliance;
- Determines the GHG emissions impacts of a CCA;
- Calculates the macroeconomic development and employment benefits of CCA formation;
- Evaluates the sensitivity of rates to different variables and drivers;
- Analyzes the potential costs and revenues of the CCA program;
- Provides a 10-year pro forma report featuring different supply scenarios, sensitivity assumptions, and customer phase-in approaches;
- Compares the benefits and risks of forming a city-only CCA or joining a neighboring CCA versus remaining on PG&E bundled service;

- Discusses, and where possible, quantifies the risks to the City and its residents and businesses of CCA formation; and
- Discusses potential governance models for the CCA.

Reaching CCA Objectives

Financial

As noted above, a City of Stockton CCA would expect to offer rates that are competitive with those offered by PG&E. At the same time, the rates would have to generate sufficient revenue for the CCA so all liabilities are covered in a matter consistent with an investment-grade entity. The CCA would not move forward unless there is confidence that both rate competitiveness and financial stability can be achieved.

The CCA would also intend to offer long-term rate stability to its customers as well as maintain its own financial condition. This will be accomplished through conservative phasing in of customers and projects; establishing and maintaining appropriate lines of credit and financial reserves; and contracting with only experienced and financially solid providers of goods and services.

We assume that a Stockton CCA would be a financially independent enterprise with no funds or debts comingling with the City General Fund. It will establish reserve funds commensurate with the working capital, operating reserves, and contingency requirements of the enterprise. To do so, the CCA would have to develop a rate design that recovers sufficient revenue to adequately fund these reserves in the intermediate term. As a part of the City of Stockton, the CCA will be able to utilize the expertise and systems of the City to reduce overhead costs.

Climate Change Mitigation

As noted above, the City adopted a Climate Action Plan (CAP) in 2014. According to the CAP, the mission of the plan is to create a feasible strategy to reduce community-generated GHG that is consistent with statewide GHG efforts.[1]

The GHG emissions goal laid out in the CAP would see the City of Stockton reduce total emissions to between 2,102,000 and 2,108,000 MT CO2e by 2020, with an estimated reduction of 565,000 to 571,000 MT CO2e.[2] To achieve this reduction, a number of voluntary, performance-based, and mandatory reduction measures would be utilized. These reduction measures include programs for building energy efficiency, increasing transit and non-vehicular travel, increased renewable energy utilization, water consumption reduction, and waste reduction. The CAP was implemented in three phases: 1) development of reduction measures and plan framework (2014-2015), 2) mid-course evaluation of CAP implementation, with further reduction measures to be implemented if needed (2016-2017), and 3) continued

[1] ICF, *City of Stockton Climate Action Plan*, August 2014.
[2] Ibid.

implementation and support of measures from Phases 1 and 2, with encouraged implementation of remaining CAP measures (2018-2019). [3]

To the extent that the carbon content of the power provided by the CCA is lower than that provided by PG&E, the CCA can help the City of Stockton continue to contribute to the goals set by the CAP and any future emission objectives set forth by future CAP revisions.

Renewables – what does it mean to be 100% Green?

Most CCAs offer rate options to customers that are "100% Green;" that is, the power consumed by customers on these rates is fully provided by qualifying renewable resources. Other CCAs have a goal of being 100% Green by a certain date (e.g., the newly formed San Diego Regional Community Choice Energy Authority intends to be fully green by 2035). The ability of a CCA or a customer to rely fully on renewable power is accurate within the framework of power procurement, but not necessarily transparent to the lay audience.

When a CCA is sourced fully by renewable power, it does not mean that for each hour of the day, 100% of the power injected into the California power grid by the CCA (that is, by the renewable generators owned or under contract to the CCA) will be renewable. There will be hours of the day where the CCA's solar resources will be generating more electricity than the CCA's customers are consuming. This power is sold into the CAISO's wholesale market. There will also be hours of the day when the CCA's load is greater that their renewable resources' output, at which point they purchase power from the CAISO wholesale market. Currently, to be 100% renewable, the CCA's renewable resources generate as much power as the CCA's customers consume, albeit not necessarily at the same time. This is analogous to the "net-zero" energy home, where, over the course of a year, the solar panels on the house generate in total as much (or more) power than the house uses, but with some hours having the solar panels inject power into the grid while in others it takes power from the grid.

In the longer run, in the late 2020s and beyond, the "balancing" function of the non-renewable generators in the wholesale market will likely be replaced in part with energy storage systems, such as pumped hydroelectric or batteries. At the point when fossil resources are not needed, one can say that the CCA—and the California Grid—is 100% renewable/carbon free.

How are CCAs financially competitive with the utilities?

All active CCAs in California currently offer rates that are at or lower than their incumbent utility, be it PG&E, Southern California Edison (SCE) or San Diego Gas & Electric (SDG&E). CCAs' ability to do this, even with the exit fees (PCIA), is attributable to three factors. First, the CCAs serving coastal areas do not have to serve as much air conditioning load as their incumbent utilities as a whole. (PG&E also serves the majority of the Central Valley and other warmer areas of Northern California, while coastal CCAs do not.) Because air conditioning

[3] Ibid.

loads often occur at the times of the day with the highest priced wholesale power, they are more costly to serve.

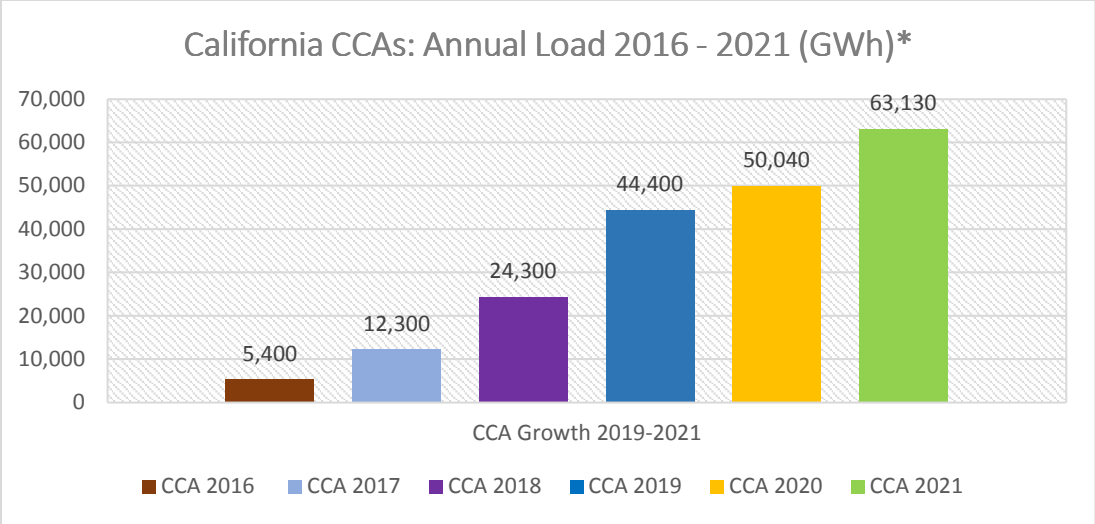
Second, all CCAs are taking advantage of the fact that the incumbent utilities have in their portfolios some relatively expensive, generally renewable, power purchase contracts. This raises the utilities' rates, but also begs the question of what happens when those contracts expire. Two things happen. First, the Power Change Indifference Amount (PCIA) fee is reduced because it is the mechanism to capture the above-market costs of these expensive power contracts and pass them on to customers who were on utility service when the contracts were signed. Second, at worst, the utility will be participating equally in the same wholesale power and renewable markets as the CCA.

Third, the incumbent utilities are still under the jurisdiction of the California Public Utilities Commission (CPUC). This means that each and every power purchase contract the utility enters into goes through a cumbersome vetting process and must be approved by the full CPUC. Furthermore, the utilities must often comply with non-economic directives from the CPUC, which is why they have the expensive contracts in their portfolio in the first place. CCA procurement is not so tightly bound by the state; they can be nimbler in responding to market movement and have much greater control over their purchasing, hedging, and risk management than the incumbent utilities. It is these latter points that give the existing CCAs confidence that they will be able to compete even after the higher-priced contracts in the incumbent utilities' portfolios expire.

Status of CCAs in California

Even though the enabling legislation was enacted in 2002, the first CCA to provide power, Marin Clean Energy (MCE), did not enroll customers until 2010. For the next five years, others investigated CCA formation, with a few early adopters stepping up in 2014 through 2016. As shown in Figure 1, once these early adopters showed that CCAs could work, the flood gates opened in 2017. By the end of 2021, CCAs are expected to serve over 63 GWhs (25% of the State), with some projecting that by the mid-2020s between 50 to 80 percent of the load in the three main IOU service territories will be served by non-utility entities (CCAs and Direct Access providers).

Figure 1. California CCA Load Growth



* Source: Cal-CCA. Values for 2020 and 2021 are estimates.

Table 2 lists the active CCAs in California, including those that have announced intended launches in 2021, along with their location and governance structure. As the table shows, most of the current CCAs are in PG&E's service area, but the growth in 2020 came from new CCAs in SCE's territory. Currently, there is only one small CCA in SDG&E's territory, Solana Energy Alliance, but two large JPAs in the San Diego region are intending to begin service in 2021.

The table also shows that the majority of CCAs are organized as joint powers authorities (JPAs). There are also many smaller cities in SCE's area that use the "JPA Light" model, in which the CCA is technically a city enterprise that relies upon the California Choice Energy Authority (CCEA) to provide the technical operations. There are also three stand-alone city CCA enterprises, King City, San Francisco, and San Jose.

Table 2. CCAs in California

CCA	IOU	Type	Formed	Load, GWh[4]
CCAs delivering power in California				
Clean Power San Francisco	PG&E	City	May 2016	3,135
East Bay Community Energy	PG&E	JPA	Jan.2018	6,200
Marin Clean Energy	PG&E	JPA	May 2010	5,275
Central Coast Community Energy (formerly Monterey Bay Community Power)	PG&E	JPA	March 2018	3,202

[4] 2019 Load (GWh) reported by CalCCA: https://cal-cca.org/cca-impact/

CCA	IOU	Type	Formed	Load, GWh[4]
Peninsula Clean Energy	PG&E	JPA	Oct. 2016	3,600
Pioneer Community Energy	PG&E	JPA	2018	NA
Redwood Coast Energy Authority	PG&E	JPA	May 2017	699
San Jose Clean Energy	PG&E	City	Sept. 2018	3,286
Silicon Valley Clean Energy	PG&E	JPA	April 2017	3,898
Sonoma Clean Power	PG&E	JPA	May 2014	2,502
Valley Clean Energy Alliance	PG&E	JPA	Dec. 2016	682
King City Community Power	PG&E	City	July 2018	35
Clean Power Alliance	SCE	JPA	Feb. 2018	10,295
Apple Valley Choice Energy	SCE	City; CCEA	April 2017	260
Lancaster Choice Energy	SCE	City; CCEA	May 2015	600
Pico Rivera Innovative Muni'l Energy	SCE	City; CCEA	Sept. 2017	220
Rancho Mirage Energy Authority	SCE	City; CCEA	May 2018	300
San Jacinto Power	SCE	City; CCEA	April 2018	170
Desert Community Energy	SCE	JPA	April 2020	640
Western Community Energy	SCE	JPA	April 2020	1,285
Baldwin Park	SCE	City; CCEA	Oct. 2020	255
Pomona	SCE	City; CCEA	Oct. 2020	655
Solana Energy Alliance	SDG&E	City	June 2018	37
Planned Launch				
Palmdale	SCE	City; CCEA	2021	655
Hanford	PG&E	City; CCEA	2021	285
Commerce	SCE	City; CCEA	2021	460
Drafted ordinances for implementation as soon as 2021				
San Diego Regional CCE Authority	SDG&E	JPA	2021	6,800
North SD County CCA	SDG&E	JPA	2021	2,750

CCA	IOU	Type	Formed	Load, GWh[4]
Butte County	PG&E	JPA	2021	1,080

Figure 2. California Active CCA Loads (Annual GWhs)

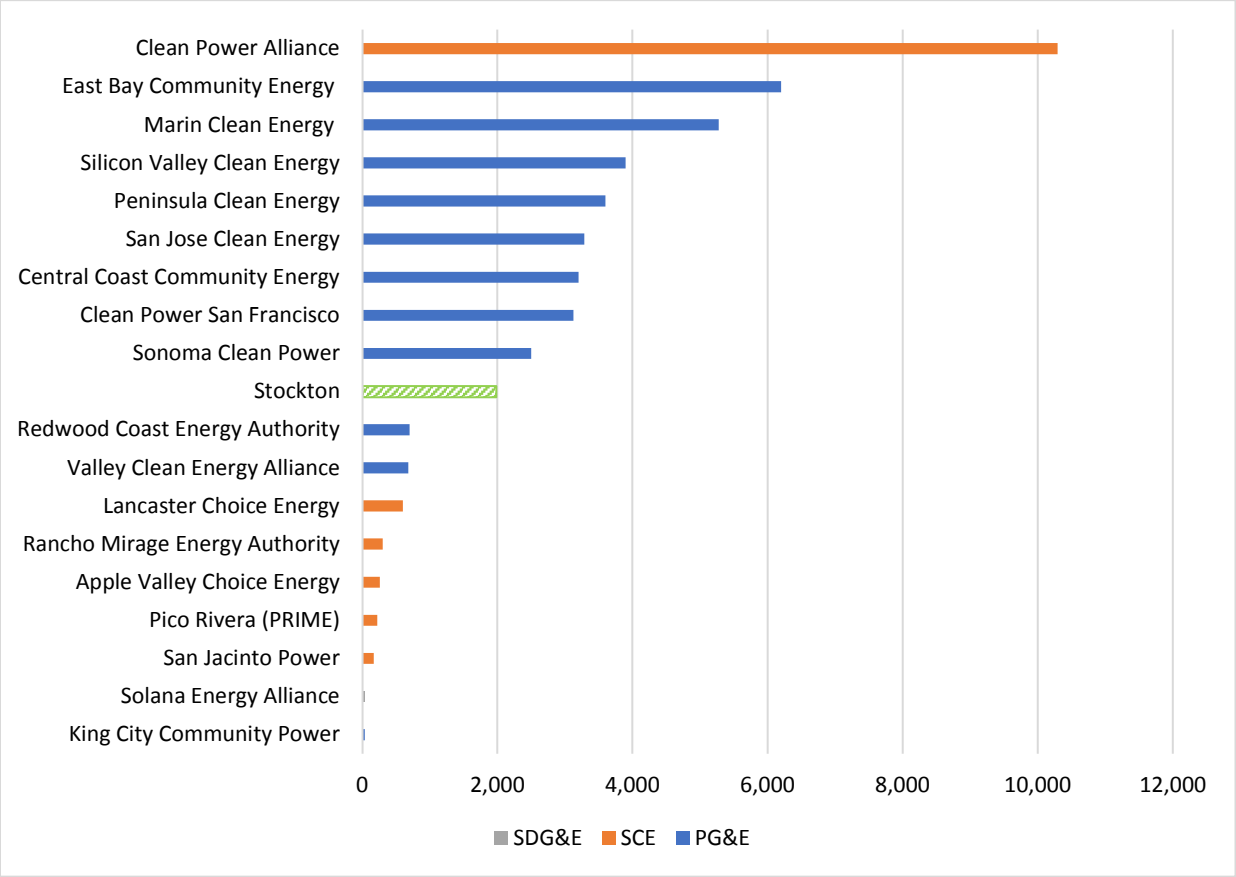


Figure 2 shows the 2019 annual loads of several active California CCAs. Three observations can be made from this figure. First, Clean Power Alliance (CPA), the CCA that serves Los Angeles and Ventura counties along with selected communities therein, is the largest CCA in California by load—nearly twice the size of the second largest CCA, East Bay Community Energy. Second, were Stockton to form its own CCA, it would be moderately sized (see green bar in Figure 2) relative to all the other CCAs, indicating that economies of scale would have been reached. Third, a Stockton CCA would be the ninth largest in the PG&E territory.

CCA Evolution

Over the first years of operation, many California CCAs have been evolving from a simple commodity procurement entity—providing power, albeit greener, at a competitive rate. After a year or two (or more), many CCAs have expanded into providing targeted and specialized

customer programs that while customized for their communities, are variations of services provided by their host IOU or are generally proven in the industry. Examples of this include CCAs like MCE, which has exercised its right to apply for energy efficiency program funding from the CPUC.[5] To do so, it must file various plans explicitly detailing what they intend to do in the EE program along with reporting requirements and protocols to verify that the energy savings that is projected will occur. If approved, the CCA receives money that is collected in IOU rates through the Public Purpose Program (PPP) rate element. Another example of this second phase of CCA evolution is offering rooftop solar programs and feed-in-tariffs (FiTs) for local renewable generation projects that connect "in front of" the customer meter. A third example is installing additional electric vehicle (EV) charging stations and encouraging EV purchasing and leasing.

The third phase in evolution observed with California CCAs is the movement into innovative and less common power-related programs and services. These are programs that are not common in California or elsewhere and may be more in the "demonstration" part of the program/technology lifecycle. Examples of these programs include Sonoma Clean Power's efforts to electrify the areas that were destroyed in wildfires (i.e., work with PG&E to perhaps not provide gas service to these areas) or the microgrid programs being pursued by Redwood Coast Energy Authority and Monterey Bay Community Power (now known as Central Coast Community Energy).

Table 3, below, shows a range of the programs being pursued by some California CCAs.

These non-commodity program offerings are becoming the focus of CCAs in the state. At the Business of Local Energy Symposium, a large CCA-oriented conference held in June 2019 in Irvine, CA, the speakers, panels, and presentations overwhelmingly focused on innovation that CCAs can do and are doing.[6] None addressed power procurement or cost competitiveness.

[5] Note that customers taking commodity service from a CCA are still eligible to participate in EE programs administered by their host IOU, regardless of whether or not the CCA is administering their own PPP-funded EE programs or not.
[6] https://theclimatecenter.org/the-business-of-local-energy-symposium-2019-presentations/

Table 3. Sample California CCA Program Offerings[7]

CALCCA ADVANCING LOCAL ENERGY CHOICE	Apple Valley Choice Energy	Central Coast Community Energy	Clean Power Alliance	CleanPowerSF	East Bay Community Energy	King City Community Power	Lancaster Choice Energy	MCE	Peninsula Clean Energy	Pioneer	PRIME	Rancho Mirage Energy Authority	Redwood Coast Energy Authority	San Jacinto Power	San Jose Clean Energy	Silicon Valley Clean Energy	Solana Energy Alliance	Sonoma Clean Power	Valley Clean Energy
Budget Billing				In dev.			✓												
Battery Storage Rate				In dev.	✓ (pilot)			✓								✓ (Same as PG&E)		In dev.	
Battery Storage Incentives								✓								In dev.		✓	
Demand Response		✓	✓	✓				In dev.	In dev.							In dev.		✓	✓
EV Rate		✓	✓	✓	✓ (Same as PG&E)		✓	✓	✓	✓ (Same as PG&E)	✓		✓		✓ (Same as PG&E)	✓ (Same as PG&E)	✓	✓	✓ (Same as PG&E)
EV Bus Program		✓		✓			✓		✓									✓	
EV Incentives (vehicles and/or charging)		✓					✓	✓	✓				✓		In dev.	✓		✓	In dev.
EV Load Shifting								✓								✓ (pilot)		✓	
Energy Efficiency				In dev.			✓	✓		In dev.			✓			In dev.		✓	✓
Energy Efficiency Data Sharing					✓														
Feed-In Tariff		In dev.		In dev.				✓					✓					✓	
Building Electrification		✓			In dev.			✓	In dev.				✓			✓		✓	In dev.
Low-Income & Multifamily EE		✓						✓	In dev.		✓		✓						
Solar Incentives												✓	✓						
On-Bill Repayment				In dev.				✓										In dev.	
Education, Outreach, and/or Innovation Grants			✓		✓				✓	In dev.						✓		✓	
Low-Income Solar Incentives		✓	In dev.	✓	✓	✓		✓	In dev.		✓								
Customer Load Shifting			✓	✓				✓								In dev.		✓	
Microgrid Development		✓					✓			In dev.			✓						
Citizen Sourcing			✓				✓						✓						
Energy Education in Local Schools				In dev.					✓						✓			✓	
Dividend Program		✓																	✓
Solar Referral Service			✓													✓			
Solar+Storage Offerings			In dev.		✓			✓	✓		In dev.		✓			✓		✓	
Advancing Reach Codes		✓			✓				✓							✓		✓	
Advanced Energy Rebuild								✓										✓	
TOU Rates				✓	✓ (Same as PG&E)		✓	✓		✓ (Same as PG&E)			✓		✓ (Same as PG&E)	✓ (Same as PG&E)	✓	✓ (Same as PG&E)	✓ (Same as PG&E)
Customer C&I Clean Power Offerings																✓			
Workforce Education & Training								✓								✓		✓	
Emissions Inventory Support for Member Agencies		✓														✓			
Property Assessed Clean Energy (PACE)										✓									

[7] https://cal-cca.org/cca-programs/

Chapter 2. Financial Study Methodology and Key Inputs

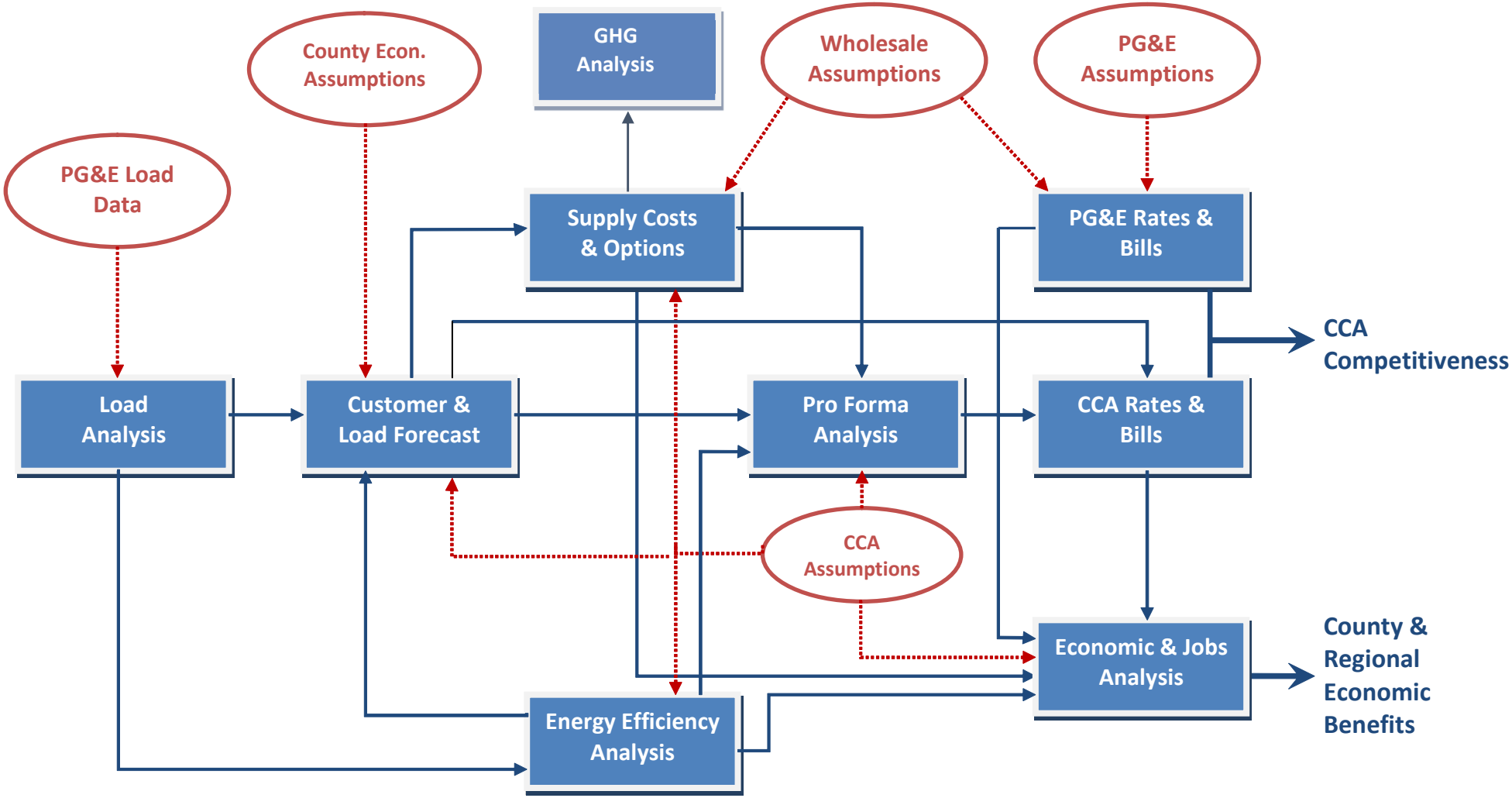
This chapter summarizes the key inputs and methodologies used to evaluate the cost-effectiveness and cost-competitiveness of a Stockton CCA relative to PG&E under different scenarios. It considers the regulatory requirements that a Stockton CCA would need to meet (e.g., compliance with renewable portfolio standard (RPS) requirements), the resources that the City has available or could obtain to meet these requirements, and the PG&E rates against which the CCA would compete. It also describes the pro forma analysis methodology that is used to evaluate the financial feasibility of the CCA.

The load and rate forecasts go out 10 years— from 2023, the earliest a CCA could be formed, through 2032. While all forecasting contains uncertainty, the years beyond 2030 are particularly uncertain and should be seen as broadly indicative and not predictive.

Understanding the interrelationships of all the tasks and using consistent and coherent assumptions throughout are critical to developing a meaningful analysis. Figure 3 shows the analysis elements (blue boxes) and major assumptions (red ovals) and how they relate to each other. As the figure illustrates, there are numerous interrelationships between the tasks. For example, the load forecast is a function of not only the load analysis, but also of projections of economic activity in the City.

An important point is highlighted in this figure: it is critical that wholesale power market assumptions are consistent between the CCA and PG&E. While there are reasons that one might have lower or higher costs than the other for a particular product (e.g., CCAs can use tax-free debt to finance generation projects while PG&E cannot), both will participate in the wider Western U.S. gas and power markets and therefore will be subject to the same underlying market forces. Applying different power cost assumptions to the CCA than to PG&E, such as simply escalating PG&E rates while deriving the CCA rates using a bottom-up approach, would produce erroneous results.

Figure 3. Task Map



Stockton Loads and CCA Load Forecasts

A fundamental operational role of a CCA is to forecast customer electricity needs in the short, medium, and long terms. Power procurement and day-to-day decision-making rely heavily on short-term forecasts of consumer demand for power, while procurement planning requires forecasts of longer-term loads. Procurement must also account for the risks associated with demand forecasting and develop appropriate risk mitigation strategies. Though it is not possible for any entity to predict with absolute certainty future energy demand; logical, data-driven, industry-standard methodologies for load forecasting will be used to provide the foundation of future procurement.

Because a Stockton CCA is still hypothetical and has yet to serve any customers, the CCA's estimated load to be served is based on historical consumption data from PG&E. Of course, if the CCA moves forward the load forecast will be continually updated and refined to reflect ongoing economic development in the City and changes in load from energy efficiency and distributed generation.

As shown in Table 4, the City's total annual electric load in 2019 is about 2,000 GWh. This load is spread across over 111,000 accounts. As shown in both the table and in Figure 4, residential loads are only slightly higher than those of large commercial and industrial customers, with each making up about a third of the total. This is unusual; most other CCAs have only modest large commercial and industrial loads.

Table 4. Potential Stockton CCA Customers and Associated Load for 2019

	Customers	Annual Load (MWh)
Residential	95,910	676,464
Small Commercial	1,413	256,687
Medium Commercial	546	276,810
Large Commercial & Industrial	28	509,970
Other*	8,381	160,828
Total	**106,279**	**1,880,759**

*e.g., streetlights, traffic control, agriculture/pumping.

Figure 4. Stockton Load Distribution 2019

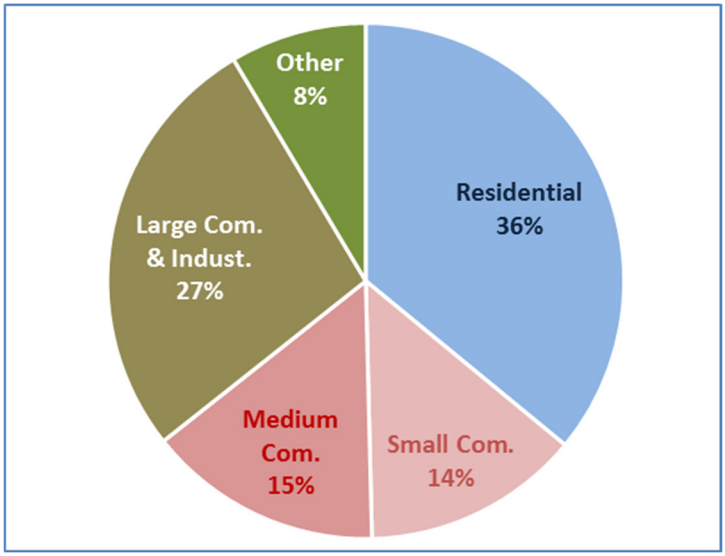


Figure 5, below shows the potential monthly load for the Stockton CCA. The highest load months are in the summer, while the lowest are in April and the winter. Also note that the highest month is about 57% higher than the lowest month. This is attributable to Stockton's inland climate where hot summers lead to more air conditioning use and the differential between the highest and lowest months is more pronounced.[8] This means Stockton will need to acquire additional "resource adequacy" capacity to cover their summer peaking loads.

To be able to project the cost of buying power for the CCA, one must not only know how much must be purchased, but when. This is accomplished using load profiles: the breakdown of each rate classes' total load into hourly consumption values. PG&E provided the monthly usage by rate class and an hourly load profile.

Based on these data, Figure 6 below illustrates the 24-hour load curve averaged across all days in August and the day with the highest load, August 15th. The peak hour was 7 pm on August 15th with a load of 476 MWh. This is the maximum capacity needed for the CCA and is the basis for the CCA's resource adequacy requirement in August. Compare this to the peak on an average August day where the peak hour was 6 pm and the peak load was 385 MWh. The significant difference between the two maximum loads highlights the load volatility in Stockton.

[8] The ratio of the usage in the highest-load month to the lowest-load month for Stockton is 1.6; for the City of Riverside, a municipal utility, the ratio of the highest-load month to the lowest-load month is 1.7. (City of Riverside Public Utilities, 2018 Integrated Resource Plan, September 26, 2018. page 2-2.)

Figure 5. Stockton CCA Load (Monthly, 2019)

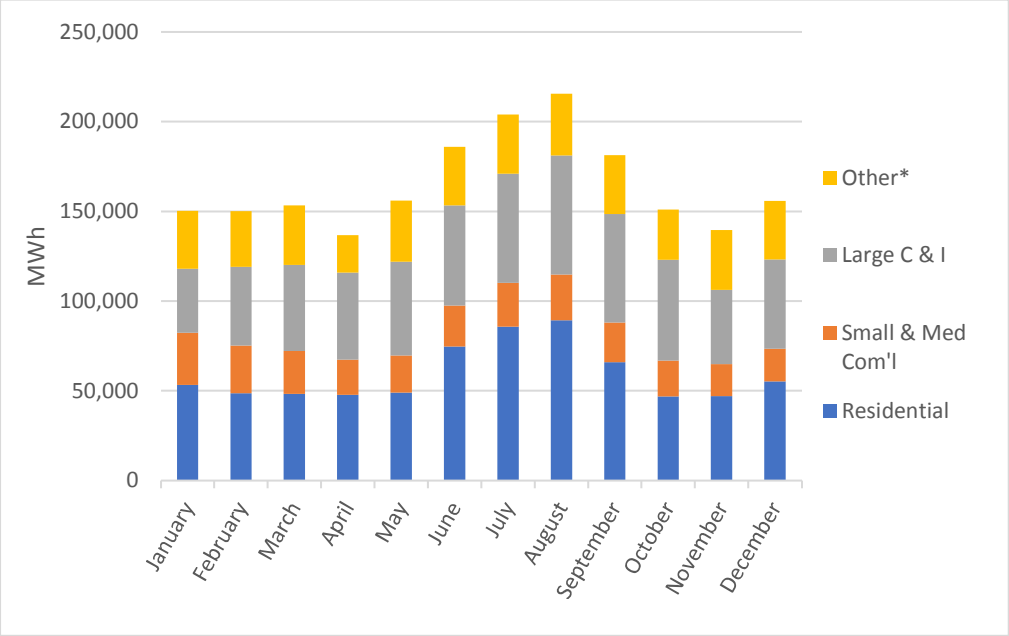
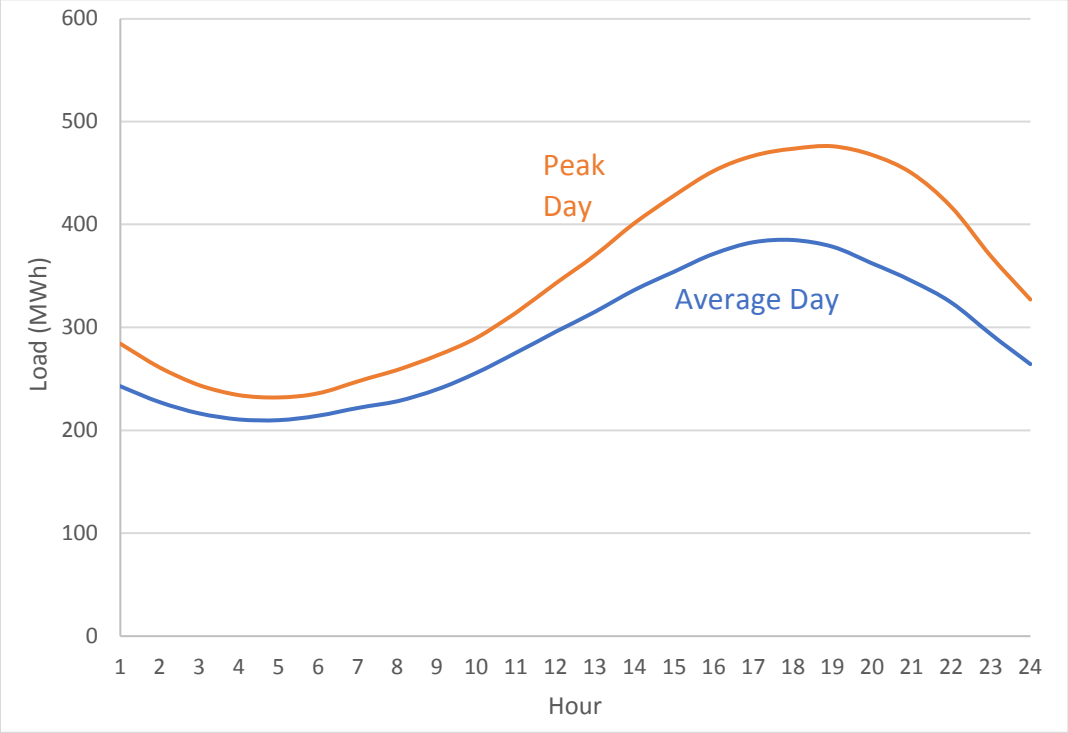


Figure 6. Stockton CCA Load Shape (August 2019)

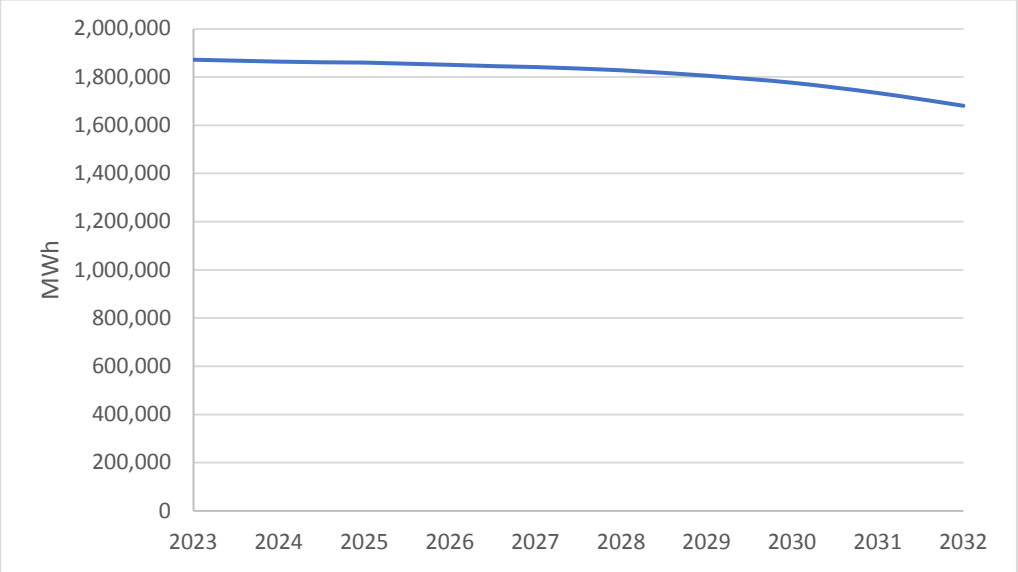


Forecasting

The CCA's base load forecast through 2032 reflects the annual average growth rate from the California Energy Commission's most recent electricity demand forecast for PG&E's planning area. This growth rate incorporates load reductions from expected behind the meter distributed generation (e.g., rooftop solar), energy efficiency programs as well as the new load added from EVs. EVs and energy efficiency technologies are discussed more in Chapter 7.

As Figure 7 shows, the CCA's load is forecast to have a slight decline that grows over time. The net growth rate from 2023 to 2032 is negative 1.2% per year.

Figure 7. CCA Load Annual Forecast

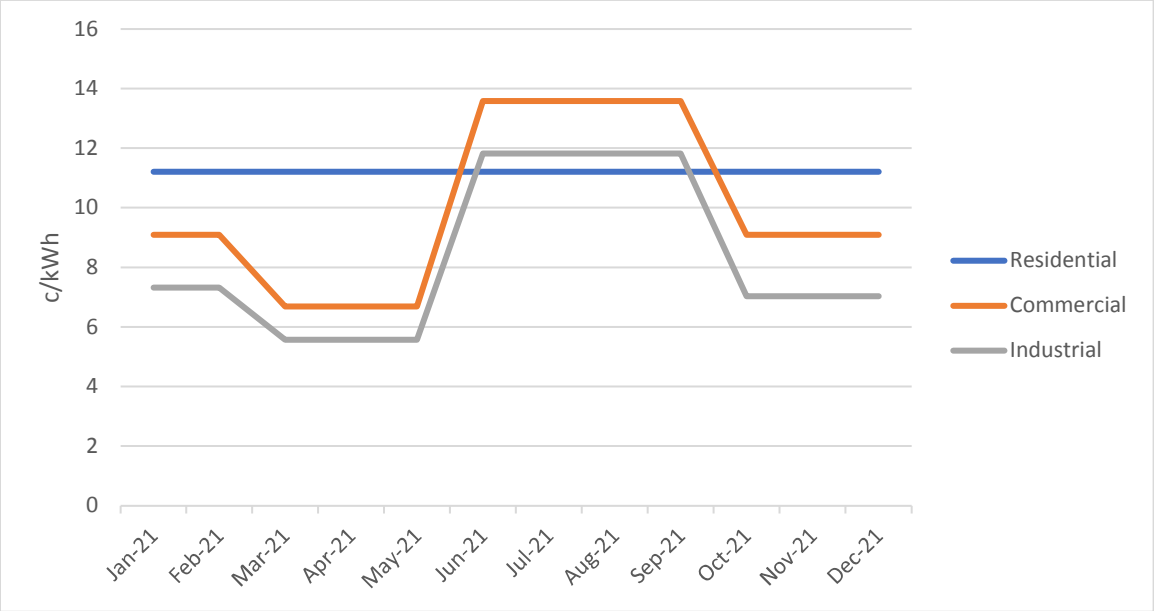


Phasing in the CCA's Load

Because our pro forma analysis is on an annual basis, all the scenarios assumed a simple one-time phase in of all accounts starting on January 1, 2023. In practice, a CCA would likely choose to phase in its loads, or at least begin service at a strategic point in the year. There are three reasons to phase-in the CCA's load. First, there are significant logistical back-office activities that must occur: loads must be forecast on a daily basis for scheduling into the CAISO; daily meter data must be exchanged between PG&E and the CCA; the CCA must calculate its customers' bills based on PG&E data and return the billing amounts to PG&E for presentation. While the providers of these services are becoming more familiar with the various protocols, it is simpler to begin serving only a small number of customers—often the municipal and government accounts—so as to work out the metaphorical kinks on less sensitive accounts before rolling out to the general public.

Second, CCAs phase in their load for economic reasons. For example, as shown in Figure 8, due to PG&E's rate design, CCA revenues for the larger commercial classes in PG&E's territory are much higher in the summer months than in the winter or spring. Thus, if the CCA is properly hedged, it can be advantageous to phase in the commercial loads in the summer to take advantage of the higher margins.

Figure 8. PG&E Monthly Average Generation Rates Projected (2021)[9]



Third, since the CCA's rates will, at least initially, be tied to PG&E's, it is better to phase in new customers a month or two after PG&E's rates are set. For example, PG&E implements major rate changes, including the PCIA, at the beginning of the calendar year. What exactly those January 1 rates will be is not fully known until late December. Thus, if the CCA was launching on January 1, too, it would have to estimate what PG&E's rates would be months in advance in order to go through its own rate-setting process. These guesses could very well be wrong and require an adjustment within the first months of service, a logistical and customer-relations gaffe better avoided.

[9] These projected rates are based on the PG&E rates effective on January 1, 2021.

CCA Power Supplies

The cost to provide power is by far the largest expenditure a CCA makes. A CCA the size of Stockton should expect to spend approximately $100 million per year for wholesale power. The Stockton CCA power supply plan will be guided by legislative requirements, regulatory mandates, and CCA policies, as well as future market dynamics.

Regulatory Procurement Requirements

California places a number of important power-procurement requirements on all "load serving entities" (LSEs) in California (e.g., utilities like PG&E and CCAs). These requirements apply to all LSEs and thus can limit the options that a CCA can pursue to lower costs or implement lower-GHG emitting power portfolios.

Renewable Power. One of these requirements is the renewable portfolio standard (RPS). This requirement has been in place since 2002 with passage of Senate Bill (SB) 1078, which set a requirement that 20% of retail electricity sales be served by renewable resources by 2017. Since then, the RPS requirement has been accelerated and expanded by subsequent legislation, most recently by SB 100 passed in 2018. SB 100 requires all LSEs to procure 50% of their power from renewable resources by 2026 and 60% by 2030.[10] SB 100 also sets a state-wide policy goal of having 100% of the electric power met by renewable or carbon-free resources (e.g., large hydroelectric dams) by 2045.

This means that PG&E is subject to the same renewable resource mandates under SB 100 as a Stockton CCA will be. Unless the Stockton CCA makes an explicit decision to exceed the state requirements, it would be offering no incremental renewable "benefits" to the City. This is why many existing CCAs' goals are often to accelerate the implementation of green power above and beyond the state's mandates and goals.

Energy Storage. Assembly Bill (AB) 251 requires LSEs to procure energy storage capacity. The storage mandate was implemented by the California Public Utility Commission (CPUC) through a requirement that CCAs procure energy storage equal to one percent of their forecasted 2020 peak load. CCAs must demonstrate progress towards meeting this target in biennial advice letter filings and must have the energy storage capacity in place by 2024. Some energy storage technologies, especially lithium-ion batteries, have fallen steeply in cost in recent years, though they are still relatively expensive compared to supply resources and demand response.[11] Battery costs are expected to continue to fall, suggesting there is a benefit to deferring procurement until required by the mandate.

Resource Adequacy. Since 2006, all LSEs, including CCAs, that are participants in the CAISO balancing area and under the jurisdiction of the CPUC are responsible for complying with

[10] In practice, the utility code establishes multi-year compliance periods ending in 2020, 2024, 2027 and 2030, with the average renewable energy supply as a percentage of retail sales for each compliance period required to be 33%, 44% 52% and 60%, respectively.
[11] Demand response are programs that incent customers to reduce their usage during hours of high grid load.

Resource Adequacy (RA) obligations required under Assembly Bill 380 (codified as Section 380 of the Public Utilities Code and implemented by CPUC rulemaking). There are three components to the RA compliance program:

1) **System** capacity requirements to meet expected peak loads in the entire CAISO balancing area;
2) **Local** capacity requirements to meet contingency needs in locally constrained areas; and
3) **Flexible** capacity requirements to meet the largest continuous three-hour ramp in each month.

Specifically, to meet the System RA requirement, load serving entities must contract for 115% of their projected monthly peak demand as determined by the CPUC in consultation with the California Energy Commission (CEC) load forecasts. The peak demand forecasts are based on a 1-in-2 (average) weather year. Year-ahead filings must show that the LSE has contracted for 90% of the projected System RA requirement in summer months (May-September). The forecasts must be updated on a month-ahead basis and show that 100% of the requirement has been contracted.

The Local RA requirement must be met by LSEs with customers in 10 local reliability areas identified by the CAISO. The Local RA requirement is based on the CAISO's assessment of the generation needed in the local area. Beginning with the 2020 compliance year,[12] the Local RA requirements are set three years ahead and updated each year.[13]

On June 11, 2020, the CPUC adopted a framework (D. 20-06-002) that designated a central buyer for the procurement of multi-year Local RA in the PG&E and SCE distribution areas, beginning in 2021. Currently, both PG&E and SCE serve as central procurement entities for their distribution service areas and have begun procuring Local RA for the 2023 compliance year. Therefore, PG&E would act as the Local RA procurer for any future CCA that served Stockton.

The CAISO also determines the required Flexible RA needs operating criteria. Currently there are three flexible capacity categories with varying must-offer obligations, energy limits and number of starts, with associated requirements for how much of each category may be used to meet the LSE's obligation. LSEs must demonstrate the purchase of 90% of their flexible RA requirement in their annual RA filing, and 100% of the requirement in their monthly RA filings.[14]

[12] The "compliance year" is the year in which the RA resources are used to meet the LSE's RA requirements for that year. For example, an LSE must demonstrate in 2019 that it has adequate RA capacity under contract for the 2020 RA compliance year.
[13] Note that Local RA capacity is a substitute for System RA capacity. However, the converse is not always true, meaning that System RA capacity might not help an LSE meet its Local RA requirements.
[14] Flexible RA can substitute for System RA and possibly for Local RA but the converse is not always true: System and Local RA resources might not help an LSE meet its Flexible RA obligations.

There is a bilateral market for RA capacity, with standardized products for each type of RA capacity.

Integrated Resource Planning (IRP). In addition to its role as the authority for implementing the state's RA program, the CPUC also has an active rulemaking to "Develop an Electricity Integrated Resource Planning Framework and to Coordinate and Refine Long-Term Procurement Planning Requirements" (R. 16-02-007). This program requires each California LSE to file a procurement plan that demonstrates that it is contributing its pro rata share to meeting the State's GHG reduction goals while maintaining sufficient generating and storage capacity to maintain a reliable power grid.

On November 11, 2019, the CPUC issue a decision (D.19-11-016) that addressed the potential for system resource adequacy shortages in PG&E's area due to the impending retirement of 3,750 MW of once-through cooled (OTC) generation by December 31, 2020 as well as the risk of additional non-OTC retirements. The decision recommended that the State Water Resources Control Board extend OTC compliance deadlines for the impacted power plants and required additional procurement of 3,300 MW of system-level RA capacity by all LSEs serving load within the CAISO balancing area. Because this analysis assumes that the Stockton CCA begins service in 2023, it will not need to take any special action to comply with these directives.

Power Supply Portfolio and Cost Assumptions

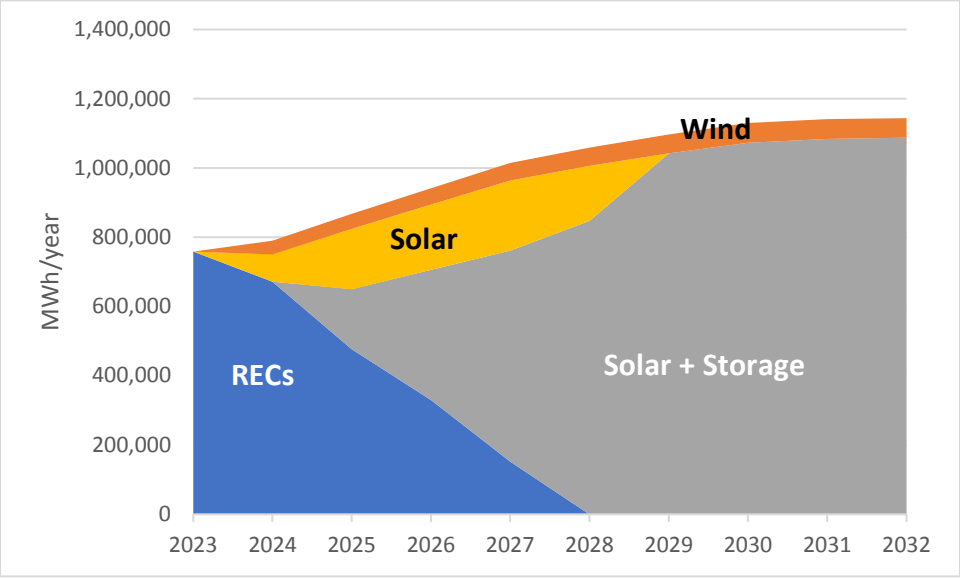
Operating within the regulatory framework described above, MRW has developed sample electric supply portfolios for use in evaluating the economics of CCA formation in Stockton. These sample portfolios are a proxy for a working portfolio that would be developed using a more rigorous assessment of costs and risk attributes developed as part of an implementation plan and ultimately through direct engagement with market participants via a request for proposals process. With RPS requirements increasing to 60% of load during the period of analysis, renewable resource assumptions are the primary driver of portfolio costs. After accounting for the hourly CCA load shape and the generation profile of resources in the renewable energy portfolio, the residual net short is assumed to be met with market purchases at hourly market prices forecast by S&P Global. Likewise, resource adequacy requirements are estimated based on peak loads and after accounting for net qualifying capacity from renewable resources. The remaining capacity need is assumed to be purchased at a forecasted market price as described below.

Renewable

The cost of renewable energy from solar photovoltaic (PV) facilities has steadily fallen since the establishment of the California RPS mandate in 2002. Looking forward, solar PV prices are expected to continue to decline, although perhaps at a slower rate as the technology matures and if import tariffs continue to be applied. At the same time, the incremental value of solar energy is decreasing as more and more solar resources are added to the electrical system, leading at times to conditions where solar energy must be curtailed to avoid overgeneration. Thus, there are advantages to a diversified supply portfolio including wind, geothermal and biomass, as well as energy storage.

Figure 9 below shows the assumed mix of renewable resources in Supply Scenario 1: meeting but not exceeding the State's renewable portfolio requirement, e.g., 50% in 2026, with incremental hydroelectric power so that the CCA has the same net GHG output as PG&E. In the first few years, the RPS requirement will be met using contracts for unspecified in-state renewable generation, with some generation from power purchase agreements (PPAs) with existing solar resources. Over time, the reliance on unspecified in-state renewables decreases and is replaced with PPAs with specific wind resources as well as PPAs with solar bundled with storage facilities. This reflects a reasonable balance of renewable resources: wind and solar are generally complementary in California—that is, when solar output is high, wind output is low.

Figure 9. Renewable Power Generation by Source (Supply Scenario 1)



Assumed renewable power prices are shown in Figure 10. The 2023 prices are consistent with current reported renewable contract prices from other load-serving entities, including California CCAs and municipal utilities.[15]

With the rate of utility-scale solar PV cost declines flattening in recent years, we assume a slight increase in solar PV costs over the forecast period. Based on data provided by Lawrence Berkeley Laboratory, solar combined with battery storage is assumed to be available at a $5/MWh premium relative to solar-only projects and to follow the same trends as utility-scale solar. For local solar and solar plus storage, we assume projects are likely to be commercial scale (i.e., large rooftop), so we relied on NREL's U.S. Solar Photovoltaic System Cost

[15] https://emp.lbl.gov/sites/default/files/2020_utility-scale_solar_data_update.pdf

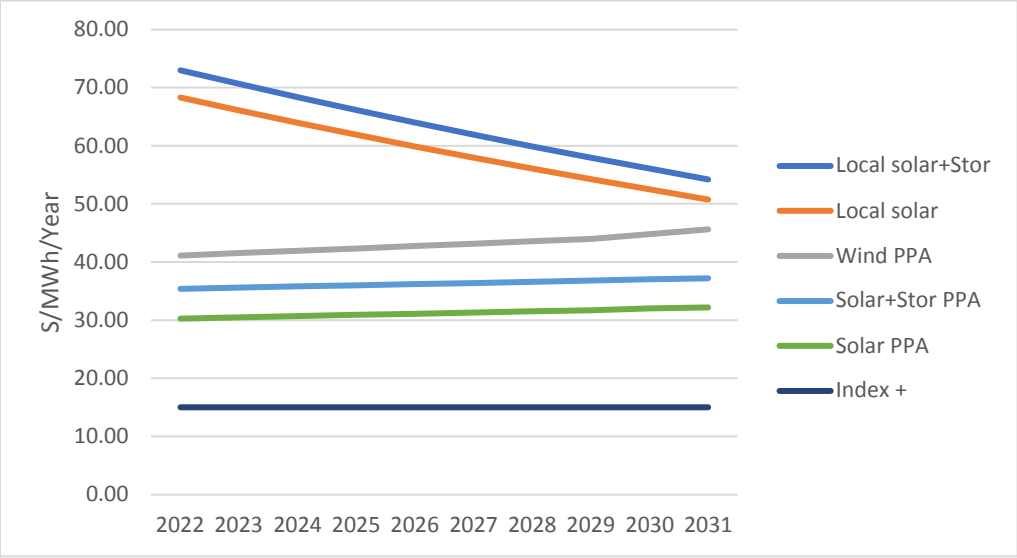
Benchmark and Cost-Reduction Roadmap for Residential Solar Photovoltaics Report for Commercial PV, which show declines from 2020 costs through 2030.[16]

For wind prices we relied on the DOE's Wind Vision report to establish a forecasted price for 2020 through 2040 and continued the price trend for subsequent years.[17]

"Index+" refers to the cost of a Bundled Renewable Energy Credit ("Bucket 1" REC) whose associated energy is priced at the CAISO hourly market price. The REC value is assumed to be $15/MWh, remaining level in nominal dollars.

Alternative renewable costs are explored in the sensitivity scenarios.

Figure 10. Projected Average Renewable Power Costs



Wholesale Power Costs

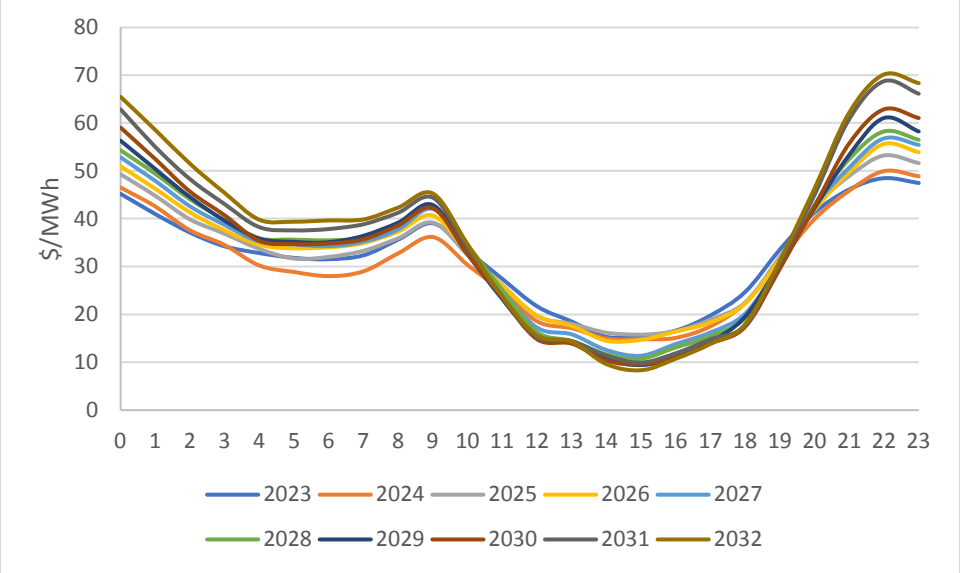
The residual net load after accounting for renewable energy supplies is assumed to be supplied from wholesale market purchases, either from the day-ahead market operated by the CAISO or through bilateral contracts with similar market pricing. To forecast market prices, we used S&P Global Market Intelligence's 2020 3rd Quarter Forecast for CAISO NP15 Hourly Energy Prices. S&P Global provides 20-year forward-looking wholesale electricity and capacity price projections based on forward market prices and fundamentals-based modeling relying on data

[16] https://www.energy.gov/eere/solar/sunshot-2030
[17] https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf, Figure 3-12.

from regulatory filings, planning guidelines, coal plant retirements, firm construction plans, and additions of renewable energy.

Figure 11shows the average hourly price comparison of the 10-year price forecast. In real terms, there is little difference in the peak energy prices among years. However, as increased renewables are built over the 10-year periods, the mid-day prices during high solar hours are anticipated to get more depressed. In California, electricity prices are often set by gas-fired resources operating on the margin. However, as increasing supplies of renewable energy are added to the system, there are periods where prices are being set by zero or even negative marginal cost resources. As a result, market prices have been trending downward, especially during seasons and periods of the day when loads are low and solar output is high. The modeling provided by S&P shows a continuation of the trend, with prices falling during the middle of the day and increasing in the morning and evening when gas-fired resources are needed to meet peak loads outside of the solar supply period. Figure 11 presents the average hourly shape of forecasted NP15 CASIO market prices over a 10-year period. Price data for individual months or days demonstrate even greater variation across the hours of a day.

Figure 11. Assumed Market Prices (2023-2032)



Capacity Costs

As noted above, CCAs are also responsible for complying with Resource Adequacy (RA) obligations. These products are typically contracted on a short-term basis (e.g., year-ahead). There has historically been an excess supply of both system and flexible capacity in the market, leading to depressed prices for these products. This changed dramatically in 2019, when RA prices doubled. MRW predicts that the system RA price will continue to fluctuate between $6.00/MWh to $9.00/MWh, but that the flexible RA price will remain stable.

Traditionally, CCAs have also bought local RA, but as of 2023, CCAs in PG&E's territory will no longer be responsible for acquiring local RA. PG&E will purchase and allocate local RA to CCAs. The specifics of this new process are still being worked out in regulatory filings and future analysis will be needed to see how this new model will affect costs.

Pro Forma Elements and CCA Costs of Service

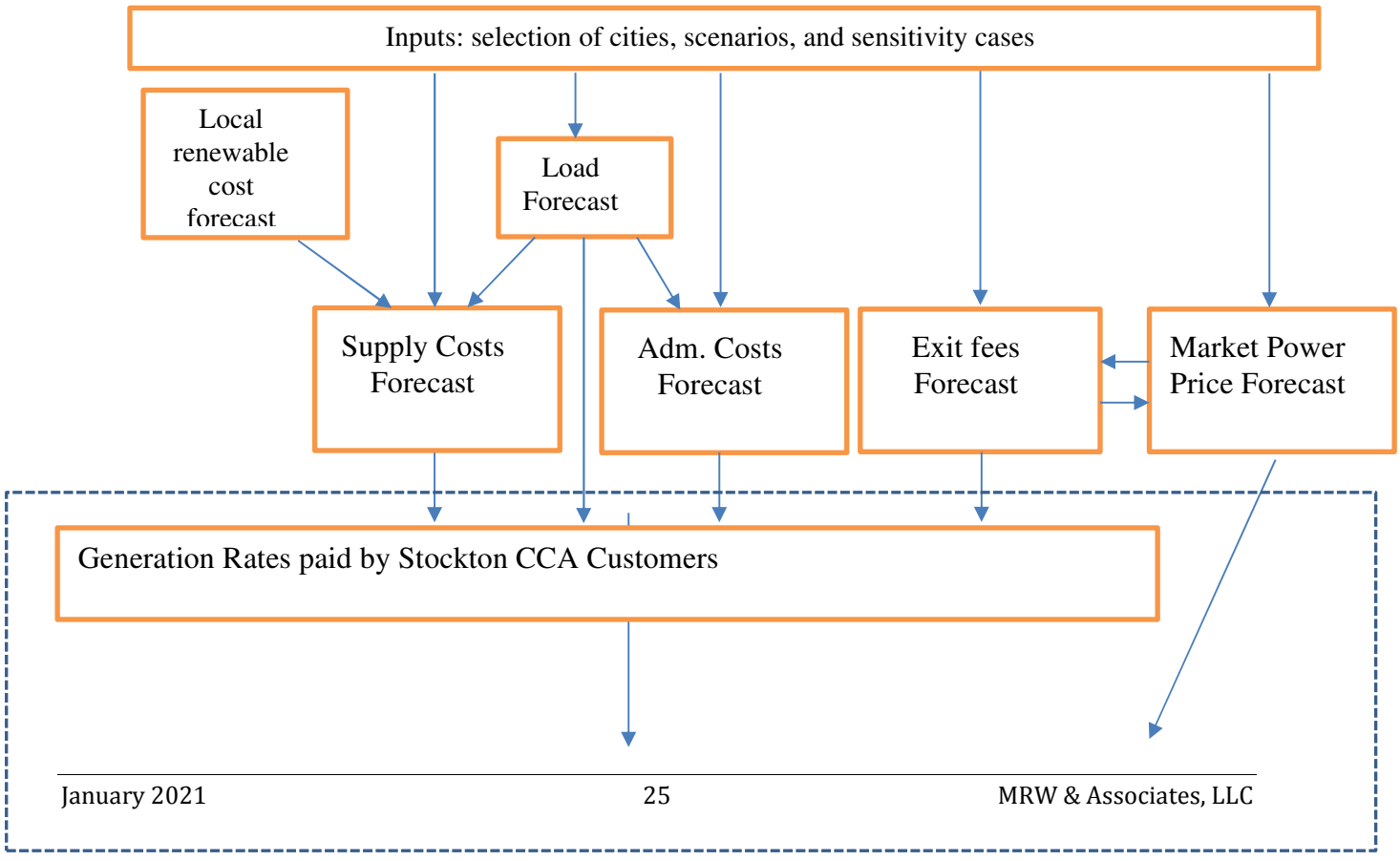
This section outlines the main elements of the pro forma analysis, the assumptions underlying the elements and the output results. The analysis also includes a comparison between the generation-related costs that would be paid by Stockton CCA customers and the generation-related costs that would be paid by PG&E bundled service customers. Costs paid by CCA customers include all CCA-related costs (i.e., supply portfolio costs and administrative and general costs) and exit fee payments that CCA customers will be required to make to PG&E.

Pro Forma Elements

Figure 12 provides a schematic of the pro forma analysis, outlining the input elements of the analysis and the output results.

As discussed in previous sections, supply portfolio costs are informed and affected by CCA loads, by the requirements the CCA will need to meet (or will choose to meet) such as with respect to renewable procurement, and by CCA participation levels. Administrative and general costs are discussed further below.

Figure 12. Pro forma Analysis



Assessment of CCA viability and CCA customer rates *vs.* PG&E customer rates (also accounts for reserve fund contributions)

Startup Costs

Startup costs are the costs the Stockton CCA will incur before operations begin. Table 5 shows the estimated CCA startup costs. They are based on the experience of existing CCAs as well as from other CCA technical and feasibility assessments. The sub-total amount ($1.35 million) reflects the basic startup costs that would be common for all new CCAs. The $25 million working capital amount is 90 days of cash flow for the CCA. This could be either a load or a line of credit of a combination of thew two. If Stockton were to move forward, these values would be refined based on more detailed projections.

Table 5. Estimated Start-Up Costs

Item	Cost	One-time or Ongoing
Professional Services/Consulting	$150,000	Ongoing
Staffing	$200,000	Ongoing
G&A costs	$25,000	Ongoing
PG&E Fees	$10,000	One-time
CAISO deposit	$500,000	One-time
Marketing strategy and brand development	$25,000	Ongoing
Website 1.0/2.0	$20,000	Ongoing
PR/Advertising Campaign -- print, social, paid and earned media	$25,000	Ongoing
Materials for tabling and events	$10,000	Ongoing
Customer Notifications	$90,000	One-time
Community Sponsorships, etc.	$5,000	Ongoing
General Counsel Services	$100,000	Ongoing
Legal review of power supply and other vendor contracts	$75,000	Ongoing
Cal-CCA Membership	$50,000	Ongoing
Regulatory Monitoring and Reporting	$50,000	Ongoing
Participation in Regulatory Proceedings/ Compliance Matters	$15,000	Ongoing
Sub-Total	$1,350,000	
Working Capital	~$25,000,000	One-time; maximum line of credit amount
Total	**$26.4 million**	

Typically, the city forming a CCA would directly pay for the initial start-up costs, such as the technical study. Once the CCA is formed by City Council action, the CCA would issue an RFP for banking services. These would set up a short-term loan or line of credit to pay back the city its CCA expenditures and fund ongoing start-up costs until the CCA is operational. At that point, the short-term loans could be rolled into a longer-term loan that would also include working capital.

Working capital reflects the fact that a business will have bills to pay prior to receiving payment from its customers. This amount would cover the timing lag between when invoices for power purchases (and other account payables) must be remitted and when income is received from the customers. Per industry standard, total working capital is set to equal three months of CCA revenue, or approximately $25 million when the Stockton CCA is fully operational (i.e., serving all potential customers.)[18] Initially, the working capital is provided by a bank on credit to the CCA. Typical power purchase contracts require payment for the prior month's purchases by the 20th of the current month. Customers' payments are typically received 60 to 90 days from when the power is delivered.

These startup costs are assumed to be financed over 5 years at 5% interest.[19] Historically, CCAs have paid down their start-up loans much more quickly.

Reserves

CCAs to date have all committed to setting aside revenues into a reserve fund to account for times in the short-term when its costs may not allow it charge rates that are competitive to PG&E. For this study, we assume that the CCA will endeavor to set aside revenues until a reserve fund reaches an amount equal to 50% of its annual revenue (e.g., 50% of $140 million = a reserve fund goal of $70 million). After the reserve target is met, it is held at the target level or drawn upon so that the desired CCA rate is achieved. If the reserve is drawn upon, the rate reserve is replenished in the next year in which headroom is available.

Administrative and General Cost Inputs

Administrative and general costs cover the everyday operations of the CCA, including costs for billing, data management, customer service, employee salaries, contractor payments, and fees paid to PG&E. Table 6, below summarizes the assumed ongoing administrative and general costs. These costs are assumed to trend with inflation.

Table 6. Ongoing Administrative and General Costs

[18] CCAs frequently "phase-in" their service, initially offering service to a smaller subset of customers and then expanding service to the remaining customers over the following months or years.

[19] 5% is currently equal to the prime rate plus 175 basis points.

	2022	2023	2024	2025
PG&E Fees, $/cust./month	$0.35	$0.36	$0.37	$0.38
Data Management $/cust./mo.		$1.00	$1.00	
Administration – Labor[20]	$200,000	$700,000	$1,500,000	$1,500,000
Administration- Non-Labor	$25,000	$250,000	$150,000	$150,000
Professional Services	$150,000	$650,000	$550,000	$560,000
Data Management Fees	$0	$110,000	$110,000	$110,000
PG&E Metering and Billing Fees	$0	$450,000	$460,000	$470,000
Total	$380,000	$2,200,000	$2,800,000	$2,700,000

PG&E Rate and PCIA Forecasts

PG&E Generation Rates

Forecasts of PG&E's generation rates and exit fees are necessary to compare the projected rates that customers would pay as Stockton CCA customers to the projected rates and fees they would pay as bundled PG&E customers.

To ensure a consistent and reliable financial analysis, a 10-year bottoms-up forecast of PG&E rates was developed using market prices that are consistent with those used in the forecast of the Stockton CCA's supply costs. The forecasted costs include the cost of PG&E's existing resource portfolio, adding in market purchases only when necessary to meet projected demand.

To develop this forecast, the key cost drivers of each of PG&E's generation rate components were examined, separately evaluating costs for renewable and non-renewable energy purchases, for PG&E-owned generation facilities, and for capacity purchases. The study assumed that near-term changes to PG&E's generation portfolio would be driven primarily by modest increases in underlying gas market prices. In 2028-2030, consistent with the Stockton CCA forecast, PG&E must pay higher prices for incremental capacity and resource adequacy, reflecting the tightening of the capacity market at that time.

The forecast further assumes that PG&E is compliant with the renewable and carbon-free requirements ordered in Senate Bill 100: a minimum of 60% renewable content in 2030 and a trajectory that would, when extrapolated, result in carbon-free power in 2045. In fact, given the current PG&E renewable portfolio and the loss of load from the Stockton CCA, PG&E would need minimal if any new renewables to meet the 2030 goal.

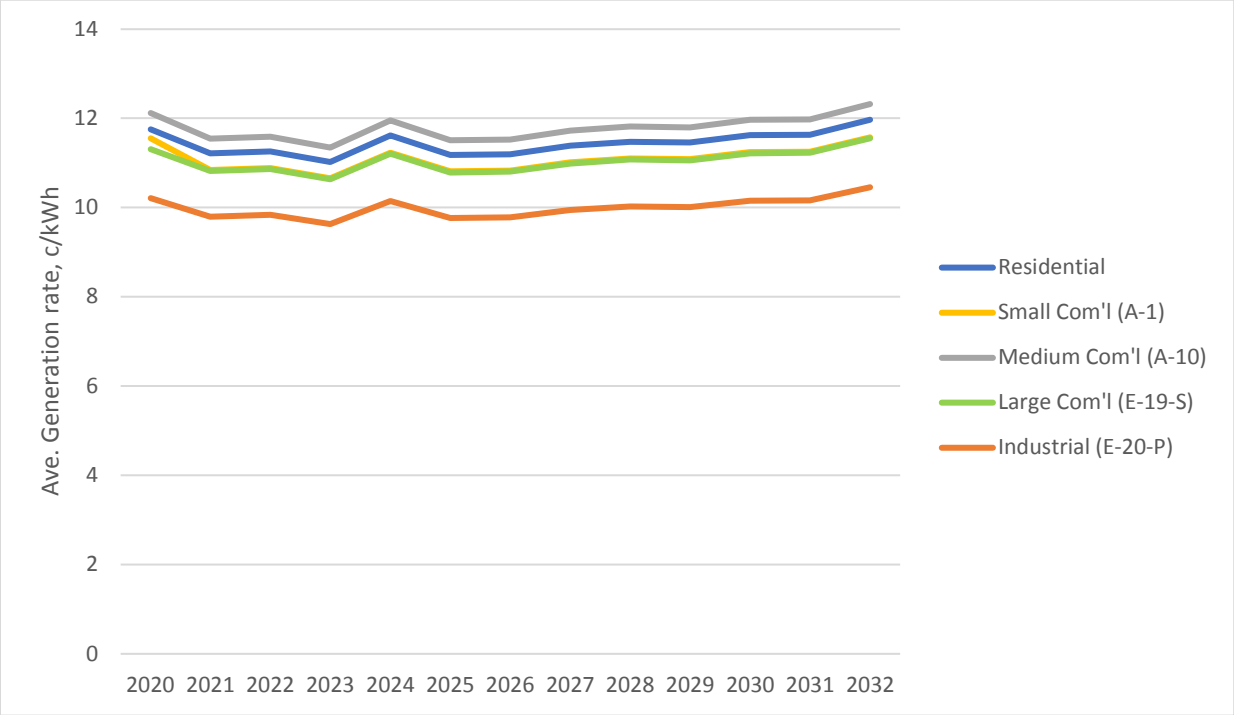
The forecast for PG&E's generation resources are based on publicly available data and forecasts. We relied on the market price forecast produced by S&P Global to estimate the cost of market purchases. However, since PG&E protects data that would reveal its detailed net short

[20] See page 60 for staffing estimate details.

position, we were unable to perform the hourly analysis completed for Stockton and instead relied on average market prices to develop estimates of the cost of PG&E market purchases.

Over the 10-year period, the study forecasts that PG&E's generation rates will escalate by an average of 3% per year. This forecast is show in Figure 13, below.

Figure 13. Forecast PG&E Average Generation Rates



PCIA

The Power Charge Indifference Adjustment (PCIA) is a fee charged by PG&E intended to prevent customers that remain with PG&E bundled service from paying for energy generation procured on behalf of customers that have since switched to CCA service. More specifically, it pays for the above-market costs of PG&E generation resources that were acquired, or which PG&E committed to acquire, prior to the customer's departure to CCA. The total cost of these resources is compared to a market-based price benchmark to calculate the "stranded costs" associated with these resources, and CCA customers are charged what is determined to be their fair share of the stranded costs through the PCIA. Bundled customers also pay the PCIA, which is embedded into their commodity portion of their total rate.

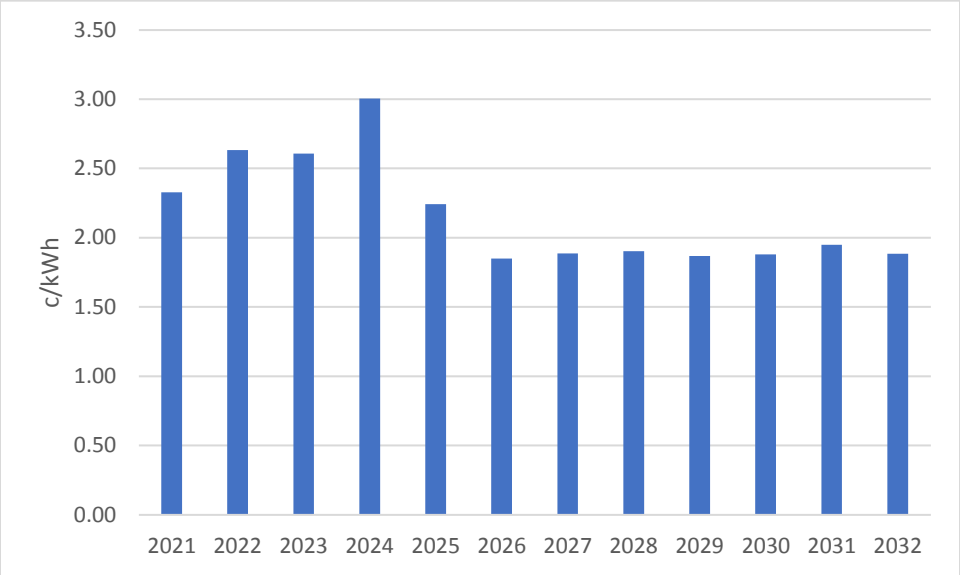
The PCIA is not paid directly by the CCA, but by the individual customers taking CCA service. Thus, it does not appear explicitly on the CCA's books, however it must be accounted for in any CCA cost analysis. While both CCA customers and customers that choose to remain in PG&E bundled service pay this fee, it appears as a separate line item for CCA customers and is embedded in the energy generation costs of PG&E bundled customers.

To forecast the PCIA, this study used the formula and approach dictated by the Alternative Proposed Decision of Assigned Commissioner Carla Peterman in Commission Rulemaking 17-06-026, which was approved by the Commission on October 11, 2018. In addition, the market

price and PG&E portfolio assumptions used in the PCIA calculations are consistent with those used to forecast PG&E's generation rates.

This study forecasts the PCIA charge by directly modeling expected changes to PCIA-eligible resources and to the market-based price benchmark. Based on our modelling, we expect the PCIA to remain between 2¢ and 3¢ per kWh between 2021 and 2025. After 2025, the PCIA is modeled to decrease markedly to just below 2¢ per kWh through 2032. The decline is mainly caused by the expiration of many of the costlier renewable power contracts entered into by PG&E, which decreases the total stranded costs. MRW's forecast of the PCIA charge through 2032 is shown in Figure 14.

Figure 14. Forecast Average PCIA



PG&E Green Option Tariff

CCA's frequently offer their customers the option to have 100% of their power met using renewable resources, albeit at a higher rate. A Stockton CCA could offer such a rate option. However, Stockton customers currently have something akin to this option via PG&E's Green Tariff Shared Renewable (GTSR) Program. The program was established in 2016 under Senate Bill 43, and pursuant to CPUC Decisions 15-01-051 and 16-05-006, to extend access to renewable energy to ratepayers that are currently unable to install onsite generation.[21] PG&E's green tariff, known as Schedule E-GT, offers homes and businesses the option to purchase 50% or 100% of their energy use from renewable resources. The program provides those with homes or apartments or businesses that cannot directly utilize renewable resources such as rooftop solar the opportunity to meet their electricity requirements through renewable energy and support the growth of renewable energy resources.

[21] California Public Utilities Commission, Decision 15-01-051, p.3

A customer must positively elect to be on the GTSR (i.e., it is "opt-in."). Once enrolled, there is no minimum length of time that a customer must take service under this Schedule, nor is there any termination fee for departing the program. Customers are eligible to remain on the Green Rate Program for up to 20 years from the date they first began service.

A generating facility eligible to provide power to GTSR customers must be (a) solar; (b) new; (c) between 500 kW and 20 MW; and (d) located in PG&E's service territory. Renewable Energy Credits (REC) generated by facilities under the GTSR program cannot be used by PG&E for RPS compliance.

The GTSR-Green Rate (GTSR-GR) consists of (a) a credit equal to the average generation rate of the customer's otherwise applicable tariff; (b) an adjustment charge to reflect the difference between the time of delivery profile the GTSR solar facility and the customer's class consumption profile; (c) a charge for the renewable power, the PCIA, and the Competition Transition Charge (CTC); (d) a CAISO grid charge; (e) a charge for Resource Adequacy (RA); and a program administration charge. Ignoring the PCIA and CTC, the average cost to a GTSR customer is about 1.1¢/kWh higher than the PG&E otherwise applicable generation rate. The program is open for enrollment until subscriptions reach 272 MW.

A Stockton CCA has the flexibility to offer rates corresponding to 100% green power, or any green power content greater than the state's minimum. While MRW believes that a Stockton CCA could likely do so at a competitive price, this option was not explicitly investigated here.

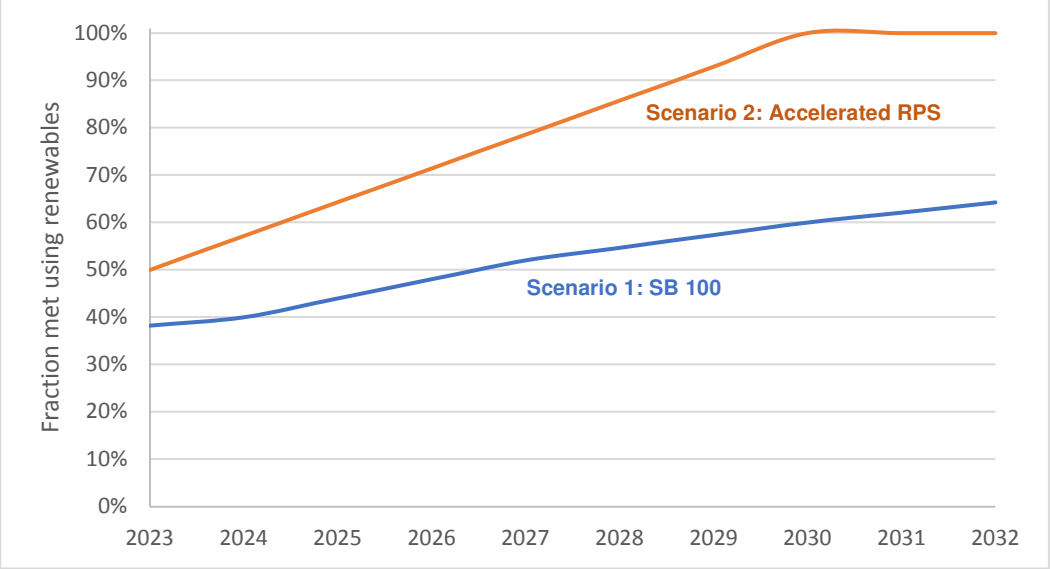
Chapter 3. Cost and Benefit Analysis

Costs and benefits are evaluated by comparing total average cost to serve the CCA customer (cents per kWh or dollar per MWh) (including PCIA) to PG&E generation rates. The pro forma results for the first 10 years of the Stockton CCA are summarized in this chapter.

Supply Scenario 1 assumes that the Stockton CCA simply complies with the State's requirements concerning renewable power. It starts in 2023 with 38% of its power being met using renewable resources and escalates this faction to 64% by 2032. Large hydropower is assumed to be used for most of the non-renewable output (priced as a modest premium above system power) so that the CCA's net GHG emissions is no greater than PG&E's. The remaining fraction of the CCA's power needs are assumed to be met using system power from the CAISO.

Supply Scenario 2 assumes that the CCA goes beyond the State-mandated RPS requirements and utilizes increasingly greater amounts of renewable power. Specifically, Supply Scenario 2 assumes that the CCA will start at 50% renewable content in 2023 and achieve net 100% renewable power by 2030.

Figure 15. CCA Scenario Renewable Power Content



Supply Scenarios

Supply Scenario 1

Figure 16 shows the Supply Scenario 1 forecast of average CCA costs and PG&E's generation rates, assuming that all customers are served. The bars in the chart show the forecasts of the major cost components of CCA operation, while the single line shows the forecast of PG&E's generation rate. When the bars are below the line, the CCA's average operating costs will be below the PG&E generation rate; meaning that it can offer power to customers at a rate lower than or competitive with PG&E.

The bottom-most green segment represents the cost of renewable power to the CCA. The renewable power costs ramp up with increasing renewable content, as required by SB 100.

The brown segment is for the costs of non-renewable, wholesale market power. This segment slowly decreases, as renewable power increases.

The light blue segment is for capacity. That is, the CCA must demonstrate that it has the generating capacity (in megawatts) to ensure that it can serve all its load, even if the "intermittent" renewable resources are not generating at their optimal rate (e.g., solar on rainy days). The more intermittent renewables—solar and wind—that are added to the CCA's generating mix, the more back-up capacity is needed to ensure reliability.

The gray segment is for debt service, operations, franchise fees and uncollectibles. The loans associated with the start-up costs are paid down. Once that debt is retired, the operations costs decrease markedly. Franchise fees are those collected by the PG&E and paid to the City for the right to operate the electric monopoly franchise in the city. It is paid as a percent of each customer's total bill and is automatically built into PG&E's rates. So that cities remain financially whole when customers' power is provided by a CCA, PG&E charges CCA customers a "franchise fee surcharge."[22] Lastly, as with any business, a certain fraction of the CCA's bills will not be paid and are treated as "uncollectible."

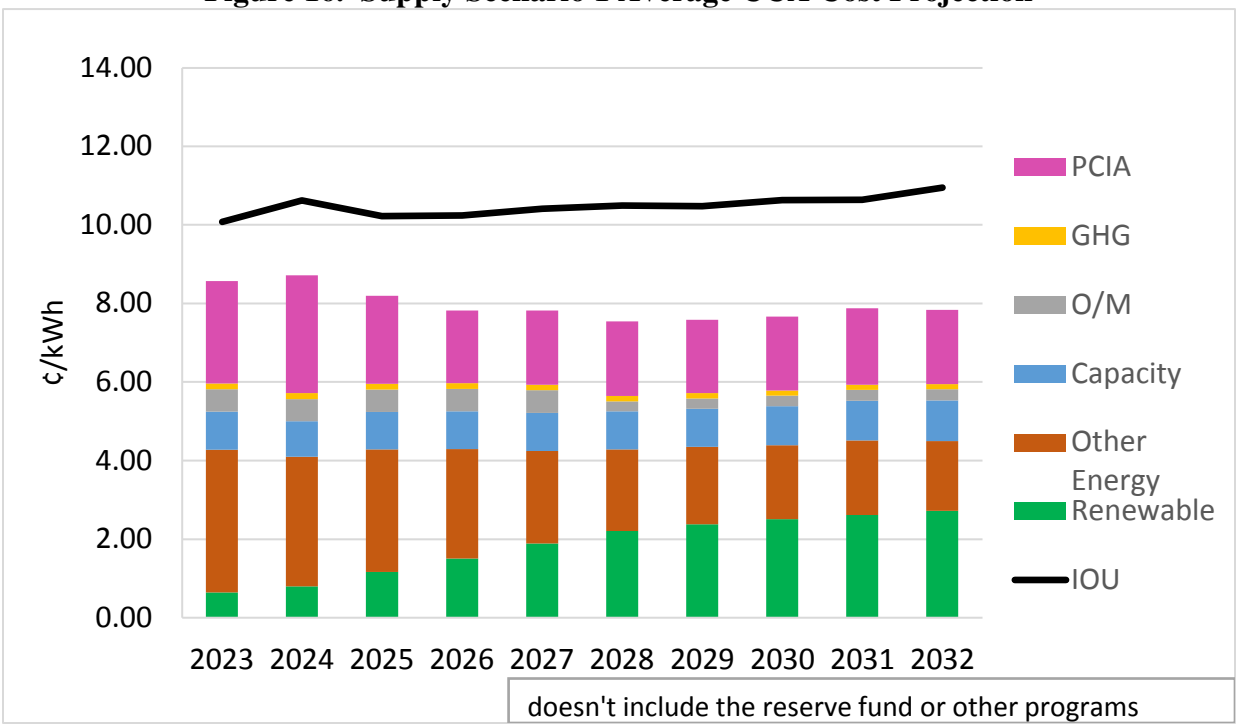
The yellow segment is for carbon cap and trade allowances. Note that for practical purposes, the carbon cap-and-trade allowances would be built into the purchase prices of natural gas-fired market resources. However, because it is an important variable on its own, the costs are shown separately.

The top-most pink segment is for the Power Charge Indifference Adjustment (PCIA), a fee paid to PG&E to ensure that the operation of the CCA does not strand PG&E's remaining bundled customers with costs associated with power purchased on behalf of customers who have shifted to the CCA.

The black line represents PG&E's average generation rate. To forecast PG&E's generation rates, the comparison model used information regarding PG&E's utility-owned generation, power contracts, power market costs, and by closely tracking changes in PG&E revenues and costs through its filings in several CPUC proceedings. In particular, it takes the most recent PG&E filing of generation rates and applies the known and anticipated changes to the wholesale power market prices and PG&E's power purchase contracts.

[22] See PG&E Tariff Schedule FFS.

Figure 16. Supply Scenario 1 Average CCA Cost Projection



As shown in Figure 16, the costs of CCA operation in Supply Scenario 1 are consistently below that of the PG&E rate. This difference between the top of the CCA cost columns and the PG&E rate line represents the operating "margin." the CCA may do a combination of one or more of three things with this margin:

- The CCA can keep its rates as the cost of operations and allow the margin to flow fully to customers through lower electric rates. (i.e., if the margin is 0.5¢/kWh, then the CCA could offer rates that are 0.5¢/kWh less than PG&E while still covering all its costs).
- The CCA can change customers the same rate as PG&E to retain the margin and build up cash reserves for a rainy day.
- The CCA can eventually use the margin to fund other energy-related services, such as providing incentives for customers to purchase an EV, install energy-efficient home upgrades, install solar PV, etc.

In practice, CCAs use the margin for all three purposes: they set a rate that is marginally lower than PG&E's and then use the remaining margin for cash reserves or programs.

In 2023, this "margin" between CCA average cost and PG&E rate is about 1.5¢/kwh, increasing to about 3.1¢/kwh in 2032. Note that this does not mean that the CCA can or will fully pass on this margin as rate savings to its customers. There are other uses that the CCA leadership may choose to use this margin for, most notably the generation of a rate reserve fund. As discussed elsewhere, other CCAs have chosen to use their margins for more generous solar PV programs, incremental energy efficiency, EV charging, or other programs that benefit the community.

For the CCA, GHG savings is achieved when the average GHG emissions from the set of generation resources used by the CCA is less than the average GHG emissions from PG&E. Unless the CCA procured GHG-free power above and beyond California's renewable requirement, PG&E's average GHG emission will be less than the CCAs. This result is caused by PG&E not only meeting the state-requirement minimum renewable content, but also using other non-renewable but still GHG-free power sources: large hydroelectric dams and nuclear power from the Palo Verde Nuclear Power Plant, of which PG&E is a partial owner. The GHG-emitting portfolios for Power Supply Scenario 1 and PG&E are shown in Table 7.

Table 7. 2023 CCA (Supply Scenario 1) and 2018 PG&E Power Content

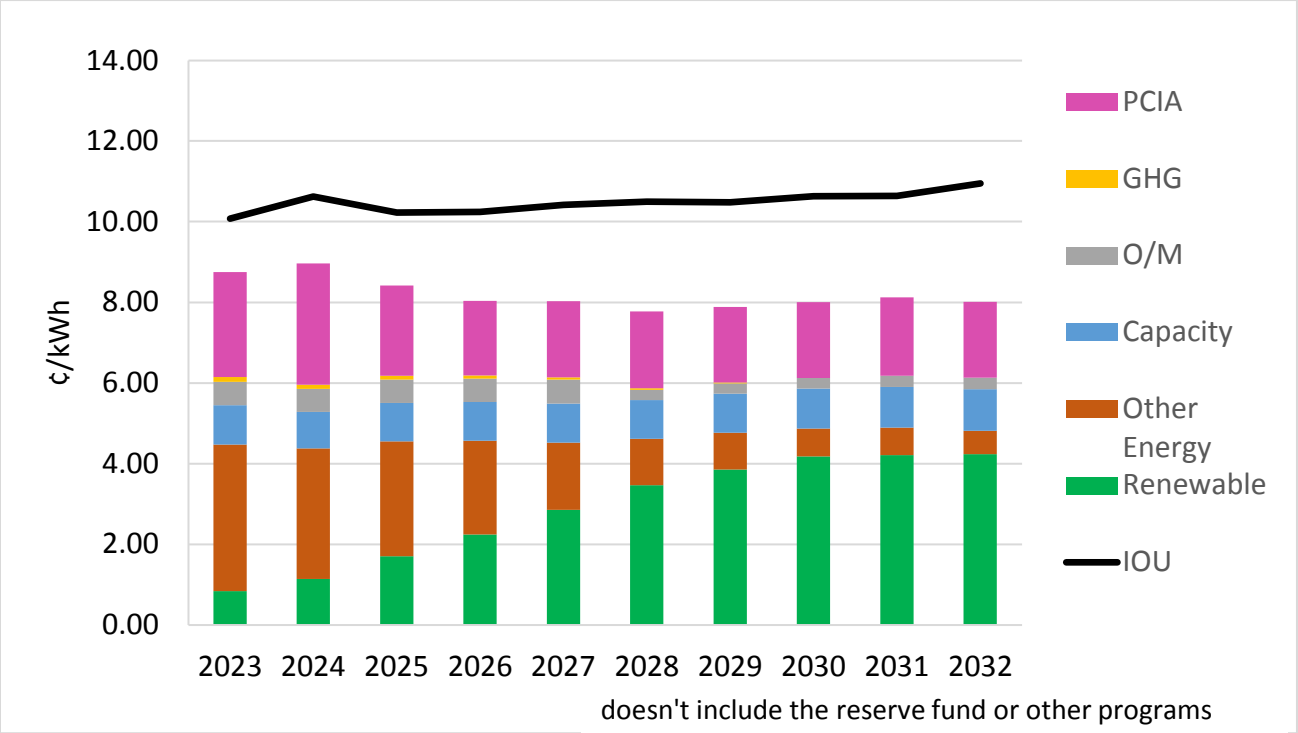
	CCA Scenario 1	PG&E
Renewable	38%	39%
Hydro	31%	13%
Nuclear		34%
GHG-Free	**69%**	**86%**
Gas		15%
System	31%	0%
TOTAL	100%	100%

Supply Scenario 2 (High Renewable Penetration Case)

Figure 17 shows the Supply Scenario 2 projections of average CCA costs and PG&E's generation rates assuming that the CCA serves all customers. As with Figure 16, the bars in the chart show the forecasts of the major cost components of CCA operation, while the single line shows the forecast of PG&E's generation rate.[23] When the bars are below the line, the CCA's average operating costs will be below the PG&E generation rate; meaning that it can offer power to customers at a rate lower than or competitive with PG&E.

[23] The PG&E generation rates in these comparisons are still the default PG&E generation rates, NOT the PG&E Green Tariff. We keep this comparison because a customer would default back to PG&E's standard generation rate no matter the renewable content of the CCA.

Figure 17. Supply Scenario 2 Average CCA Cost Projection



Note that even though by 2032 the CCA will be providing 100% net green power, it will still be incurring some costs for "brown" system power. This is because, as described in the *Renewables – what does it mean to be 100% Green?* section earlier, even when the CCA generates the same number of renewable kilowatt-hours as its customers consume, the timing of the renewable generation and consumption do not align. Therefore, there will be hours where the CCA is effectively selling its excess green generation when it is generating more renewable power than its customers are consuming and purchasing system power when customer consumption exceeds the CCA's renewable generation. When the CCA is selling its excess green energy, those sales revenues are credited against the renewable costs in the green segments of the cost columns in Figure 17, while the costs of system power are shown explicitly as the brown "Other Energy" column segments in Figure 17.

Greenhouse Gas Emissions

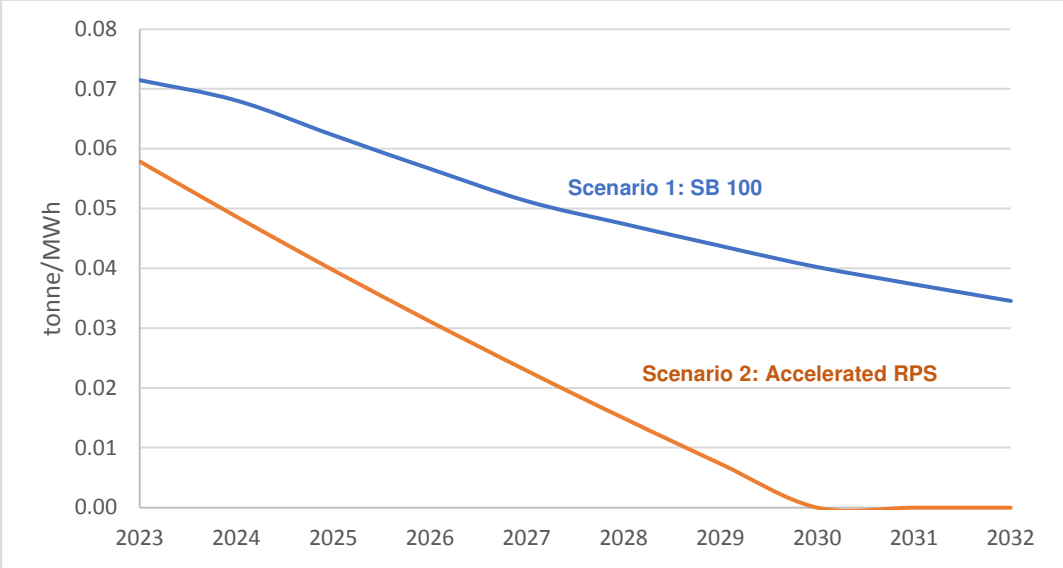
As shown in Table 10, Supply Scenario 2 uses more renewables than Scenario 1 and it has a greater percent of GHG-Free resources. However, its percentage of GHG-free resources is still less than PG&E. This is because Scenario 2 relies less on non-RPS compliant GHG resources like large hydro power and nuclear. Scenario 2's reliance on renewables will increase until it reaches 100% renewable in 2030. This is far sooner than the SB 100 mandate (100% carbon-free by 2045) which dictates Scenario 1's and PG&E's procurement.

Table 8. 2023 CCA and 2018 PG&E Power Content

	CCA Scenario 1	CCA Scenario 2	PG&E
Renewable	38%	50%	39%
Hydro	31%	25%	13%
Nuclear			34%
GHG-Free	**69%**	**75%**	**86%**
Gas			15%
System	31%	25%	0%
TOTAL	100%	100%	100%

Because Supply Scenario 2 increases its renewable percentage so quickly it has greatly reduced emissions as compared to Scenario 1 as shown in Figure 20.

Figure 18. Scenario Carbon Emissions Rates



Chapter 4. Sensitivity of Results to Key Inputs

The results shown in the scenarios above reflect expected market conditions and outcomes with variations only in the amount and type of renewable generation. However, it is unlikely that the conditions assumed in these scenarios will occur exactly as assumed. In order to evaluate the robustness of the analysis, the key variables were identified, and analyses conducted with other assumptions for those key variables to "stress test" the assumptions. The five variables with the greatest potential impact on the overall average cost of the CCA were investigated:

(1) Higher Renewable Supply Costs

(2) Higher Wholesale Market Prices

(3) Higher PCIA

(4) Lower PG&E Rates

(5) High Opt-Out

Other than the variable being tested, all other assumptions are from Scenario 1. The specific assumptions on the sensitivity scenarios are shown in Table 9.

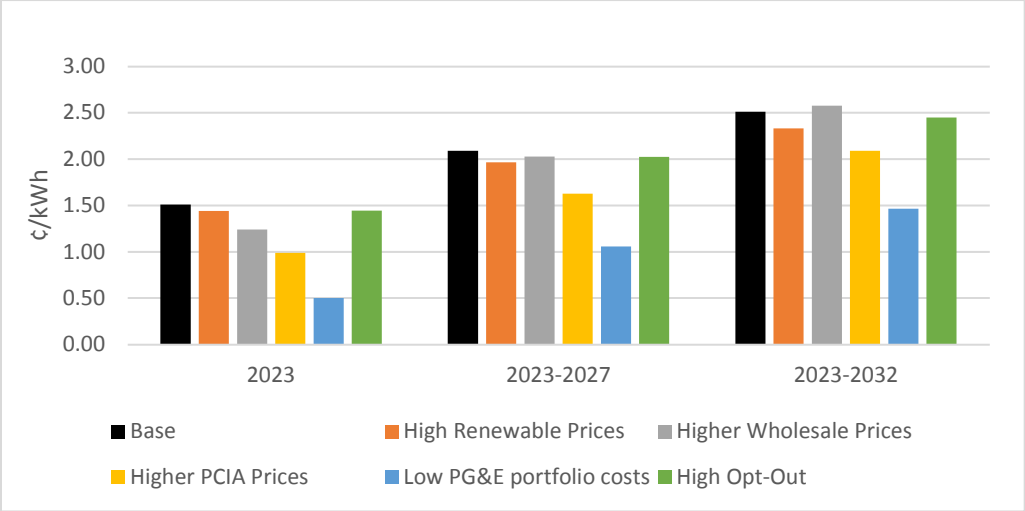
Table 9. Sensitivity Case Definitions

Sensitivity Case	Definition
Base	Supply Scenario 1
Higher renewable costs	Renewable costs 25% higher than Base
Higher gas and power prices	Power Prices 33% higher than Base
Higher PCIA	PCIA 33% higher than calculated in Base
Lower PG&E Rate	PG&E rates 10% lower than in Base
Higher Opt-Out	30% Opt-out

Sensitivity Case Results

Figure 19 summarizes the margins resulting from the modeling of the sensitivity cases. The figure shows the margin in cents per kilowatt-hour between the PG&E rate and the cost to average cost for the CCA to serve its load, including the PCIA. (Each case is discussed in detail below). When the bar is positive, then the CCA's cost of service is less than PG&E's generation rates, which means the CCA can offer a rate discount. Consistent with the rest of the analysis, the margins are the smallest during the first years of operation.

Figure 19. Sensitivity Results



Higher Renewable Power Prices Sensitivity

This sensitivity case evaluates the impact of higher renewable power prices on the CCA's financial viability. Average renewable power prices in this scenario are 25% higher than in the base case scenario through 2032. These higher prices affect both the CCA and PG&E, but they have a greater effect on the CCA because PG&E has significant amounts of renewable resources under long-term contract. The impact of this sensitivity case was a reduction of the 2023-2032 average rate differential by ~0.2¢/kWh relative to the base case.

Table 10. Higher Renewable Power Prices Sensitivity Results, 2023-2032

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
High Renewable Prices	1.4	1.9	2.3
Percent Difference	-4.5%	-5.9%	-7.2%

Higher Wholesale Prices Sensitivity

Wholesale Market prices increases affect power supply costs for both a Stockton CCA and PG&E; however, the higher renewable capacity in CCA's resource mix makes it less sensitive than PG&E. The net effect of higher prices is therefore to decrease CCA rates relative to PG&E rates (i.e., increase the average rate differential). Under the sensitivity conditions considered, the 2023-2032 average rate differential increases relative to the base case by .06¢/kWh.

Table 11. Higher Wholesale Prices Sensitivity Results, 2023-2032

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
Higher Wholesale Prices	1.2	2.0	2.6
Percent Difference	-18%	-2.9%	2.6%

Higher Exit Fee (PCIA) Sensitivity

PG&E's PCIA exit fees are subject to considerable uncertainty. Under the current methodology, PCIA rates can swing dramatically from one year to the next, and this methodology is currently under review and may be adjusted in the coming years. MRW evaluated a stress case increased PCIA rates where they are 33% higher than the base. The impact of this sensitivity case was a reduction of the 2023-2032 average rate differential by 0.42¢/kWh relative to the base case.

Table 12. Higher PCIA Exit Fee Sensitivity Results, 2023-2032

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
Higher PCIA Prices	1.0	1.6	2.1
Percent Difference	-35%	-22%	-17%

Lower PG&E Portfolio Cost Sensitivity

While changes to wholesale prices and renewable power prices affect both the CCA and PG&E, dampening the impact on the CCA's cost competitiveness, reductions to the costs to operate and maintain PG&E's nuclear and hydroelectric facilities would provide cost savings to PG&E that would not be offset by cost savings to the CCA. MRW considered a case in which PG&E's overall generation rates are 10% below the base case, driven by reductions to PG&E's nuclear and hydroelectric portfolio costs. Under such a scenario, the 2023-2032 average rate differential would be reduced by 1.05¢/kWh relative to the base case scenario.

Table 13. Lower PG&E Rates Sensitivity Results, 2023-2032

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
Low PG&E Rates	0.5	1.1	1.5
Percent Difference	-67%	-49%	-42%

High Opt-Out (Lower Participation) Sensitivity

This sensitivity case evaluates the impact of higher opt-out or lower participation on the CCA program. If fewer customers join, CCA rates will generally be higher because the annual CCA costs are invariant to the amount of CCA load. In the High Opt-Out sensitivity, we assume that the Opt-Out percentage is 30% instead of 5%. The impact of this sensitivity case was a reduction of the 2023-2032 average rate differential by 0.06¢/kWh relative to the base case.

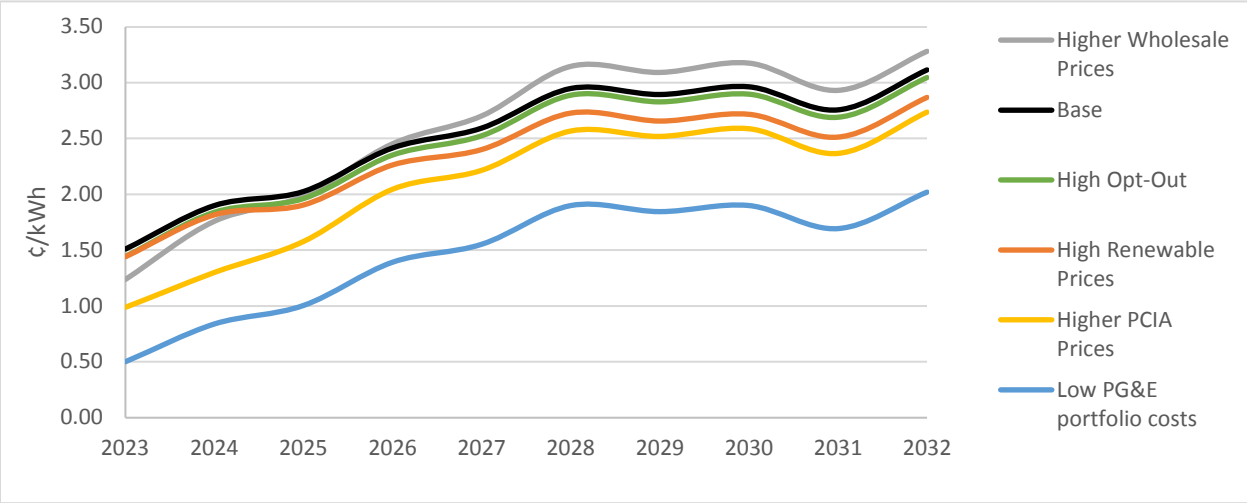
Table 14. High Opt-Out Sensitivity Results, 2023-2032

	Margin, PG&E Rate and CCA Average Cost, ¢/kWh		
	First Year	Average of 1st 5 Years	Average over Study Period
Base	1.5	2.1	2.5
High Opt-Out	1.45	2.03	2.45
Percent Difference	-4.2%	-3.1%	-2.6%

Sensitivity Summary

Figure 20 shows the difference between the PG&E customer rates and the Stockton CCA customer rates (including exit fees) in the base case, and in each of the sensitivity scenarios, for each year from 2023 to 2032. As Figure 20 illustrates, CCA customer rates are lower than PG&E customer rates in each of the individual sensitivity cases in each year. The Low PG&E portfolio costs has the smallest margin.

Figure 20. Difference Between PG&E Customer Rates and CCA Customer Rates Under Each Sensitivity Case, 2023-2032



Chapter 6: Risks & Mitigating Strategies

As discussed so far, there are clear benefits to CCA formation, but there are also risks. This chapter lists many of the larger risks that a Stockton CCA would face—and in fact all CCAs must deal with—along with summaries of how the CCA can address the risk. If Stockton were to pursue CCA formation, it should create a risk management plan that would flesh out more specific risk policies and proceedings.

Financial Risk to City

A single-city CCA is assumed to be formed as a financially independent enterprise, with no dollars flowing into or out of the City's general fund. As such, the general fund cannot be drawn upon by the CCA's creditors, nor can CCA dollars flow into the general fund.

In the event that Stockton joined a JPA-governed CCA, the formation documents for the CCA define the rights and responsibilities of each member of the CCA. Similarly, the JPA's books are completely separate from any of their member cities', and thus isolates the city from any CCA liabilities.

Nonetheless, starting up a CCA often requires a credit-worthy entity to backstop its initial financing. Some, such as CleanPowerSF, use the balance sheet from its existing power enterprise to backstop initial financing. Others have relied upon their host city or county as a backstop to initial financing. For example, MCE's initial bank loans for working capital were guaranteed by Marin County and the Town of Fairfax. After approximately six years, the CCA had demonstrated its creditworthiness and the guarantees were lifted. Still, the JPA cannot place any financial obligations or risks onto any of its members without that member's approval.

Opt-Out Risk

Customers may choose to opt-out of a CCA service before or during their transfer to CCA, or in fact at any time. (Reduced CCA participation due to high rates is addressed in Section B, below). The opt-out risk comes at two district time periods. The first is the initial roll-out of the CCA program. The most recent CCA launches have experienced only very modest opt-outs: around two to three percent of the eligible customers have elected not to take service from their CCA. If there are negative communications to Stockton citizens and businesses during the initial roll out (e.g., bad press of some sort), then the opt-out rate could increase. Second, customers could choose to leave CCA service after the initial opt-out period. The most likely driver of this opt-out risk is expanding Direct Access eligibility, which is addressed in more detail below.

***Mitigation**:* The experience of the prior CCAs suggests that opt-outs at the beginning of service tend to be in a relatively narrow range, allowing for some predictability in initial opt-outs. In addition, prudent power procurement strategies will allow for a reasonable uncertainty in load, especially uncertainty associated with DA expansion, without having to either dump power at a loss or purchase excessive amounts at high spot market prices. CCAs also can charge an "exit

fee" akin to the PCIA to customers who have left CCA service after power contracts have been signed to serve their load, but to date none have been imposed.

Rate and PCIA Uncertainty

A primary goal is to offer power to Stockton residents and businesses at a competitive price relative to PG&E. In this circumstance, competitiveness is tied to the rate offered by PG&E. A number of factors can cause Stockton CCA's net power costs to exceed PG&E's costs. Stockton CCA will have in place risk management plans and options to both mitigate these risks by lowering rates passed on to customers back down to a competitive rate as well as to address unexpected risks.

Changes to PG&E Generation Rates: There could be circumstances that result in PG&E's generation' rates to being less than Stockton CCAs. Assuming that PG&E's rates are based on its cost of service, Stockton CCA obviously has little or no ability to influence the rates that PG&E offers.

Mitigation: While Stockton CCA has little ability to affect PG&E's generation rates, it can take proactive steps to mitigate the impact of reductions in PG&E's generation rate. These steps are discussed below.

Changes to PG&E's PCIA Rate: Assembly Bill 117, which established the Community Choice Aggregation program in California, included a provision that states that the customers that remain with the utility should be "indifferent" to the departure of customers from utility service to CCA service. This has been broadly interpreted by the CPUC to mean that the departure of customers to CCA service cannot cause the rates of the remaining utility "bundled" customers to go up. To maintain bundled customer rates, the CPUC has instituted an exit fee, known as the "Power Charge Indifference Amount" or "PCIA" that is charged to all CCA customers. The PCIA is intended to ensure that generation costs incurred by PG&E before a customer transitions to CCA service are not shifted to remaining PG&E bundled service customers.

Thus, for a Stockton CCA customer to realize an economic benefit (i.e., pay the same or less for electricity), the sum of the Stockton CCA charges plus the PCIA must be lower than PG&E's generation rate.

Mitigation: The PCIA is established at the CPUC. To ensure that this charge is properly calculated and that it is correctly allocated to Stockton CCA customers, it will be necessary for the Stockton CCA to monitor and possibly actively participate in the regulatory proceedings in which the CPUC sets the PCIA.

CPUC "Financial Security Requirement" Risk

Pursuant to CPUC Decision 05-12-041, a new CCA must include in its registration packet evidence of insurance or bond that will cover costs as potential re-entry fees, specifically, the cost to PG&E if the CCA were to suddenly fail and be forced to return all its customers back to PG&E bundled service. Currently, a bond amount for CCAs is set at $147,000.

This CCA bond amount covers PG&E's administrative cost to reintegrate a failed ESP's customers back into bundled service, plus any positive difference between market-based costs for PG&E to serve the unexpected load and PG&E's retail generation rates. Since the CCA bonding requirement has been in place, retail rates have always exceeded wholesale market prices, and thus CCAs' bond requirement have been simply equal to the modest administrative cost.

Mitigation: During normal conditions, the CCA Bond amount will not be a concern. However, during a wholesale market price spike, the bond amount could potentially increase to millions of dollars. But the high bond amount would likely be only short term, until more stable market conditions prevailed. Also, it is important to note that high power prices (that would cause a high bond requirement) would also depress PG&E's PCIA and would also raise PG&E's rates, which would in turn likely provide the CCA sufficient headroom to handle the higher bonding requirement and keep its customers' overall costs competitive with what they would have paid had they remained with PG&E.

Direct Access and Competitive Retail Services

The most likely driver of opt-out risk is expanding Direct Access eligibility. As noted earlier, about 15% of the load in PG&E's territory is served through Direct Access, with an additional 3% likely to occur in 2020 due to the limited expansion of the DA cap from SB 237**.** In addition to modestly expanding the availability of DA service, SB 237 also directed the CPUC to report to the Legislature by June 1 of 2020, a deadline that the Commission has missed on how to open DA completely for all non-residential customers. The CPUC's report on how to fully open DA service was delayed due to the outbreak of COVID-19, and preliminary Staff Report was eventually issued in September 2020. The Staff Report recommended that ESP's demonstrate obligation compliance by submitting robust IRPs and meeting their procurement, RA, and RPS requirements before further DA is opened. If legislation directs further reopening of nonresidential DA, then a re-opening schedule of increments of 10 percent of eligible non-residential load per year should be used under the condition that each expansion meets IRP, RA, and RSP requirements and allows LSEs to fully comply with RA requirements. A fully opened DA market would allow any commercial or industrial customer to switch its provider to a third-party, potentially reducing a Stockton CCA's revenue and creating a mismatch between its wholesale power portfolio and the CCA's load.

Additional expansions are possible, if not likely. If they come to pass, CCAs will have to compete with the DA providers on price and/or other services.

Mitigation*:* As stated earlier, CCAs' history suggests that opt-outs at the beginning of service tend to be minor. Prudent power procurement strategies will allow for a reasonable uncertainty in load, including potential DA expansion, without having to dump power or purchase power at high spot prices. CCAs also can charge an "exit fee" akin to the PCIA to customers who have left CCA service after power contracts have been signed to serve their load, but to date none have been imposed.

Energy Risk Management

A Load Serving Entity (LSE) that is formed as a Community Choice Aggregator (CCA) faces financial risk of procuring energy, capacity, Renewable Energy Credits (RECs) and carbon-free energy (if needed) at a cost that exceeds the revenue that it receives from its retail customers. The other risks that are faced by the CCA roll up into the overarching risk of buying products and operating the CCA at a cost that exceeds revenue.

To mitigate risk, the CCA must establish a sound risk management program that forms the structure for measuring, monitoring, and managing risk. This section describes the elements that comprise risk, components, and functions of a Risk Management Program, and approaches that can be used to manage risk. CCA Risk Management plans can be found on their respective websites.[24]

Legislative and Regulatory Risks

As noted above, the CCA must meet various procurement requirements established by the State and implemented by the CPUC or other agencies. Regulatory risk, which changes the rules under which CCAs operate, affects the CCA's ability to maintain stable procurement activities, manage costs to its customers, and compete with the local incumbent utility and direct access providers.

Regulation of the electric utility sector that affects CCAs at the federal level is provided by the Federal Energy Regulatory Commission (FERC) which regulates the CAISO and at the state level by the California Public Utilities Commission (CPUC) which implements legislation passed by the California State Legislature and signed into law by the governor. Although CCAs are not directly regulated by the CPUC but rather their own local governing bodies, the CPUC is tasked with implementing details of legislation signed into law.

Risk to CCAs is in changes in the regulatory environment that affects the CCAs ability to attract, compete for, and retain customers, the products that it has already procured, and procurement practices going forward. Major issues that are currently evolving include:

- Direct Access
- Resource Adequacy[25]
- Power Charge Indifference Adjustment
- Renewable Energy Purchase Requirement

[24] E.g., San Jose Clean Energy: http://www.sanjoseca.gov/DocumentCenter/View/77619; Silicon Valley Clean Power: https://www.svcleanenergy.org/wp-content/uploads/2019/03/2019-Risk-Management-Policy-F.pdf.

[25] For example, on September 12, 2019, the CPUC issued a proposed decision requiring electric system reliability procurement for 2021-2023 in the Integrated Resource Planning proceeding, Rulemaking 16-02-007. That proposed decision directs Southern California Edison to procure 1,745 MW of Resource Adequacy with a start date ranging between August 1, 2021 and August 1, 2023. Although the decision is not final, if it holds, and Southern California Edison moves forward, it most likely will be long Resource Adequacy and will need to re-sell it or have it allocated to Load Serving Entities.

- Power Content Label Reporting
- Central Procurement Entity
- Energy Provider of Last Resort (POLR)

These include procuring sufficient resource adequacy capacity of the proper type and meeting RPS requirements that are evolving.[26] Additional rules and requirements might be established. These could affect the economic performance of the CCA.

There are potential risks associated with legislative proceedings that affect the Power Charge Indifference Adjustment (PCIA), which is a fee ($/kWh) charged by IOUs to cover the generation costs incurred before a customer changed to a new service provider, such as a CCA. The fee fluctuates per year based on the difference between an IOU's actual generation cost and the current market value of its generation portfolio. The PCIA charge also varies per customer based on the date or "vintage" they enrolled with an alternative provider. CCAs are concerned with changes in the PCIA since significant increases in the PCIA can affect the rate competitiveness of CCAs with IOUs.

Legislation that affects RA creates risks for CCAs since all CCAs, like IOUs and Energy Service Providers (ESPs), have RA obligations. These obligations require LSEs to procure a specific amount of capacity so that this capacity is available to the California Independent System Operator (CAISO) in order to ensure electric service reliability. Drastic changes in RA requirements, particularly increases in obligation, would concern any LSE, especially since recently there was a decrease in available resource adequacy capacity in 2019.

Due to the rise in wildfire risks over the past several years, CCAs are following legislation that addresses wildfire mitigation and public safety power shutoffs (PSPS). Some CCAs are focused on insulating their customers from potential wildfire risks and subsequent power shutoffs.

***Mitigation**:* Regulatory and legislative risk can only be managed though close monitoring of the relevant proceedings at the CPUC and legislation in Sacramento and intervening where needed to advocate for the CCA. If Stockton pursues CCA, it should consider teaming with other CCA, such as through the Cal-CCA trade organization on regulatory and legislative monitoring.

[26] Rules to establish RPS requirements under the new 50% RPS mandate established by SB 100 are currently being debated at the CPUC.

Chapter 7. Distributed Energy Resource Opportunities

This chapter looks at distributed energy resource (DER) opportunities[27] for a potential CCA in Stockton and what benefits and costs may be associated with certain DER opportunities. This topic will be discussed in two sections:

- **Market Characterization** provides a brief overview of fuel use in Stockton and some of the implications related to electrification.
- **Distributed Energy Resource Potential** discusses various considerations for DER that may be impacted by a CCA, including:
  - Energy Efficiency, including potential MWh impact forecasts through 2032;
  - Light Duty Electric Vehicles, including potential MWh impact
  - Distributed Generation, including a discussion on San Joaquin Valley (SJV) participation in solar funding programs and what priorities might be for a CCA;
  - Demand Response, including annual load shapes in Stockton and what priorities might be for a CCA;
  - Other Opportunities, focusing on microgrid attributes.

Market Characterization

Table 15 provides an estimate of energy use and costs based on annual consumption data for recent years indicating that, on average, Stockton residents spend approximately $1.3 billion on various types of energy, most of which are not developed locally but are produced elsewhere and transported into the county through various means (e.g., pipes, wires, etc.).

Table 15. Estimated Stockton Energy Costs

Fuel	Units Consumed	Total Fuel Cost	Carbon Emissions, MTCO2e
Electricity[28] (kWhs)	1,626,935,866	$341,656,532	426,257
Natural Gas (Therms)	108,937,871	$184,105,002	637,287
Gasoline (Gallons)	145,740,000	$581,502,600	1,431,167
Diesel (Gallons)	52,920,000	$207,446,400	592,175
Total Annual		$1,314,710,534	3,086,885

The changing landscape of DERs will impact where this energy is generated and how efficiently it is used. These changes present a new set of economic opportunities at the community level, as

[27] DERs are defined here are energy efficiency, demand response, and distributed generation, distributed energy storage and increasing electrification of buildings and transportation.
[28] PG&E emissions rate (electric): 0.524 lbs CO2 per kWh at https://www.pge.com/includes/docs/pdfs/about/environment/calculator/assumptions.pdf

reduced spending on energy imported into the county converts to local wealth in the form of increased jobs, additional expendable income, and the value of locally-owned assets. Consider, for example:

- For most constituents, opportunities for widespread and significant reductions in annual fuel expenses will increase, freeing up expendable income, much of which will be spent locally and this will have broad impacts. For example, at the municipal level, this will result in increased local sales tax revenue. Conversely, increasing adoption of solar will reduce grid-purchased electricity and raise the value of properties, but may have a negative impact on revenues for cities that levy utility use taxes or benefit from franchise fees associated with energy sales from electric utilities. The conversion of transportation fuel from petroleum to electricity will benefit constituents by significantly reducing fuel costs for light vehicles but this transition might negatively impact funds received by a community from taxes on gasoline and diesel products. Alternatively, this fuel conversion will increase electricity usage and offers the potential to mitigate the reduction in electric utility use taxes and franchise fees resulting from the adoption of distributed generation.

- Opportunities for increased wealth will develop as annual energy expenses are converted into locally owned assets. For example, solar systems or energy efficiency improvements will increase the value associated with housing and commercial buildings stocks. These same DER installations are subject to local code compliance and may trigger a reassessment of property values, thereby resulting in higher property tax revenues. Thus, the current annual expense for electricity that represents an outflow of community monies converts to an asset, benefiting constituents through increased property value, which provides new property tax revenue to the municipality.

- Developing locally owned assets will increase local jobs. For example, the cost to produce fuels (e.g. gasoline, electricity, natural gas, etc.) elsewhere that are imported into a community from distant refineries or electricity generating plants will be displaced by an increase in local labor and material needed to build out DER assets. This presents new wealth opportunities for constituents, and also benefits municipalities through increased income taxes and increased sales tax based on wages spent locally.

- The potential for any emerging markets for carbon should be considered. Electricity is on a path to lower carbon production as renewable sources increasingly power individual homes, commercial buildings, and the broader utility distribution grid. The path to de-carbonize fossil fuels is less defined and will require market interventions. Stockton produces roughly 2.7 million metrics tons of carbon dioxide ($mTCO_2$) annually through the use of fossil fuels and this can be reduced with the support of DER programs that drive the electrification of buildings and transportation

Distributed Energy Resource Potential

The following sections discuss DER opportunities relevant to CCA constituents. For the Energy Efficiency and Light Duty Electric Vehicles sections, we provide a baseline market profile and a summary of CCA programs that are currently open or recently closed, and a forecast of energy

(MWh) impacts. For Distributed Generation (i.e., solar photovoltaic) and Demand Response, we do not provide an assessment of energy impacts but do provide a baseline market profile and a summary of CCA program that are in operation.

The operational CCA programs listed are constrained to programs where the CCA is either fully funding the program or where the CCA is provided supplemental funding for programs being implemented through other program administrators, such as regional energy networks. It should be noted that CCAs frequently promote programs being offered by other administrators without offering additional funding assistance and we have excluded references to these co-marketing efforts.

Energy Efficiency

Baseline Market Profile

Much of the funding for programs that promote the installation of DERs associated with electricity use in buildings, including energy efficiency, comes from public purpose funds (PPFs) collected as a non-bypassable charge on customer electricity bills at an average rate of $0.00998/kWh. Based on Stockton's consumption in 2019 as presented in Table 15, this equates to a collection from Stockton ratepayers of about $16 million for that year. Annually, the CPUC reports to the State legislature on how PPFs are allocated to cover program costs and the CPUC report for 2019[29] indicated that funds collected from Stockton would be allocated to various DSM program categories as shown in Table 16. Importantly, this is not a statement about how much of the funds paid in PPF is actually remitted to Stockton through participation in DER programs, it is simply an estimate of how collected funds would be apportioned according to how PG&E allocates funds across broad DER program categories.

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[29] 2020 Assembly Bill (AB) 67 Annual Report pursuant to California Public Utilities Code Section 913

Table 16. Estimated Program Allocation of Stockton Public Purpose Finds

Program	Allocation	Estimated ($000)
Energy Efficiency	32%	$5,168
Demand Response	11%	$1,819
California Solar Initiative	1%	$211
Self-Generation Incentive Program	10%	$1,591
Electric Program Investment Charge	15%	$2,389
California Alternative Rates for Energy	9%	$1,535
Energy Savings Assistance	21%	$3,442
Other PPP Programs	1%	$90
Total	**100%**	**$16,245**

PPP dollars used for energy efficiency can fund many different types of programs across all customer segments. These segments can be categorized as 1) statewide programs which serve the customers of all of California's three investor-owned utilities, and 2) locally focused programs. Locally focused programs tend to target local constituents based on unique needs and include local government partnerships (LGPs), CCA administered programs, and regional energy networks (RENs). Table 17 compares per capita funding for counties with locally focused programs in 2018[30] including Marin County that has LGP, CCA, and REN programs, San Francisco that has LGP and REN programs, and counties such as Fresno and San Joaquin County that have only LGP programs.

Table 17. Examples of 2018 Local Program

Budgets by County ($ per Capita)

Locally Focused Program	Fresno	San Francisco	San Joaquin	Marin
LGP	$2.9	$4.4	$0.7	$3.3
REN		$2.2		$2.2
CCA		Pending		$1.1
Total Funding	**$2.9**	**$6.65**	**$0.7**	**$6.6**

[30] PG&E 2018 Annual Budget Advice Letter

The design and funding of LGP programs was revised in 2019 and these programs are largely being defunded beginning in 2020. Table 18 is a budget history for San Joaquin County's LGP program funding, the Northern San Joaquin Valley Energy Watch program, from 2017 through 2019 and also the 2020 funding request of $0. Stockton benefits from the Northern San Joaquin Valley Energy Watch program because it is designed to address issues that are specific to San Joaquin County. Because there are no CCA and REN programs in the area, and the LGP is defunded, as of 2021 there will be no locally focused programs funded through PPFs collected from city (or county) constituents. This does not mean that EE programs will not be available to Stockton residents and businesses. Residents and businesses will still have access to all statewide programs being offered by PG&E and these programs cover the majority of EE, and other DER, opportunities across all market sectors. CCAs can still help PG&E drive participation in their programs, however the CCA staff tasked with this support would be funded through CCA operating income, or other sources, not through PPFs already being paid by city constituents.

Table 18. PG&E Local Government Program Budget History ($millions)

Service Area	2017 Adopted	2018 Adopted	2019 Request	2020 Request
Northern San Joaquin Valley Energy Watch	$3.7	$1.5	$0.9	$0
PG&E Total Energy Watch budget	$44.2	$44.8	$31.0	$16.0
Northern San Joaquin Valley Energy Watch as % of PG&E LGP Budget	8%	3%	3%	0%

In terms of savings achieved through energy efficiency programs, Table 19 shows average incremental MWh savings for 2016 through 2019 based on our review of the California Energy Data and Reporting System (CEDARS) database for the PG&E service territory, San Joaquin County, and in the City of Stockton. The table simply shows where savings are being achieved at the sector level and is intended only to compare San Joaquin County and the City to PG&E overall, not if the level of savings (i.e., MWh) are proportionately correct based on local usage patterns and populations. On average, Stockton customers saved about 5,572 MWh energy each year through participation in PG&E EE programs. Of note is that Stockton had a higher percent of savings in the residential sector than in the commercial[31] sector when

[31] We define the commercial sectors as the commercial, industrial, and agricultural markets.

compared to PG&E, which indicates that the markets for delivering EE savings (i.e., contractors, equipment venders, organizations that promote EE, etc.) are active in the city.

Table 19. Average Annual EE Savings by Sector

Sector	MWh			% MWh		
	PG&E	SJ CO.	Stockton	PG&E	SJ Co.	Stockton
Residential	49,905	2,330	1,489	9.6%	19.8%	26.7%
Commercial	471,378	9,448	4,083	90.4%	80.2%	73.3%
Total	521,283	11,778	5,572	100.0%	100.0%	100.0%

Table 20 shows the average distribution of savings by measure category from 2016 through 2019 from CEDARS. High residential sector HVAC EE savings indicate a strong market for delivering successful air conditioning projects.

Table 20. Average Distribution of EE Savings by Measure Category

Measure Category	Residential			Commercial		
	PG&E	SJ Co.	Stockton	PG&E	SJ Co.	Stockton
Lighting	14.9%	7.3%	8.5%	22.1%	60.1%	67.8%
HVAC	21.0%	48.5%	56.7%	9.0%	9.6%	9.6%
Process	0.0%	0.0%	0.0%	11.7%	13.9%	8.3%
Refrigeration	8.0%	1.2%	1.6%	3.7%	6.5%	11.2%
Whole Building Retrofit	4.8%	15.8%	15.4%	1.6%	6.7%	2.6%
Other	51.2%	27.3%	17.8%	51.8%	3.2%	0.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

CCA Programs

California's CCAs offer several programs designed to increase the efficiency of fuel use, including programs intended to save fuel by switching from natural gas to electric appliances. Table 21 lists EE programs currently being funded, either wholly or in part, by active CCAs. Some programs, such as those offered by Marin Clean Energy (MCE) are funded through public

purpose funds collected from ratepayers and administered by MCE, while other programs are funded through other sources, such as CCA operating income or grants, or partially funded through other program administrators, such as RENs where the CCA provides supplemental funding. By and large these programs focus on the residential market and any of these programs are applicable to the Stockton market.

Table 21. CCA EE Programs Currently Active

CCA	Program	Market	Description	Program Type					
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install
Sonoma Clean Energy	Advanced Energy Build	New Construction	Enhancement of CAHP, $7,500 for Advanced Energy Home, $12,500 for All Electric Home	✓					
	Gridsaavy-Heat Pump Water Heater Rebate	Residential and Non-residential	In partnership with BAYREN, SCP is offering its customers a $1,700-$2,000 rebate for replacing their existing water heater with a heat pump water heater	✓					
	Induction Cooking	Residential	Small, portable induction cooktop units to borrow and try out at home				✓		
	Lead Locally	Other	Select 16 local homes to receive free energy & money saving technology upgrades. Upgrades are valued at $5,000 or more		✓				✓
East Bay Com. Energy	Community Innovation Grant	Other	EBCE offers up to $160,000 in funding to non-profit and community organizations "for projects designed to deliver energy-related social and environmental benefits to residents of Alameda county."	✓					

CCA	Program	Market	Description	Program Type					
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install
Marin Clean Energy	MCE Healthy Homes Program	Residential	Provides upgrades to improve the health, safety, and efficiency of Marin County homes (up to $5,000 in incentives) and multifamily properties (up to $2,250 in incentives per unit in addition to the Low Income Family and Tenants (LIFT) Program rebates)	✓					
	Home Energy Savings Program	Residential	Provides qualifying homeowners with free energy savings gift-box (includes a smart thermostat, kitchen faucet aerator, & other energy savings items), and a free virtual home energy assessment with a trained energy advisor	✓			✓		
	Heat Pump Water Heater Rebates	New Construction	MCE, in partnership with Bay Area Regional Energy Network (BAYREN), is offering cash incentives to qualified contractors and installers on the purchase & installation of heat pump water heaters	✓					
Silicon Valley Clean Energy	Building Electrification Technical Assistance	Non-Residential	Free technical assistance for design of new buildings and upgrades			✓			
	Reach Code Development	Codes and Standards	Develops reach codes that help encourage the construction of sustainable buildings and homes			✓			
	Community Engagement Grants	Other	Awarded $75,000 in grant funding to six local nonprofits to reach underrepresented members of our community		✓	✓	✓	✓	

CCA	Program	Market	Description	Program Type					
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install
Peninsula Clean Energy	Reach Codes	Codes and Standards	Provides extensive technical assistance plus a $10,000 incentive to each city that brings reach codes to their councils	✓					
	Heat Pump Water Heater Program	Residential	Peninsula Clean Energy is partnering with the Bay Area wide BAYREN Home+ program to offer additional rebates for installing Heat Pump Water Heaters for San Mateo County residents	✓					
	Community Pilot Awards	Other	PCE has awarded grants of up to $75,000 each for six innovative local pilot projects that reduce greenhouse gas emissions and deliver benefits to the communities of San Mateo County.	✓		✓			✓
Lancaster Choice Energy	Energy Advisor Program	Residential	Free survey to highlight ways to use less energy around the house, including special financing programs for energy saving appliances and equipment.			✓	✓		
	Small Com DI Program	Other	Free energy saving products and free installation, such as lighting and refrigeration upgrades						✓
Central Coast Community Energy	Reach Code Incentive Program	Codes and Standards	Onetime incentive payment of $15,000 to 3CE member jurisdictions to offset staff costs associated with the adoption of a reach code ordinance	✓					
	Multi-Unit Electrification Grants	Residential	Supports housing developers with incentives to choose all-electric residential building designs.	✓					

Energy Impact Forecast

Our forecast for energy efficiency potential for the City is based on the CPUC's *California 2019 Energy Efficiency Potential and Goals Study*.[32] This study establishes EE goals for California's four investor-owned utilities and provides detailed forecasts of EE potential, including various scenarios.[33] Our forecast methodology involves accessing EE potential data for PG&E's service territory and using population ratios to define the potential in San Joaquin County and the City of Stockton. These data were analyzed to define a baseline savings forecast assuming only PG&E EE programs are active in the City, shown as the blue columns in Figure 21.

Once we defined baseline savings that will occur through PG&E programs, we estimated the incremental annual savings that could be achieved through CCA administered EE programs, as shown in the grey columns in Figure 21 and further detailed in Table 22 showing baseline savings, the total savings under our CCA program funding scenario and the incremental CCA program savings over a 10-year forecast horizon. To estimate these incremental savings, we reviewed actual EE savings data recorded in the CEDARs for program years 2016 through 2019 to assess what market sectors are most active in the county and city, and what type of measures are actually being installed. As discussed at Table 19 and Table 20, this analysis indicates that the city has been successful at achieving EE savings in the residential and commercial sectors, also discussed in greater detail in Appendix 2: Supplemental Information. The city has recorded no savings in the agricultural or industrial sectors. In addition, Appendix 2 also shows that the city has been successful at leveraging PG&E programs to install HVAC projects in the residential sector.

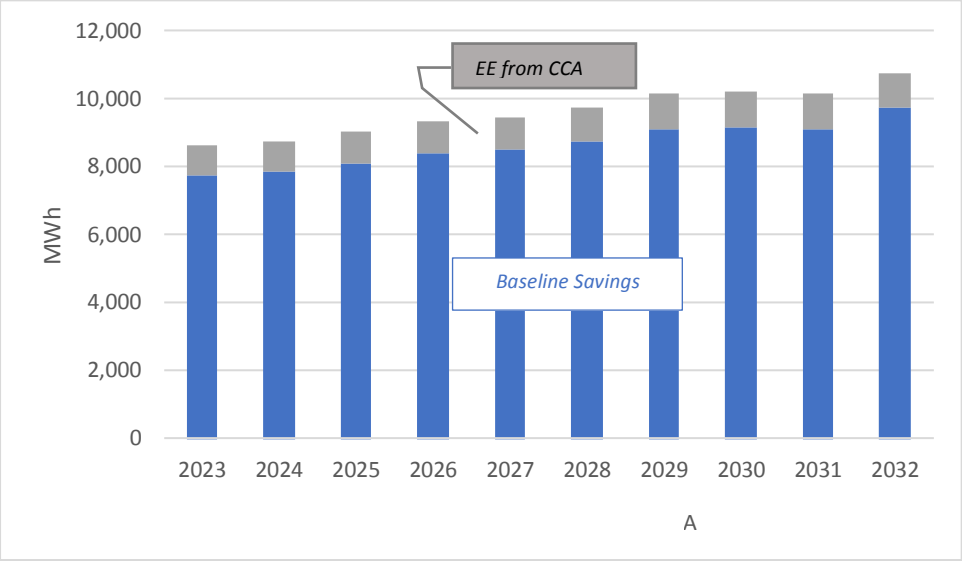
The incremental EE savings forecast for a Stockton CCA is based on a review of the performance of Marin Clean Energy (MCE) programs over time to estimate the savings achievable in Stockton through a comparable level of per capita CCA program funding. We chose MCE as our CCA prototype EE program administrator based on the longevity of their operation, experience as program administrators, and success at innovation. As discussed in our review of past savings performance, we expect that the most successful EE programs operated by a CCA would focus on the residential market with an emphasis on HVAC system upgrades.

[32] These can be viewed online at Cubeplan (analytica.com) Final 2019 Potential and Goals Study
[33] This online tool lets you explore the forecasted results California Investor Owned Utility (IOU) Rebate Programs. This forecast was generated by the 2019 Energy Efficiency Potential and Goals Study funded by the California Public Utilities Commission (CPUC). Accessed September 2020 at https://acp2.analytica.com/acpbeta/shared/#dash/fca42209-b98d-4e83-852f-3d075f99ce9b

Table 22. Local Program Budgets for Various PGE Counties

Year	MWh		
	Baseline	CCA Scenario	Incremental CCA
2023	7,730	8,607	877
2024	7,850	8,741	890
2025	8,101	9,020	919
2026	8,363	9,311	949
2027	8,492	9,455	963
2028	8,737	9,728	991
2029	9,110	10,143	1,033
2030	9,183	10,224	1,042
2031	9,110	10,143	1,033
2032	9,771	10,769	998

Figure 21. Annual Incremental EE MWh



Using these savings assumptions, Table 23 shows the annual program budget for a funding scenario similar to MCE, as discussed above, and the resulting economic benefits. The total program budget shown in Table 23 represent the total annual EE program costs to be funded through a CCA, including program administration costs (about 36% of budget) and programs incentives that would be paid to ratepayers or businesses installing the EE projects (about 64% of budget). The economic value in Table 23 represents our estimate of the value derived from these EE programs, including the total value of material installed, an estimate of what material would be produced locally, and the value of the local installation labor spent on these projects.

This is not intended to define the full economic benefit of EE but did serve as inputs into the broader economic impacts modelling appearing elsewhere in this report.

Table 23. Program Budgets and Economic Value

	Costs			Economic Value		
Year	Total Programs	Program Admin	Program Incentive	Total Material	Locally Produced Material	Local Installation Labor
2023	$1,448,213	$512,914	$935,299	$1,870,597	$18,706	$2,338,247
2024	$1,499,321	$525,737	$973,583	$1,947,167	$19,472	$2,433,958
2025	$1,568,728	$538,881	$1,029,848	$2,059,695	$20,597	$2,574,619
2026	$1,641,992	$552,353	$1,089,639	$2,179,279	$21,793	$2,724,099
2027	$1,700,250	$566,162	$1,134,089	$2,268,178	$22,682	$2,835,222
2028	$1,776,400	$580,316	$1,196,085	$2,392,169	$23,922	$2,990,212
2029	$1,873,105	$594,823	$1,278,282	$2,556,564	$25,566	$3,195,704
2030	$1,930,357	$609,694	$1,320,663	$2,641,326	$26,413	$3,301,658
2031	$1,967,931	$624,936	$1,342,995	$2,685,990	$26,860	$3,357,487
2032	$1,970,505	$640,560	$1,329,945	$2,659,889	$26,599	$3,324,862

Light Duty Electric Vehicles

Baseline Market Profile

As presented in Table 15, gasoline and diesel vehicle fuels account for roughly 61% of our estimate of annual energy costs in Stockton. Most of these vehicles will have electric options in the coming years, however passenger cars and light-duty trucks account for the majority of fuel use and these vehicles will likely be the first markets where electric vehicle adoption occurs at scale. Our forecast of energy impacts and CCA programs focuses on the light duty vehicle market. We reviewed data from various sources, defined in Appendix 3: Data Sources, and Table 24 presents our estimate of fleet characteristics for these vehicles in San Joaquin County, indicating approximately 532,000 vehicles operating in 2019, the vast majority of which were gasoline fueled. Based on a ratio of the population of Stockton and San Joaquin County, we estimate that about 41% of these vehicles are located in the city.

Table 24. San Joaquin County Fleet and Vehicle Characteristics

Type	Passenger Cars	Light-Duty Trucks
Fleet Size	358,461	173,574
Fleet Distribution	67.4%	32.6%
Gas %	98.8%	99.8%
Diesel	1.2%	0.2%
MPG Gasoline	23	22
MPG Diesel	26	24
Mile/kWh Electric	4.0	2.8
kWh/Mile	0.3	0.4
kWh/gal	5.9	7.8
VMT	11,244	11,346
Annual Fuel Use (GGE)	480	524
kWh / Vehicle	2,811	4,085
mTCO2 vehicle / Year	5.0	5.5
Retirement VMT	120,000	120,000
Economically Useful Life (Years)	10.7	10.6

We also reviewed the 2018 California Vehicle Surveys, an analysis completed by the CEC to gain insights into vehicle types and driving patterns[34]. Table 25 provides additional detail on the passenger car market, including an analysis of fuel savings potential for low-income constituents, defined as households at or below 200% of the federal poverty level (FPL) and households above that threshold. This analysis indicated that converting the average low-income household fleet of 1.8 cars to electric cars would save about $2,072 in fuel costs if charged at the average charging cost of $0.315 per kWh versus a fuel savings of $2,876 annually if these same constituents had access to off-peak charging on PG&E's EV-A rate of $0.129 per kWh. We did not analyze the additional maintenance savings realized from EV ownership.

[34] California Vehicle Survey

Table 25. Estimated Annual Fuel Use and Costs Savings

Income Cohort	San Joaquin County			California		
	Below 200% FPL	Above 200% FPL	SJ Co. Avg.	Below 200% FPL	Above 200% FPL	State Avg.
Miles per year driven	9,544	11,838	11,244	10,281	9,760	9,810
Miles per gallon	18.7	25.0	24.1	25.9	29.2	28.9
Estimated vehicles per household	1.81	1.94	1.92	1.68	1.96	1.93
Estimated Gallons per year fuel	926	920	921	667	657	657
Est kWh	4,325	5,741	5,537	4,316	4,793	4,741
Est gasoline cost	$3,434	$3,414	$3,416	$2,475	$2,437	$2,437
Est kWh cost - Ave Statewide	$1,363	$1,809	$1,745	$1,360	$1,510	$1,494
Est kWh cost - PG&E Ave Off Peak	$558	$741	$714	$557	$618	$612
Savings at Ave Charging $/kWh	$2,072	$1,605	$1,671	$1,115	$927	$943
Savings at PG&E EV-A Off Peak	$2,876	$2,674	$2,701	$1,918	$1,819	$1,825

Access to charging for low-income customers, including access to low-cost charging such as the PG&E EV-A off peak rate discussed at Table 24, is likely a barrier to EV adoption because many low-income customers reside in multifamily dwellings where access to charging is limited. This is due in part because of various market barriers in the multifamily sector

consistent with those defined in the MultiCharge San Diego pilot project funded through the CEC[35], including:

- Outreach to building owners, property managers, and electric vehicle drivers showed that recruiting eligible buildings is difficult for a variety of reasons. Specifically, the lack of awareness and demand for electric vehicles, installation costs, and the disruption to parking operations were the main challenges faced in recruiting buildings.

- The cost of purchasing and installing electric vehicle service equipment (EVSE), the disruption to parking operations, and the lack of demand for EVs are the largest barriers preventing wider adoption of EVSE at multiple dwelling units (MDUs). At present there are very few numbers of EVs on the road and a disproportionately small share on the road that are owned by low-income MDU residents.

As discussed in the MultiCharge program report, "installing EVSE into existing MDUs can be challenging, and many site assessments performed concluded that it would either be cost prohibitive or technically unfeasible to install EVSE. Issues with capacity in the electrical panel and distances between utility meters, parking spaces and electrical panels, can be very expensive to upgrade in order install EVSE. As a result, numerous MDUs interested in EVSE dropped out after the site assessment and the estimate of installation costs was quantified. Also, the disruption to parking operations caused by EVSE presents a challenge in existing MDUs. Moving or assigning parking spots can be very disruptive to the leasing contracts that stipulate and assign private or shared public parking spaces."

In addition to access to on-site charging, it appears that access to public charging may also be limited for low-income multifamily residents. Because EV adoption to date has been targeted at higher income customers, it is possible that most public charging station are located in more affluent areas that have fewer low-income multifamily dwellings. While we did not identify specific research supporting this assumption, Figure 22[36] shows the location of publicly available public EV charging stations and Figure 23. SB 535 Disadvantaged Community Map[37] shows disadvantaged community areas (in red) in Stockton, as defined by SB 535, which appears to show a lack of public EV charging infrastructure.

[35] MultiCharge San Diego. Prepared by ChargePoint for the California Energy Commission. February 2016, CEC-ARV-12-024
[36] From Stockton, California EV Charging Stations | PlugShare accessed November 2020
[37] At SB 535 Disadvantaged Communities | OEHHA (ca.gov) accessed November 2020

Figure 22. Public Charging Station Locations in Stockton

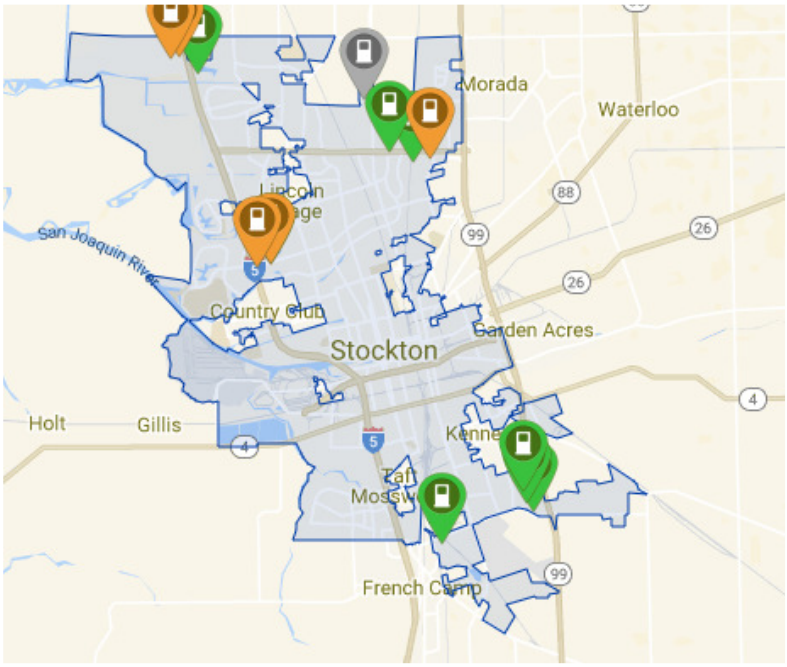
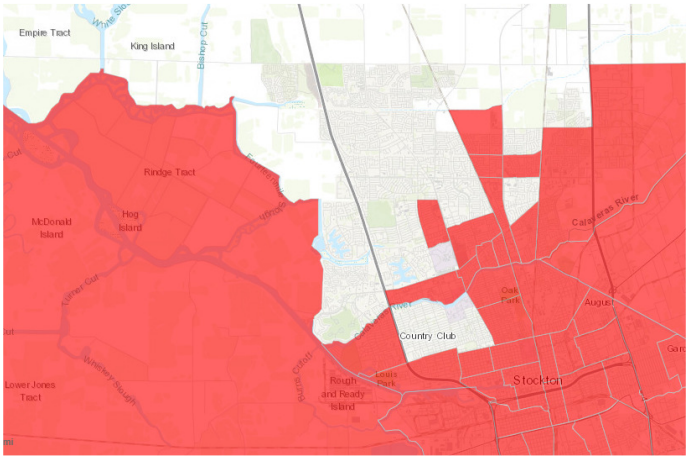


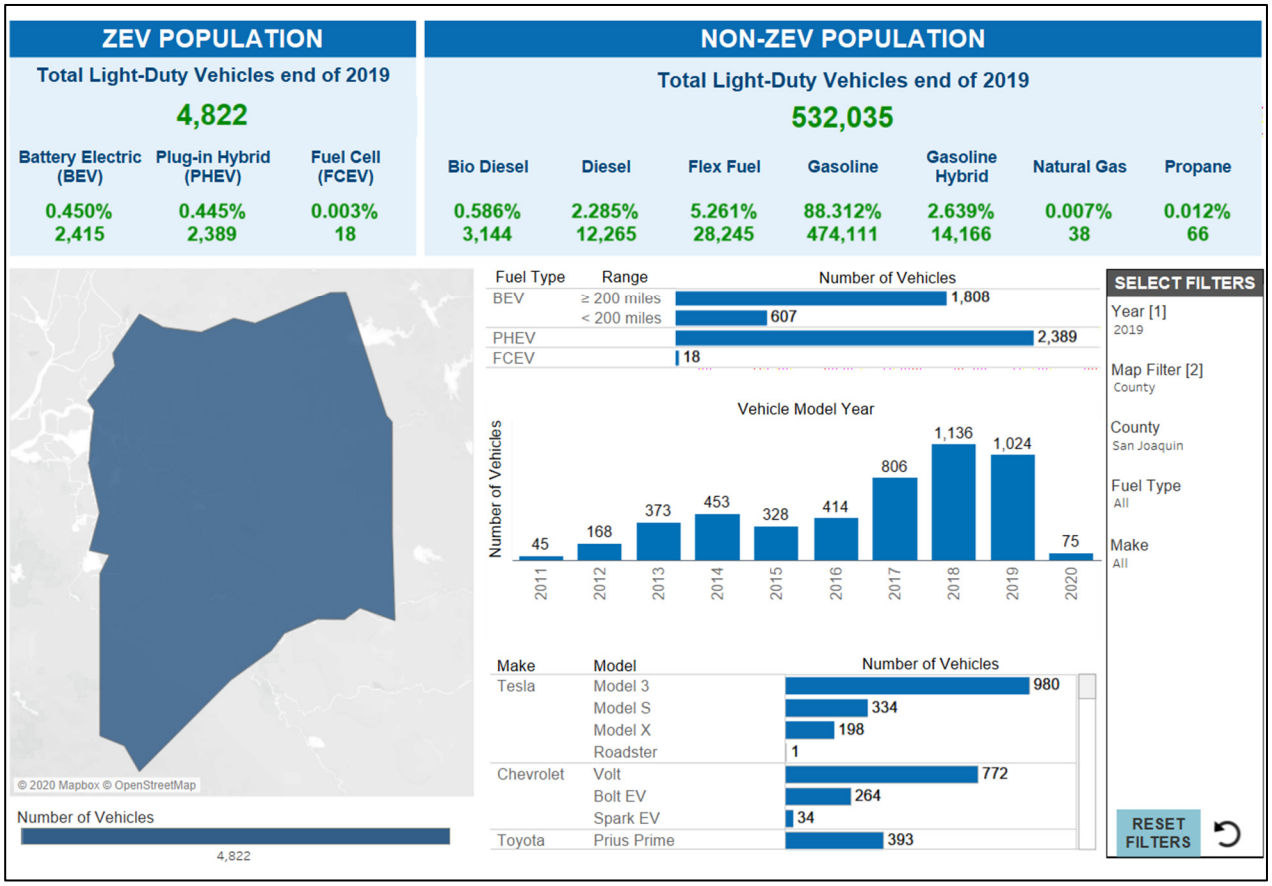
Figure 23. SB 535 Disadvantaged Community Map



The California Energy Commission has partnered with the Department of Motor Vehicles (DMV) to track the sales and population of light duty zero emission vehicles (ZEVs) in California.[38] Based on these data,

Figure 24 shows an estimate of light duty vehicle populations in San Joaquin County, indicating that current EV saturation is approximately 0.9%.

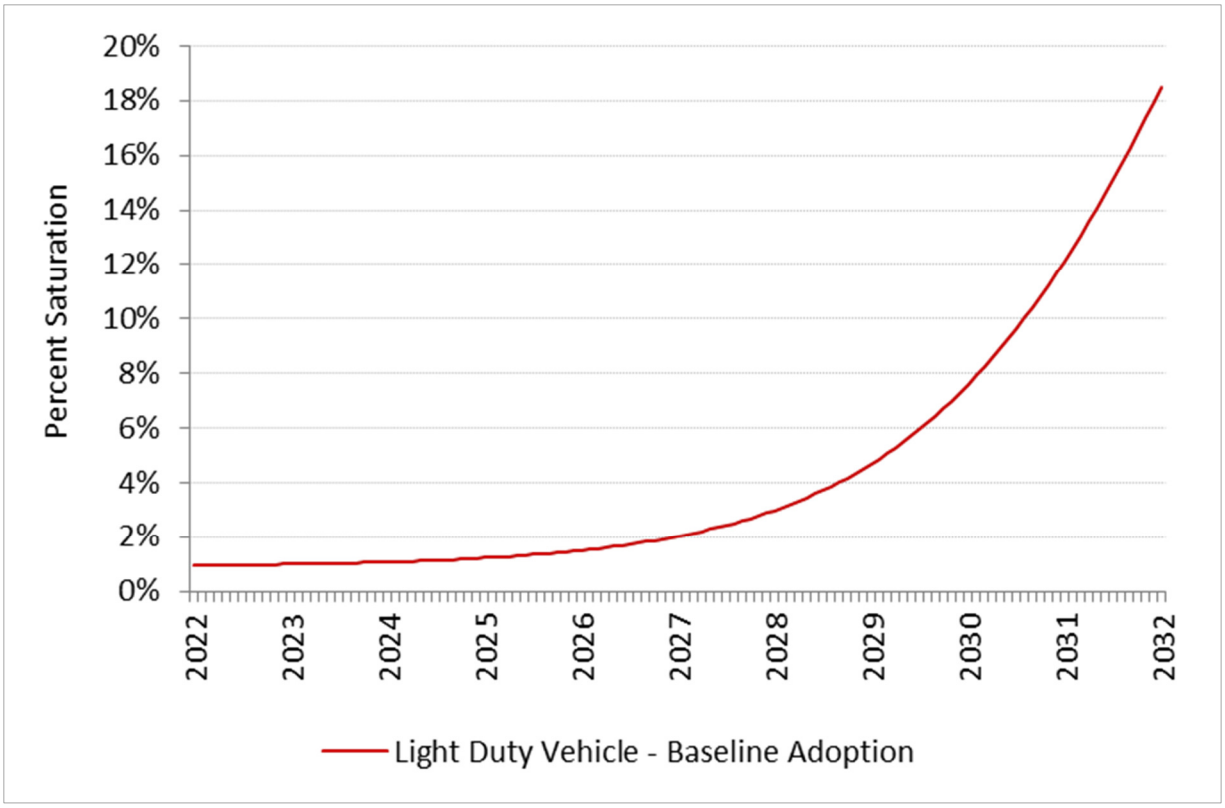
Figure 24. Vehicle Population in San Joaquin County



EV adoption will be driven by many factors, including California's goals of adopting 1.5 million light duty ZEVs in California by 2025 under Executive Order B-16-2012 and the adoption of 5 million light duty ZEVs in California by 2030 under Executive Order B-48-18 detailed in the CEC's 2019 Integrated Energy Policy Report.[39] Figure 25 provides our forecast of the adoption rate for light duty electric vehicles in Stockton necessary to meet the Governor's overall EV adoption target for California by 2030, as defined in these executive orders.

Figure 25. Light Duty Vehicle Baseline Adoption

[38] At https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics accessed October 2020
[39] 2019 Integrated Energy Policy Report



CCA Programs

Most of California's CCA's are active in promoting EV solutions and Table 26 lists current programs funded through California's CCAs. While all of these programs are applicable to a Stockton CCA, the Priority Zone Direct Current Fast Charging (DCFC) Incentives program offered by Silicon Valley Clean Energy should be reviewed based on the limitations and barriers to EV charging for low-income multifamily residents previously discussed.

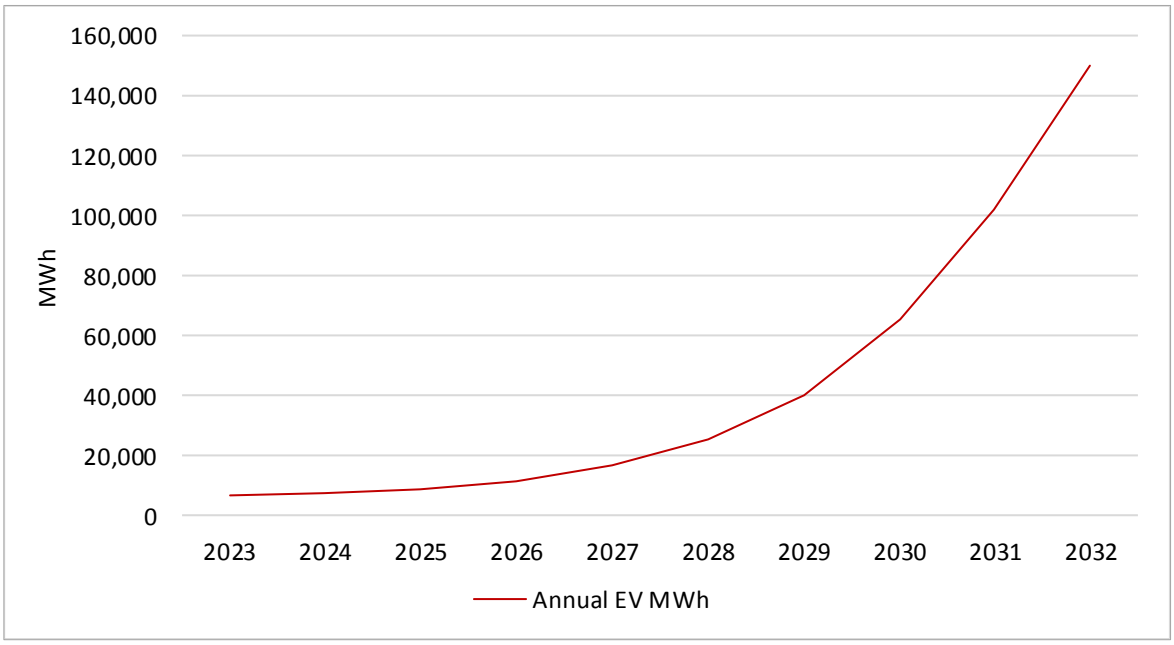
Table 26. CCA EV Programs Currently Active

CCA	Program	Market	Description	Program Type			
				Incentives	Financing	Tech. Assist.	Info. & Ed.
Sonoma Clean Energy	GridSavvy-EV Charger Rebate	Residential	A customer pays up front 50% of the cost of an EV vehicle charger, and once it is installed and activated, SCP reimburses the customer for the charges (installation charges not included)	✓	✓		
Silicon Valley Clean Energy	FutureFit Assist- EV Charging	Residential	Silicon Valley Clean Energy is providing qualifying customers with free assistance to install EV charging on the customer's premises			✓	
	Priority Zone DC Fast Charging (DCFC) Incentives	Multifamily / Non-Residential	Deployed near-certain clusters of multi-unit dwelling developments as a way to provide more access to charging for residents	✓	✓	✓	
Peninsula Clean Energy	Used EV Rebate Program	Residential	Provides qualifying customers with free assistance to install EV charging.	✓	✓		✓
	New EV Rebate Program	Residential	Peninsula Clean Energy will offer a customer a $700 rebate for new plug-in hybrid electric vehicles or a $1,000 rebate for new all-battery electric vehicles.	✓	✓		✓
Lancaster Choice Energy	Ready, Set, Charge	Residential	$250,000 in vouchers to eligible LCE customers to be used towards the purchase or lease of a qualifying Electric Vehicle or Plug-in Hybrid Vehicle.	✓			
Central Coast Com. Energy	Zero Emission School Bus Program	Commercial	Partnership between Central Coast Community Energy and Monterey Bay Air Resources District, to fund 100% of the cost to replace 6 traditional school buses with electric buses	✓			

Energy Impact Forecast

Based on the fleet and vehicle characteristics defined in Table 24, Figure 26 provides our forecast of the MWh sales resulting from the EV adoption. A CCA scenario forecast for EV adoption was not run as there is general uncertainty about how such programs actually drive additional sales versus the role of the programs serving broader goals, such as addressing potential equity goals related to access to EV charging infrastructure.

Figure 26. Annual EV MWh



Distributed Generation

Baseline Market Profile

This report's review of the potential for distributed generation was limited to reviewing certain performance metrics related to San Joaquin County and identifying CCA programs related to distributed solar generation. Community or utility scale solar potential was not reviewed for this report. In general, Stockton and San Joaquin County have high solar insolation[40] and it is unlikely there is a technical limit on the generating capacity that can be installed relative to city and county needs.

This report evaluated the California Solar Initiative (CSI) program impact in Madera, Merced, Fresno, and San Joaquin counties by using the CSI Working Dataset[41] to get a general overview of the program's installed generation capacity. This report also referred to the SOMAH (Solar on Multifamily Affordable Housing) dataset to see how CSI incentives have fared in this particular market within the four counties. CSI's SOMAH program offers up to $100 million yearly in financial incentives to install PV systems in multifamily affordable housing communities. The CSI working data set revealed that San Joaquin produced the least amount of nameplate watts per capita out of the four counties, and the second least watts per person in the SOMAH dataset. Table 27 provides the cumulative nameplate watts per capita installed, indicating that, overall, participation in San Joaquin in each program has lagged behind the comparison counties.

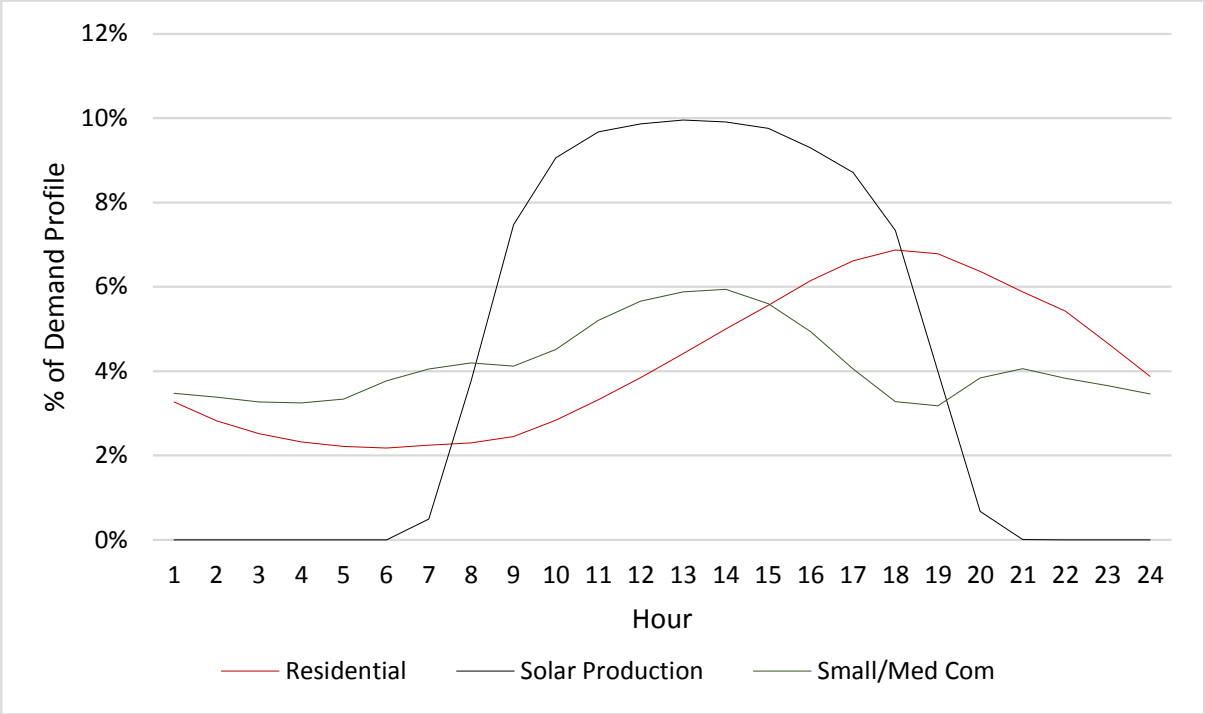
[40] A measure of the solar energy that is incident on a specified area over a set period of time.
[41] At CaliforniaDGStats accessed October 2020

Table 27. Comparison of Installed Solar Capacity by County

County	Nameplate Watts per Capita	
	SOMAH	CSI
Fresno	4	181.7
Madera	5.5	106.7
Merced	0.9	60.9
San Joaquin	2	50.8

An emerging regulatory issue is the misalignment of solar production with customer time of use demand. This report reviewed full year 2019 PG&E daily consumption history for Stockton customers and Figure 27 shows consumption data for PG&E rates during a 2019 weekday in August and also data from CAISO on solar production for that same day which shows the misalignment between solar output and residential demand. Driven by the need for air conditioning, residential demand peaks late in the day and into the evening as solar output drops, while small and medium commercial demand aligns well with the solar generation profile. In general, the misalignment of solar energy production with residential usage is discouraging CCA programs that incentivize residential solar installations that do not include the ability to manage evening peak loads. Instead, programs are incentivizing solar projects that must include storage batteries or thermostat controls to help manage evening residential peak loads.

Figure 27. Summer Load Shape Comparisons



CCA Programs

Several California CCAs provide programs supporting customer installation of solar generation systems as summarized in Table 28, which focus on either solar that is combined with battery storage or providing incentives for installation on properties supporting income-qualified residents, including funding for direct installation. Any of these programs would be appropriate for application through a Stockton CCA.

Table 28. CCA DG Programs Currently Active

CCA	Program	Market	Description	Program Type				
				Incentives	Financing	Tech. Assist.	WE&T	Direct Install
Marin Clean Energy	MCE's Solar Rebate	Residential	MCE has allocated $535,000 in rebates to income qualified MCE customers and property owners who install solar	✓				
Silicon Valley Clean Energy	Lights on Silicon Valley	Residential	Develops a network of customer-sited solar and storage systems	✓				✓
	Battery Storage Assistant	Residential and Non-residential	Helps install battery storage, solar, and/or other clean power technologies for homes and businesses	✓	✓	✓		
Peninsula Clean Energy	Power On Peninsula	Residential	Up to $1,250 rebate on a solar and battery back-up system	✓				
Central Coast Community Energy	Project Sunshine: Affordable Housing Solar Program	Residential	Provides funding for 20 income-qualified homeowners to receive no-cost solar. Connects people to clean energy jobs by incorporating workforce development into each project.	✓			✓	✓

Demand Response

Baseline Market Profile

Demand response includes programs and strategies that reduce load during critical times, such as during grid reliability events or during peak price events when the cost of procuring and using electricity is high. Increasingly, IOU programs are focusing on the residential market because in many jurisdictions this is the primary source of demand during critical hours. This is illustrated in Figure 28, which shows average seasonal load shapes in 2019 by sector, including a large spike in residential demand during the summer, driven primarily by residential air conditioning load.

Figure 28. Average MW per Hour Seasonal Analysis by Market Sector

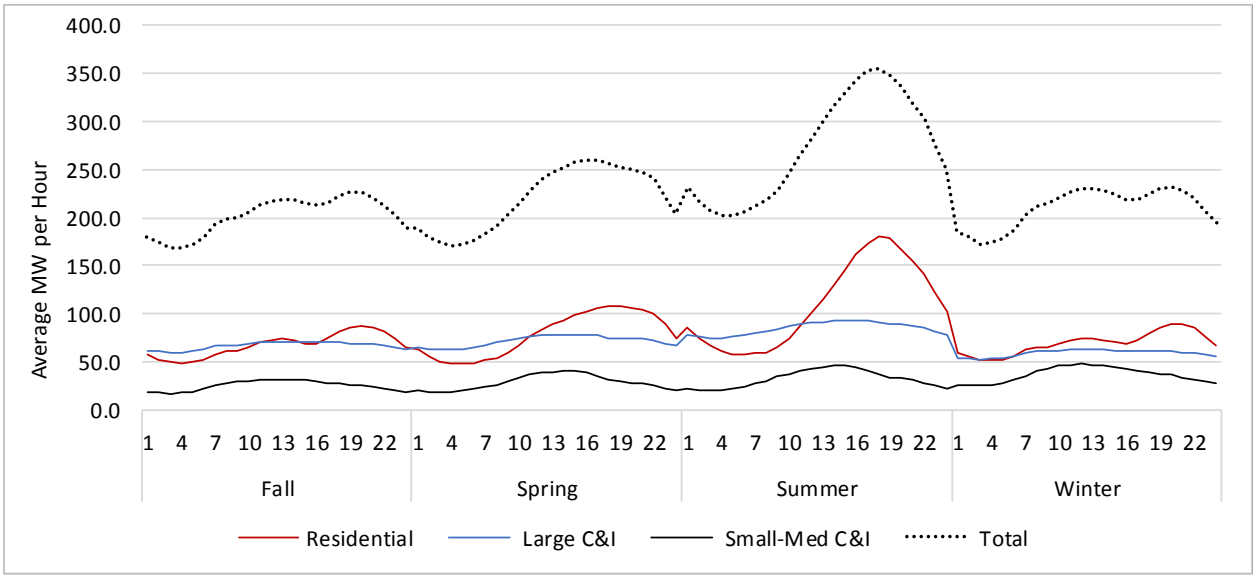


Figure 29 shows the average 2019 seasonal load profile for the residential sector in Stockton, further illustrating the issue of high residential demand late during the day in the summer, including peak use late in the day as residents return home late in the day and turn on air conditioners and other appliances. Seasonal variation in residential daily demand profiles contrast with seasonal load profiles for the commercial sector, which are relatively constant as shown in Figure 30.

Figure 29. 2019 Average Residential Daily Load Profile Weighted by Season

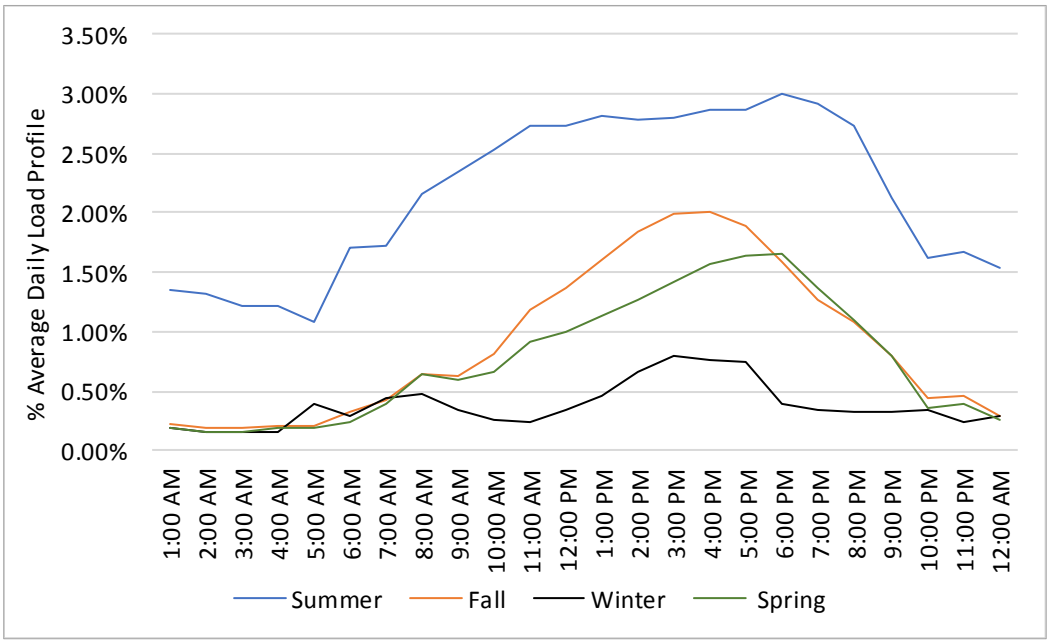
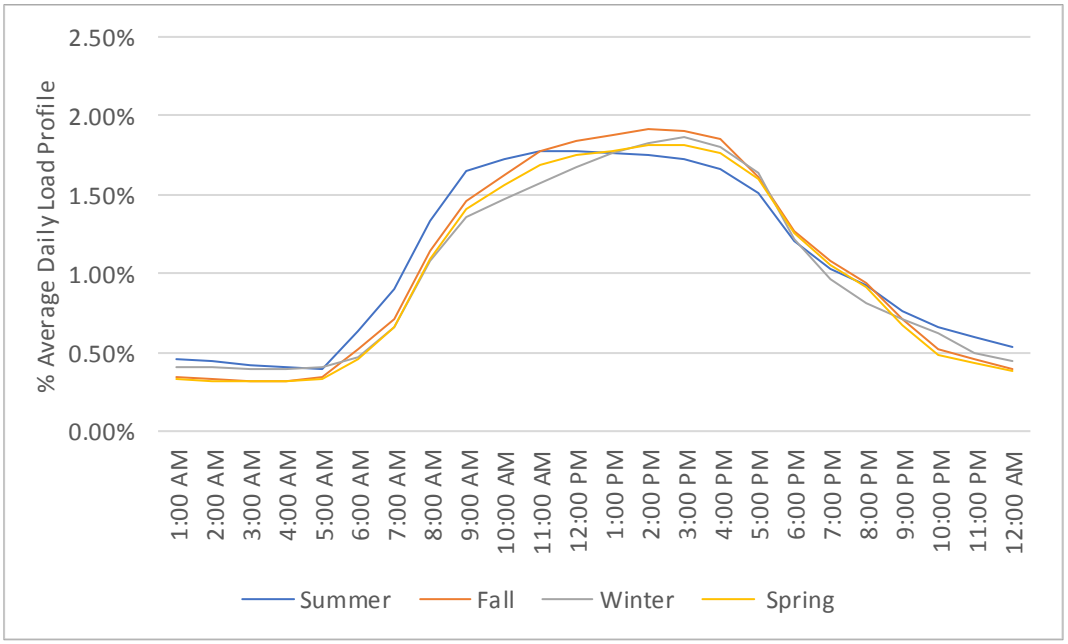


Figure 30. 2019 Average Small-Medium Commercial Daily Load Profile Weighted by Season



CCA Programs

We did not identify any CCA programs currently in operation that specifically address grid resiliency and reliability issues, or CCA power procurement strategies driven by residential peak demand. The programs in operation, as shown in Table 29, are intended to provide battery systems that manage the discrepancy between solar production and residential energy use, as also discussed at Table 28, or are programs that are intended to provide backup for critical equipment, such as the Power On Peninsula program that provides free backup portable batteries for medical needs.

Table 29. CCA DR Programs Currently Active

CCA	Program	Market	Description	Program Type			
				Incentives	Financing	Tech. Assist.	Direct Install
Silicon Valley Clean Energy	Lights on Silicon Valley	Residential	Develops a network of customer-sited solar and storage systems	✓			✓
	Battery Storage Assistant	Residential and Non-residential	Helps install battery storage, solar, and/or other clean power technologies for homes and businesses	✓	✓	✓	
Peninsula Clean Energy	Power On Peninsula - Medical Device	Residential	Free portable backup batteries for medical needs	✓			
	Power On Peninsula	Residential	Up to $1,250 rebate on a solar and battery back-up system	✓			

Other Opportunities

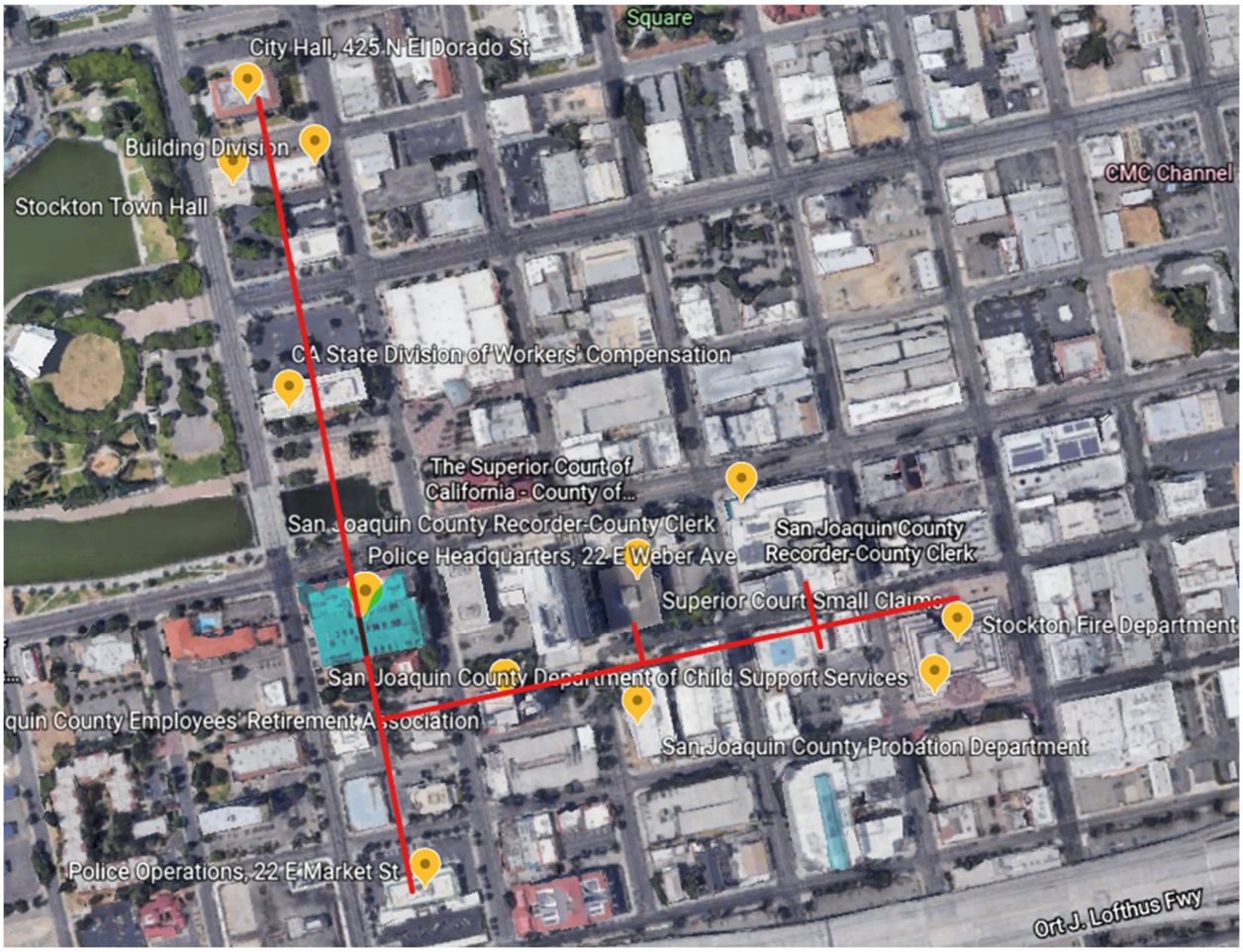
Microgrids

Microgrids are local energy grids that can connect a set of buildings to power using distributed energy resources. They are known as an alternative to the traditional, larger utility driven power-grid because they produce and distribute power locally and can be relied upon when the larger grid fails. They can operate both alongside and independently from the central power grid. In a time when utility prices and demand are increasing, and power outages are commonly occurring, microgrids are becoming increasingly popular. In addition to their reliability, microgrids can also reduce energy costs. Although microgrids are still considered to be a newer

technology, there are several successful microgrids providing power to facilities and communities across California.[42]

Figure 31 provides an illustrative example showing how a microgrid might apply to public facilities in downtown Stockton. This report did not assess the viability of such an installation but note that a microgrid is likely viable within a Stockton CCA service territory and may be a reasonable topic for further research. As of the development of this report, there are no CCA programs specifically designed to advance microgrid installations.

Figure 31. Example of Stockton Microgrid Area



[42] At https://gridintegration.lbl.gov/ accessed October 2020

DER Implications for a Stockton CCA

CCA's are serving as viable platforms to help drive the adoption of DERs. These programs are focused explicitly on the communities that the CCAs serve, and while the benefits can be significant, they require funding and organizational commitments to implement.

Our analysis of public purpose funds (PPFs) indicates that San Joaquin County and the city have lower per capita funding for locally focused programs than do other jurisdiction, such as the counties of Marin and San Francisco. Locally focused programs include local government partnerships (LGPs), CCA administered programs, and regional energy networks (RENs) that are designed to aggressively serve local needs. We estimate that in 2021 Marin and San Francisco counties will have approximately $6.60 in per capita in funding for locally focused programs, while San Joaquin County and the city will have no funding for these programs. This funding disparity is further compounded by the fact that residents in San Joaquin County use more energy per capita, and pay higher per capita PPFs, because SJV is a hot climate and energy used for air conditioning is higher than in Marin or San Francisco. CCAs can help partially address this funding disparity by becoming program administrators that can access PPF's to implement EE programs.

This does not mean that EE, and other DER programs, will not be available to Stockton residents and businesses. They will still have access to all programs offered by PG&E across their service territory and these programs cover the majority of DER opportunities across all market sectors. CCAs can still help PG&E drive participation in their programs, however the CCA staff tasked with this support would be funded through CCA operating income, or other sources, not through PPFs already being paid by city constituents. Beyond PPFs, other funds are available from the California Energy Commission and California Air Resources Board in the form on grants or low interest loans. CCAs can serve an important role in organizing strategies and accessing these funds on an ongoing basis, such as leveraging the city's recent success accessing Transformative Climate Communities funds.

Our review finds that there is significant potential for DERs in Stockton that could in part be met through a CCA. For example, the adoption of electric vehicles will increase in the coming years, but barriers to installing EV charging systems at multifamily dwellings will likely have a disproportionate impact on low-income residents, of which a large percentage live in multifamily units. There are numerous existing and emerging technology and programmatic solutions to this barrier and a CCA could be an effective implementation platform for these solutions.

The adoption of distributed solar systems in San Joaquin county appear to lag behind other counites in the region, and several California CCAs have implemented programs that support solar projects that include battery storage systems. Solar projects that include battery systems help customers manage their energy costs, while also offering a utility an opportunity to better management the cost of electricity procured during summer peak periods. These programs could be replicated by a Stockton CCA.

A Stockton CCA need not self-fund DER program, nor bear the full burden of program administration. Over the past several decades local programs have emerged that use funds collected through electricity bills to pay for energy efficiency and other types of DER investments. These programs address a community's unique needs and have been managed by Local Government Partnerships, Regional Energy Networks (RENs) as well as CCAs. As of 2021, none of these local programs have operated in Stockton or San Joaquin County.

Chapter 8. Macroeconomic Impacts

This chapter describes how the establishment and operation of a CCA will affect the economy of Stockton over the period from 2023 to 2032. The chapter describes how each of the components of the proposed Stockton CCA will impact the community:

- Start-up and operation of the CCA;
- Bill savings resulting from reduced rates;
- Locally developed solar generation;
- Energy Efficiency targeted to lower income residents and small businesses

Each of these activities will produce multiple impacts with respect to jobs and income within the community. When communities purchase goods or services, such as electricity supply, from outside their region, the dollars flowing out are referred to as leakage. Up to this point, a significant portion of the dollars used to purchase electric service leak out of the City of Stockton and San Joaquin County. The CCA will reduce some leakage through purchases of goods and services that originate within the county. The operation of the CCA itself will create some jobs with income that can be spent locally. Most of the electric supply will still originate outside the area in the form of power purchase agreements made by the CCA but those purchases will produce lower electric rates, creating surplus dollars that can be spent within the Stockton economy. An increasing percentage of electric supply will consist of locally constructed and operated solar generation. This new generation will produce jobs and generate income that can be spent within the Stockton economy. Solar development will also increase the reliability and resilience of the local electric infrastructure, producing additional customer savings that are not addressed in this analysis. Much of the increased energy efficiency will be delivered by local contractors and their workers, producing additional energy savings for residents and businesses, and increasing affordability and business competitiveness

Overview: How a CCA Will Affect the Local Economy

Types of Impacts. In general, effects occur via three mechanisms:

Direct CCA Administration and Operation Spending, Installation of Solar Generation, and Energy Efficiency Spending. For the CCA, this includes Start-Up and continuing operations, spending for staffing, supporting office equipment, and professional-technical services and I/T-database services. Start-up operations is a short-term effect, while continuing operations is a long-term effect.

Energy Efficiency spending includes the costs of any local manufacturing/ assembly, costs of transporting equipment, warehousing, installation, supervision, and quality controls.

Solar generation installed within the city and the surrounding San Joaquin County will involve the cost of the solar generation equipment, its installation and maintenance, and operational integration within the electric grid serving Stockton.

The direct spending will also result in the creation of jobs within Stockton and the surrounding area.

CCA spending will include a small number of jobs for start-up and additional long-term jobs for operations of the CCA. With the exception of data management, these jobs will be local and include office and administrative support, sales, business and financial operations, and management.

Solar generation jobs will be created for the construction of new solar generation within the city and/or surrounding area. These jobs will include a variety of construction jobs created during several periods over the next 10 years. Additionally, jobs will be created pertaining to the operations and maintenance of the solar installations, as well as the integration of the generation into the area electric grid.

Energy Efficiency work will focus on lower income homes and small businesses. This will include several job functions, including the transport of materials, (primarily heating, ventilation, and air conditioning (HVAC) equipment) to warehouses and job sites, contractor installation of efficient HVAC systems, home weatherization, supervision and quality control, and potential local fabrication.

Direct Effects on Energy Bill Savings. Cost savings provide local households with additional money to spend on local consumer goods and services. They provide local commercial and industrial energy customers with a reduction in their "cost of doing business," which makes them competitive when serving wider markets. These savings enable commercial and industrial customers to grow further and increase employment. Municipal energy customers can provide more local services with the money saved on energy bills. These impacts will continue to grow over the long-term. Additional savings from energy efficiency sponsored by the CCA will further increase these effects.

Indirect and Induced Economic Impacts. The abovementioned economic effects will directly grow local economic activity, leading to further purchases from local suppliers of materials and services (referred to as "indirect effects"). The economic effects will also lead to re-spending of the additional worker wages on consumer purchases within the community (referred to as "induced effects").

Direct, indirect, and induced effects occur over time. There is also a spatial component to these effects because the economy of Stockton can indirectly benefit from spillover impacts on supplier activities in surrounding parts of San Joaquin County and other adjacent counties. All of these various impact elements are covered in this report.

The Stockton CCA analysis also anticipates that additional benefits from energy efficiency will be provided to lower income residential customers and small businesses. Energy efficiency services will augment the direct, indirect, and induced effects described above through additional investment in the City of Stockton and the surrounding San Joaquin County. For example, additional jobs and associated income will result from direct installation of energy efficiency measures. Additionally, getting the materials and services to local residents will also

require transport services to local warehouse and storage, the operation of warehouses, and further transport to job sites.

Analysis Methodology

In the following sections, we explain how the direct spending effect on Stockton is calculated on the basis of the expected CCA budget, and how the direct energy cost savings for Stockton customers are calculated on the basis of the expected change in energy rates and customer energy use, as well as additional energy efficiency services. The underlying factors that are the basis for these calculations are derived from energy scenarios and financial analyses in prior chapters.

To calculate the indirect and induced economic consequences, a multi-regional input-output (I-O) economic model was used to represent the economy of Stockton and its interactions with the rest of San Joaquin County and other adjacent counties. An I-O model is an accounting system that shows how each type of industry/organization buys and sells products and services from other industries. It also shows the extent to which the inter-industry purchases and sales occur within the study area or occur as flows of money to and from industries located outside of the study area. This kind of accounting system makes it possible to calculate the expected indirect and induced economic effects that occur as a consequence of direct changes in spending and income among local industries. The economic modeling process also included estimates of how rate changes would affect the economic competitiveness and growth of local industries, as well as increased energy efficiency investments.

Spending Impacts from CCA Administration and Operations

The setup and operation of a CCA comes at a cost, which is reflected in the rate impact calculations. However, this money is spent on employing local workers and purchases of materials and support services, some of which are also locally located. The spending therefore creates jobs and income in the local economy. This section explains the spending impact.

Calculation of CCA Start-Up and Operation Spending.

The estimated cost of a CCA start-up is $8.1 million (not including working capital), which will be spent within Stockton over the period of 2021-2022. That money will go to administrative services, computer and office equipment, and staff salaries. The tasks will include the setup and provision of customer enrollment or opt-out, financial accounting, and billing systems. These activities will generate income for local area workers and businesses, as well as suppliers located elsewhere in surrounding county areas. Table 30 shows start-up spending impacts.

Table 30. Impacts of CCA Start-up

Impact Measure	Direct	City Total
Jobs	15	23
Wages Paid (2019$)	$1.2 million	$1.5 million
Gross Regional Product (2019$)	$1.3 million	$1.7 million
Business Output (Revenue) (2019$)	$1.8 million	$2.9 million

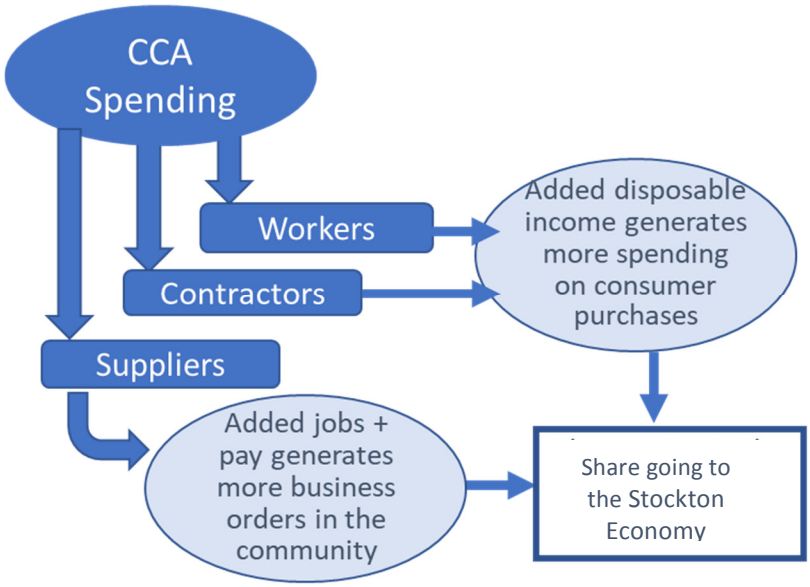
Over the long-term, there will be continued CCA operation with a staff assumed to be approximately 19 employees plus contractors, with an annual operating budget averaging $3.4 million/year. That budget will grow by an estimated 2.3% annual inflation over time, from $4.1 million in 2021 to $6.6 million by 2032. Table 31 shows a breakdown of the average yearly expenditures including administration, office operations, and purchases of professional services and data management from contractors. These activities will generate additional income within the economy of Stockton and surrounding areas. There are other costs associated with energy purchases in later years, including the payoff of start-up loans and PG&E exit fees that will affect CCA operating costs and energy rates, but these costs will not directly affect the local economy. Data management services are expected to be performed entirely outside the city and county and are not included in the impacts.

Table 31. Expected Breakdown of 2021-2032 Annual Average CCA Operation Spending

Average Annual Operations Expenditures 2021-2032	
Category	Annual Averages
Administration - Labor	$1.7
Administration – Non Labor	$1.1
Professional Services	$0.6
Data Management Contractor	$2.7
Average Total Annual Expenditures	$6.1*

Economic Impact of CCA Operational Spending. The $6.1 million of average yearly CCA spending (from Table 31) will go into the pockets of workers, suppliers, and contractors, with some but not all being located in Stockton. These money flows are illustrated in the graphic below.

Figure 32. CCA Spending Impact Flow



To calculate the economic impact of these money flows for Stockton, we utilized the IMPLAN input-output economic model. The model calculated the portion of direct CCA spending that will represent income to local workers and revenue for local product and service suppliers. This represents the "direct effect." Specifically, the $18.4 million of the 2023-2032 CCA operations labor budget (from Table 31) was presumed to go to jobs located in Stockton. Regarding other CCA spending, it was also assumed that most of the professional service and supplier spending, but only a small share of the data management spending, will generate income in Stockton.

The economic model calculated how direct purchases of supplies and staff salaries will recirculate in the economy, leading to further "indirect" (supplier) impacts and "induced" (worker wage re-spending) impacts. The total of direct, indirect, and induced impacts is shown in the "City Total" column of Table 32. The results indicated a total impact on annual worker income in the city ($5.2 million/year) that is larger than the direct worker income impact ($3.3 million per year). The model results also show that the CCA budget spending will ultimately lead to a total average impact of $8.3 million per year of business revenue in Stockton.

Note that in Table 32, "output" represents total business sales (revenues) occurring in the study area. "GRP" is gross regional product, which is the portion of output that represents income to workers and net income to businesses. "Wages" represent the portion of GRP going to pay workers, suppliers and contractors, located in Stockton and surrounding counties. A small part of the spending may go to local manufacturers for equipment such as sheet metal fabrication for Heating, Ventilation, and Air Conditioning (HVAC) equipment installed by program contractors.

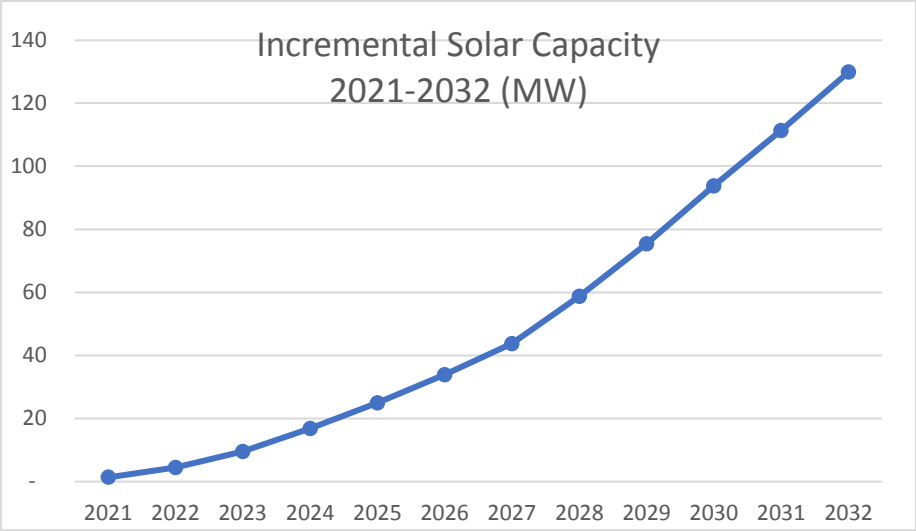
Table 32. Impacts of CCA Operations Spending

Impact Measure	Direct	City Total
Jobs	16	29
Wages Paid (2019$)	$2.2 million	$2.8 million
Gross Regional Product (2019$)	$2.3 million	$3.0 million
Business Output (Revenue) (2019$)	$3.3 million	$5.2 million

Impacts from Solar Energy Installations

While most of the CCA's renewable energy capacity will be provided through power purchase agreements (PPAs) the CCA plan includes the development of solar generation within the city and county. This involves construction, management, and maintenance, all throughout the feasibility study period. **Figure 33** shows the incremental increases in solar capacity, starting with 2021, through the study period 2021-2032. Solar capacity will increase from 1 MW to 130 MW.

Figure 33. Solar Capacity Additions 2021- 2032 (MW)



Economic Impacts

Economic impacts from locally constructed solar are estimated to stem primarily from construction labor (100% in county). There are additional construction impacts from periodic construction spending, engineering services, O&M labor, and O&M parts and materials spending. The primary occupations in which jobs will be generated are concentrated in architecture and engineering, construction, legal services (for permitting and regulatory work),

and building services (cleaning/maintaining solar equipment). Table 33 shows the economic impact contributions of the projected solar generation to the CCA's overall impact.

Table 33. Impact from Solar Construction

Impact Measure	Direct	County Total
Jobs	45	70
Wages Paid (2019$)	$3.3 million	$4.4 million
Gross Regional Product (2019$)	$4.4 million	$6.4 million
Business Output (Revenue) (2019$)	$7.4 million	$10.8 million

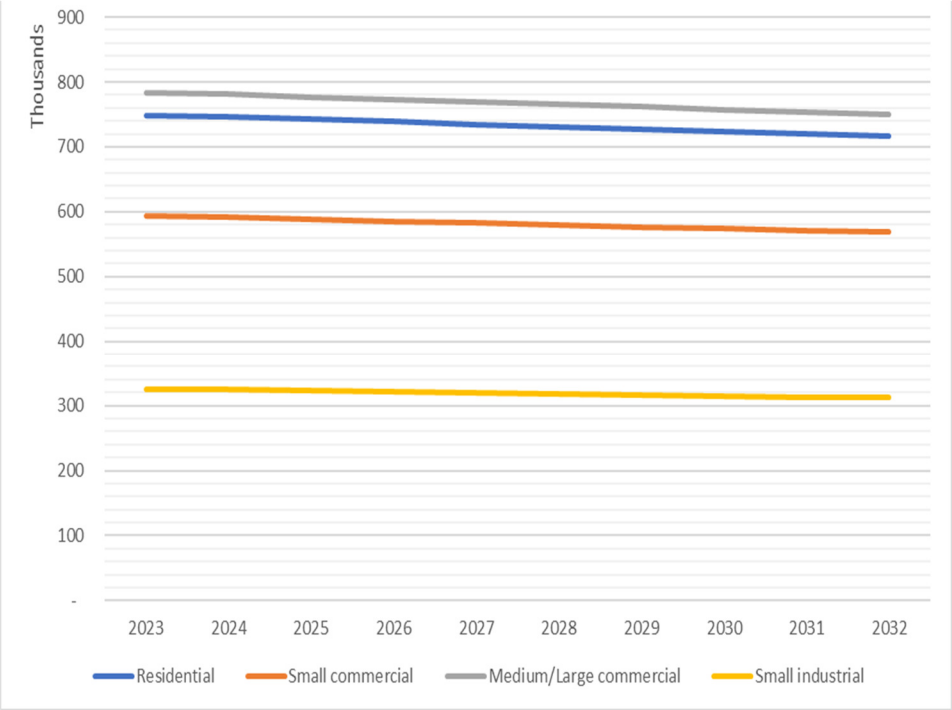
Energy Bill Savings

Energy Consumption Projections

Stockton electricity customers will achieve savings in four ways. The first of these is in the form of bill savings due to reduced energy rates. Absent active energy efficiency initiatives, we do not project any significant decreases in energy consumption over between2023-2032. This relatively flat consumption pattern has been typical for California as a whole and is not expected to change in the near future. Thus, electric bill savings will result primarily from the reduced rates offered by the CCA.

Figure 34 shows expected energy consumption across all customer classes. The breakdown of electricity consumption is shown alongside the Figure 34.

Figure 34. Energy Consumption Projection (MWh) by Class



Percentage of 2023 load by rate class	
Residential	30%
Small commercial	24%
Medium/Large commercial	31%
Small industrial	13%
Large Industrial (yes, zero)	0%
Ag & Pumping	2%
Lighting	1%
Total	100%

Energy Bill Savings Due to Rate Reductions

To calculate the value of anticipated energy bill savings, we utilized information from prior chapters that calculate the expected rate reduction by rate class, and then multiplied it by the expected energy load occurring in each rate class. The expected savings in energy costs will be distributed across different rate classes and will affect the economy in different ways that are explained in the discussion of economic implications.

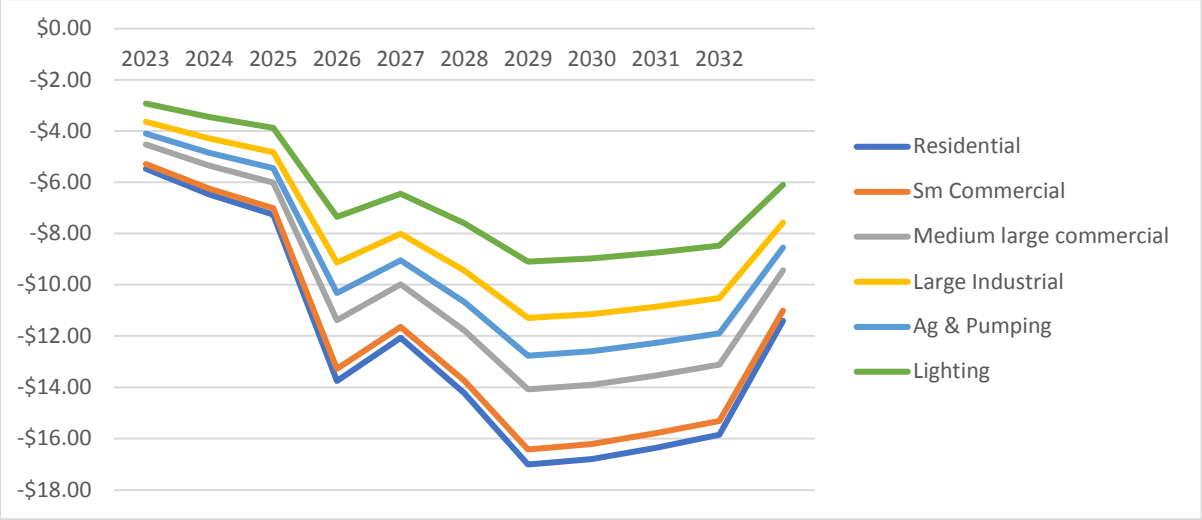
Calculation of Energy Bill Savings. Figure 35 shows the expected average rate reduction by rate class. These rate reductions are not guaranteed but use one-half of the expected annual margins.

The total expected energy bill savings for Stockton electricity customers is the product of the expected rate reduction multiplied by the expected level of consumption. For instance, the expected average rate savings in 2026 is roughly $12/MWh (Figure 35) and the expected consumption in that year is roughly 2.5 million MWh (Figure 34). Hence the total expected cost savings for that year is $12/MWh x 2.5 million MWh = $30 million.

Figure 35 shows the breakdown of cost savings by customer rate class for an average year. It shows that of the roughly $25.2 million in bill savings for an average year, 33% of the savings will be for residential customers, 24% will be for small commercial customers, 31% will be for

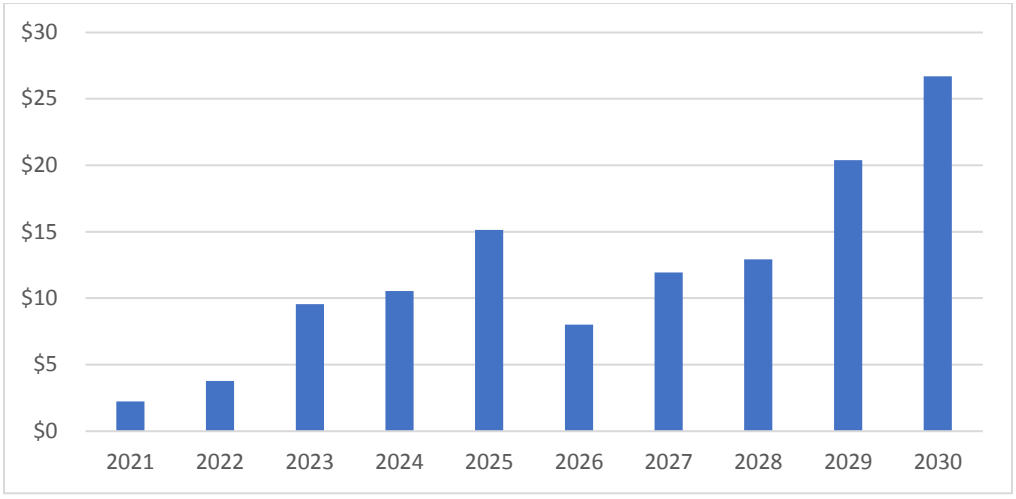
medium/large commercial customers and 13% will be for small industrial customers. Street lighting and agriculture customers account for the remainder.

Figure 35. Average Rate Reduction (dollars per MWh) by year and rate class



The cost savings will vary over time. Figure 36 shows that the savings increases from roughly $10 million per year in 2023 to over $26 million per year by 2030. There is a dip in 2026-2027 due to debt payments on startup costs. The average energy bill savings for the 10-year period is actually $25.2 million per year for all customer segments combined.

Figure 36. Annual Energy Bill Savings for Stockton from reduced rates ($ millions)



Economic Impact of Energy Bill Savings. The expected energy bill savings will enable both additional consumer spending and business productivity benefits in the local economy. In the economic model, cost savings generate the following impacts:

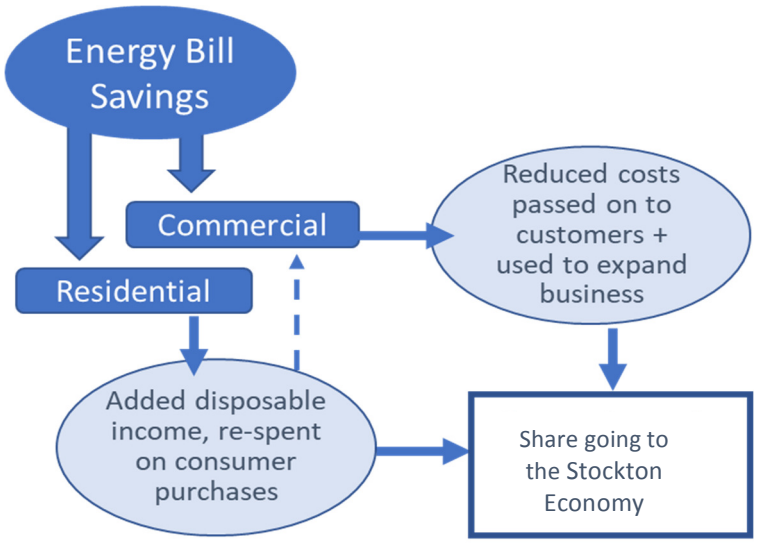
- Energy bill cost savings for residential energy customers becomes added disposable income for Stockton residents, potentially generating additional local consumer spending.

- Energy bill cost savings for small-medium commercial energy customers represent added business income and increased business productivity. Commercial businesses typically pass on added net income in the form of lower prices for customers (thus increasing disposable household income) as well as added investment in expansion to create more jobs. Either way, the cost savings can increase the money available to be re-spent in the community.

- Savings for industrial customers enables that sector of the economy to be more cost-competitive in serving broader markets beyond the local community. However, Stockton does not have large industrial activity so the competitiveness effect will be muted.

These money flows are captured by the economic model and are illustrated in the Figure 37 below. Some but not all of the money will flow to Stockton businesses. That direct effect, in turn, will lead to further "indirect" effects on sales for local product/ service suppliers as well as "induced" effects of worker wage re-spending.

Figure 37. Bill Savings Impact Flow



Total impacts on the growth of Stockton's economy are shown in Table 34 below. Actual impacts will vary by year, reflecting differences in consumption as shown earlier in Figure 34.

Table 34. Impact of Energy Bill Savings, Annual Average: 2023-2032

Impact Measure	City Total
Jobs	235
Wages Paid (2019$)	$9.3 million
Gross Regional Product (2019$)	$13.0 million
Business Output (Revenue) (2019$)	$21.2 million

Impacts from Energy Efficiency Implementation

This study anticipates new energy efficiency implementation, primarily in residences of low-income customers and small businesses. This spending is in addition to energy efficiency provided through utility programs, state-funded programs, and other sources. The energy efficiency programs are projected to primarily improve/replace Heating, Ventilation, and Air Conditioning (HVAC) equipment, and add programmable thermostats for lower income residential customers. As with spending on CCA operations, energy efficiency spending impacts the Stockton economy and the surrounding San Joaquin area. This includes wages to pay workers, suppliers, and contractors located in Stockton and surrounding counties. A small part of the spending may go to local manufacturers of equipment such as sheet metal fabrication for equipment installed by program contractors. With a focus on HVAC equipment, which is manufactured outside the region, there will also be spending on transport, warehousing and distribution to contractors.

Table 35 below shows the average annual economic impact contributions of the projected energy efficiency measures to the CCA's overall impact.

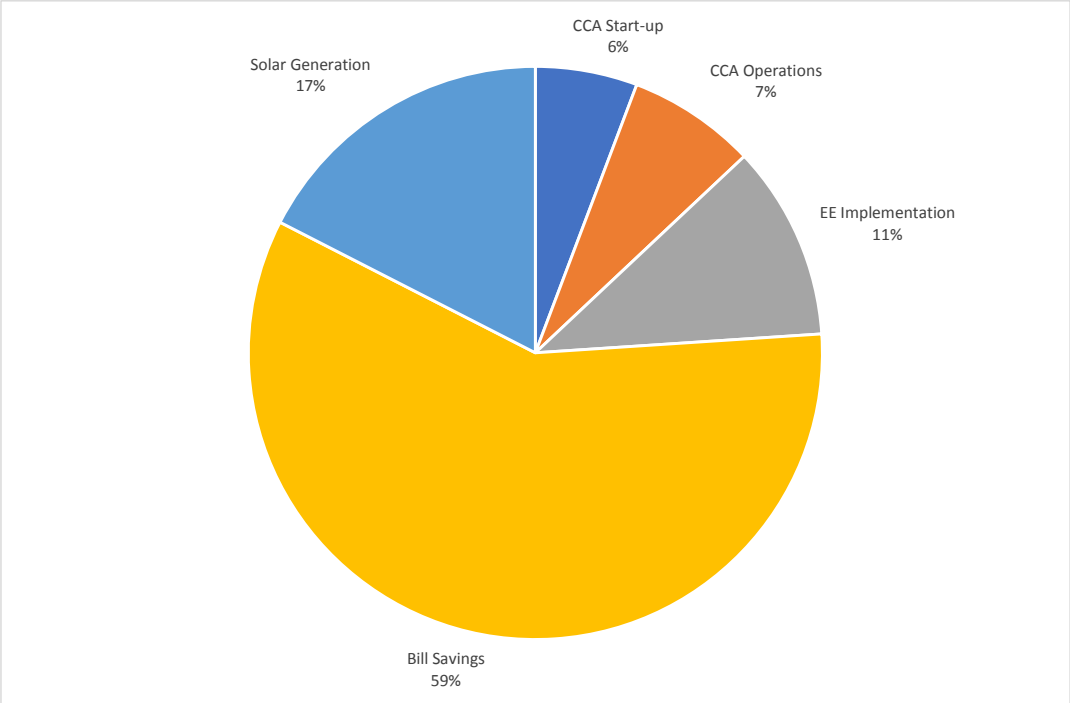
Table 35. Average Annual Energy Efficiency Impacts

Impact Measure	Direct	County Total
Jobs	34	44
Wages Paid (2019$)	$3.3 million	$3.8 million
Gross Regional Product (2019$)	$4.3 million	$5.1 million
Business Output (Revenue) (2019$)	$7.8 million	$9.2 million

What kinds of Jobs will be generated directly or indirectly by the CCA?

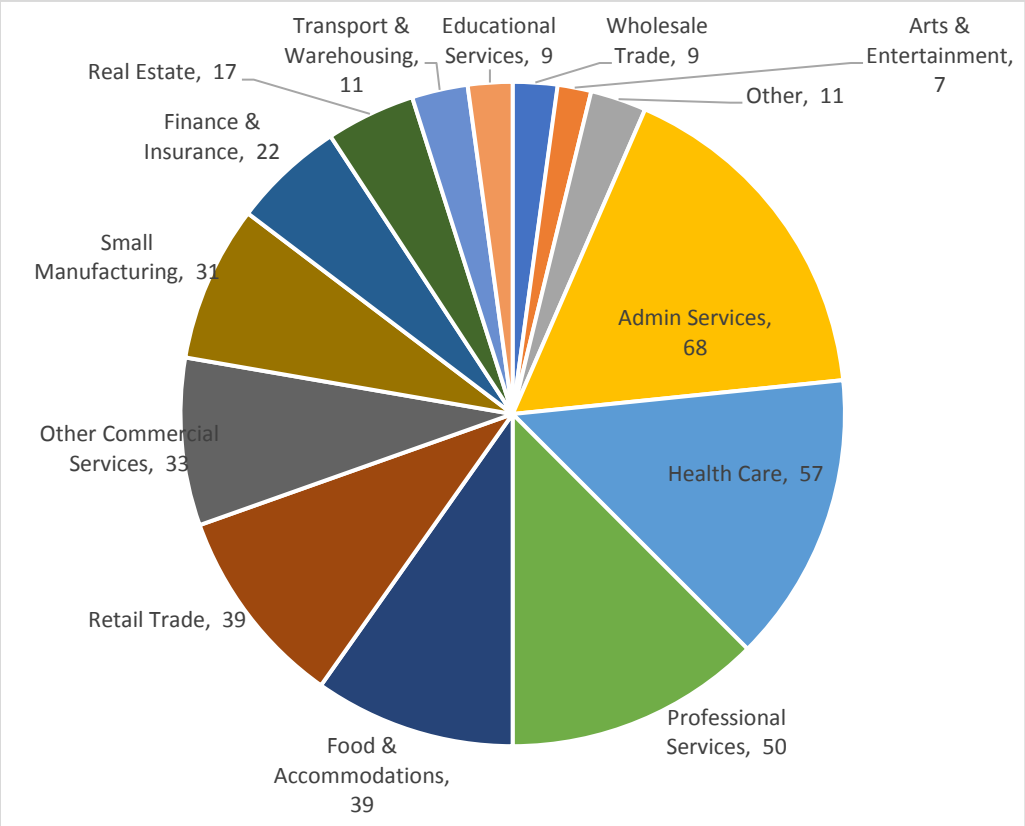
The overall economic impact of the CCA represents the combined effect of CCA operational spending, energy cost savings, and their additional indirect and induced economic impacts. The energy efficiency and energy bill savings due to rate decreases will be the main sources of impact on the local economy, though the CCA operational spending will also contribute to local economic activity. Figure 38 shows the distribution of jobs tied to CCA activities. The figure shows the vast majority of jobs will be associated with the bill savings provided by the CCA.

Figure 38. Distribution of jobs by CCA Activity



Job Impacts by Industry Sector. The economic impact of CCA operations and associated energy bill and other savings will be distributed widely across all sectors of the Stockton economy. Figure 39 shows the potential distribution of jobs by industry associated with the creation and operation of the CCA. The figure shows that administration services, health care, and professional services are the sectors that will be impacted the most by the CCA in terms of jobs.

Figure 39. Job Distribution by Industry Type and Number



Chapter 9. Overview of Power Agency Design & Implementation Process Options

Governance Model Options

In addition to selecting an operating structure, the City will decide between three primary governance options for the CCA:

1. Where the City is the sole government agency responsible for the CCA's creation and operation,
2. Participation with other agencies in a Joint Powers Agency (JPA), where multiple agencies share oversight responsibilities for the new agency; or
3. Joining an existing CCA JPA.

Forming a Single City Agency

In a sole jurisdiction approach, the City maintains full flexibility—and responsibility—for developing policies and procedures. This means that they can be tailored to and responsive to the City's stakeholders and constituents only and based upon their own objectives. The City would be responsible for setting policy priorities in general and making specific decisions about power generation, staffing policies, local economic development activities and strategies, the formulation of financial and debt policies, and the development of EE, demand response, electric vehicle (EV), and distributed generation programs. Along with greater autonomy, the City would assume all risk, liability, and costs associated with operating the CCA. In this case, the likely path would be for the City to establish the CCA as an enterprise fund, and work with appropriate legal counsel to explore options for controls and structural safeguards to insulate it and minimize risk to the City's general fund.

The City would need to establish the CCA as an enterprise. Enterprises are commonly used for public utilities such as electric, water and wastewater, or other city functions where a public service is operated and provided in a manner similar to a business enterprise, where fees and charges are collected for services provided, and accounting and budgeting are separate from a city's general fund. Setting the CCA up as an enterprise provides a structure where the revenues and expenditures are separated into different funds, budgeted for on their own, and reported on their own financial statements. In an enterprise, financial transactions are reported like business activity accounting; revenues are recognized when earned and expenses are recognized when incurred. Establishing an enterprise fund provides management and CCA customers with more visibility and accountability, and the ability to more easily separate and measure performance, analyze the impact of management decisions, determine the cost of providing electric service, and use this information to develop cost-of-service electric rates. Enterprise accounting will allow the City to demonstrate to customers, the public and other stakeholders, that the cost of power is being recovered through its rates, and not being subsidized or comingled with other City funds or functions.

Within the City-Only option, the Stockton CCA would determine if it is to be a fully in-house operation with existing or added City Staff, or if the City would outsource some of all of the activities, with the City only administering contracts and managing vendors. Examples of some of the categories of operating activities that would need to be performed in-house or outsourced:

- Power procurement, scheduling
- Finance, budgeting, and accounting
- Coordinating with PG&E on billing
- Customer service
- Communications, outreach, and public relations
- Specific programs such as demand response, EE, EV, or rooftop solar PV
- Regulatory monitoring and compliance, CPUC filings, etc.

The likely best short-term option would be to outsource the highly technical functions, and maintain some of the management, planning, and other public-facing functions like communications in-house. The range of options depends upon the degree of operating control the City wishes to maintain, the costs associated with maintaining those functions, and the degree of risk it is willing to accept on its own, or delegate to (and pay) third-party providers to assume.

No matter the amount of outsourcing, a CCA of Stockton's size would eventually (i.e., within the first three years) require a core staff of experienced professionals for CCA-specific operations. This would include:

- Executive Director
- Finance Director
- Data/IT manager
- Power resources/procurement director
- Customer relations/outreach director
- Account service manager
- General Counsel
- Regulatory affairs director

If the Stockton CCA were to pursue additional services, such as their own energy efficiency, rooftop solar, or other customer-facing program, more managers would be needed. Additionally, many of these would be supported by 1 or 2 support analyst professionals, some of whom could be shared with other Stockton departments.

All larger CCA have dedicated staffs of 15 – 40 employees. The closest analog to Stockton is San Jose Clean Energy (SJCE). SJCE is the only larger city with an enterprise CCA. Its planning documents show an eventual staff of 20.

Forming a Joint Powers Agency

The second option would be the formation of a JPA, where the JPA is an independent agency that operates on behalf of the public agencies which are party to its creation. In this approach, the City effectively shares responsibility with the other agencies participating in the JPA. The divisions of these responsibilities and the sharing of decision-making authority would be determined at the time the JPA is created. Other critical 'ground rules' would also need to be negotiated and memorialized, such as financial and possibly staffing commitments of each participating agency, and the composition of the board and voting procedures.

Sections 6500 to 6536 of the California Government Code constitute the enabling legislation for Joint Powers Authorities, and the Public Utilities Code allows a CCA program to be carried out under a joint powers agreement between entities that each have the capacity to implement a CCA program individually. A JPA may be formed when it is to the advantage of two or more public entities with common powers to combine resources, or when local public entities wish to pool with other public entities to save costs and/or gain economies. It can also be employed to provide the JPA with powers and authority that participating entities might not have on their own. A JPA is a legal and separate public entity with the ability to enter contracts, issue debt, and provide public services, among other things, and like the City, it would have broad powers related to the operation and management of the CCA, and the study, promotion, development, and conduct of electricity-related projects and programs.

The JPA structure may reduce the risks of implementing a CCA program to the City by immunizing the financial assets of the City and the other participating agencies, and distributing the risks and costs associated with the CCA among the participating entities. It could also provide the benefits of scale and economy for certain aspects of CCA operation, such as power procurement or back office billing and accounting functions.

A CCA operated under a JPA could benefit from increased negotiating and buying power for power purchases, access to better financing terms for borrowing, and operating efficiencies gained by combining back-office functions such as billing and accounting. These benefits would accrue to customers through better pricing for power and debt, and ultimately more competitive electric rates. A larger JPA could also wield more political influence, which could be beneficial when participating in CPUC or other regional or state regulatory, legislative, or policy making activities.

Key tradeoffs to the benefits of a JPA are that decision making is allocated amongst the parties and management independence is diminished. Objectives of participating agencies will likely differ, and reduced autonomy can manifest when setting priorities for local generation, economic development activities, and the importance of support programs. When the JPA is formed, a Board must be appointed to set policy and make decisions. The makeup of this board is subject to negotiation among the participating entities but would likely be made up of elected officials from each participating agency. The process of determining the makeup of the board and each respective members' voting weight can be based on several factors, such as the percentage of customers or load or relative financial contribution, but in any case, decision

making is certainly more complicated. The number of stakeholder interests and priorities are multiplied, and in many cases, reaching consensus on key decisions is more complex and time-consuming than if only one agency were involved.

A quantitative analysis of whether a JPA would benefit or reduce the financial prospects of the CCA, based upon the addition of specific agencies and their associated energy load, is beyond the scope of this report. Additional analysis would be necessary to determine if adding the load of other agencies to the load served by the Stockton CCA would create different demand patterns and peaks, or compound existing peaks, either of which might adversely impact Stockton CCA customers, or the customers of the other prospective JPA members.

A standard JPA would be possible for the City, but it would require joining with at least one other jurisdiction. This could include one or more of the neighboring cities who have already formed a CCA or are also considering CCA. If this option is to be pursued, discussions with potential partners would need to begin.

Joining an Existing Joint Powers Agency

If the City joins an existing CCA JPA, the start-up activities are simpler as the organization is already operating. However, the overall governance structure and policies would have to be established prior to joining an existing CCA program and could limit the ability of Stockton to influence CCA program actions or reflect Stockton's particular priorities. The existing JPA may also require the City to make a payment towards the initial start-up and operating costs of that CCA program. CCAs in close geographic proximity to the city of Stockton include East Bay Community Energy, Marin County Energy, Sonoma Clean Power, and Pioneer Community Energy. It may be possible for Stockton to join one of these CCAs, but no formal outreach or request has been made at this time.

Financing

The CCA will need to evaluate the financing options available and the relative costs and benefits of each in consideration of the CCA's risk tolerance. Financing options include:

Direct Loan from City (startup): The City could loan funds from the General Fund for all or a portion of the start-up needs. The City would be secured by the CCA revenues once launched. The City would likely assess a risk-appropriate rate for such a loan which is likely higher than the City earns for funds otherwise invested. This rate is estimated to be 4.0 percent to 6.0 percent per annum.

Collateral Arrangement from City (startup and ongoing): As an alternative to a direct loan from the City, the City could establish an escrow account to backstop a lender's exposure to the CCA. The City would agree to deposit funds in an interest-bearing escrow account which the lender could tap should the CCA revenues be insufficient to pay the lender directly.

Loan from a Financial Institution with Support (startup and ongoing): Another alternative to a direct loan from the City would be for the City to backstop a lender's exposure to the CCA

via a letter of credit, loan guarantee, or other promissory. The financial institution would not call upon the City unless the CCA was unable to make payment.

Loan from a Financial Institution without Support (startup and ongoing): At least one CCA, Silicon Valley Clean Energy Authority (SVCEA), was able to use this option to fund ongoing working capital. After members provided a total of $2.7 million in start-up funds, SVCEA has obtained a $20 million line of credit without collateral.

Vendor Funding (ongoing): The City can pursue arrangements with its power suppliers to eliminate or reduce the need for or size of funding for the start-up and operations. This could come in many forms such as a "lockbox" approach with a power provider. That is, the revenues that PG&E would collect on the CCA's behalf would first go into a secured "lockbox" account, from which the power suppliers would be directly paid.

Short-term commercial paper (ongoing): Short-term commercial paper (less than nine months maturity typically) is usually not backed by any form of collateral and as such is a form of unsecured debt—however only large entities with high-quality debt ratings will find issuers without having a much higher cost for the debt issue. The CCA is a new entity and does not have an established credit history or recognized debt rating and as such access to this instrument would be difficult without the backing of the City's General Fund.

Letters of credit (ongoing): These typically would be letters of credit required by the power producers/marketers, with the required level of extreme specificity and additional complexity and rigidity associated with these instruments. Typically, a letter of credit is issued by the entity's existing Banker; as a new entity the CCA would need to explore this option with their potential Banker(s), and/or have the letter backed by the City's General Fund.

The City of San Jose's CCA (SJCE) is similar in size to a Stockton CCA. SJCE's initial capital requirement will be provided from the City budget and via conventional financing methods (e.g., bank loans or lines of credit). Subsumed in the initial capital requirement is SJCE's initial start-up funding (up to $7.5 million), plus capitalized interest and fees on startup funding, which will be provided by the City of San Jose through the issuance of Commercial Paper and will be repaid by from the working capital financing. For the working capital financing, SJCE will make repayments (including any interest, as applicable) over an assumed 5-year term. SJCE will recover the principal and interest costs associated with the initial funding via retail generation rates charged by SJCE to its customers. It is anticipated that the initial working capital financing will be fully recovered through such customer generation rates within the first several years of operations.

Chapter 10. Start-Up Schedule and Milestones

This section discusses phase-in options for the Stockton CCA, presents a general overview of the main implementation requirements for establishing a CCA and discusses the main parties with which the CCA interacts, set up requirements, and CCA structure.

General Implementation Schedule

An implementation timeline for a CCA startup in 2022 is shown in Table 36. The overall schedule is driven by CPUC requirements, which are shown in the second column.[43] While there are a number of CPUC requirements for a new CCA, the factors driving the launch of the CCA are: submitting an implementation plan for CPUC approval one year prior to launch; meeting the RA requirement filing requirements throughout the year prior to launch; and meeting the customer notification requirements 90 days before launch. The detailed CPUC process is also discussed in the following section.

Through both legislation and regulation, PG&E is required to work cooperatively with a CCA during the exploration, implementation, and operation of the CCA. During the operation of the CCA, PG&E will provide electricity meter data to the CCA, bill customers, and remit customer payments back to the CCA. PG&E is also required to include customer notices with the utility billing statements on a cost basis for the CCA. Some CCAs in CA did not use utility billing statement inserts opting instead to use direct-mail notices providing requisite information about enrollment and opt-out.

[43] Per CPUC Resolution 4907.

Table 36. Implementation Schedule, Hypothetical CCA Launch in June 2023

Time	PER CPUC Requirements	COORDINATION WITH PG&E	Internal CCA
Mid-year 2021			City Commit to CCA formation via Ordinance
Sept-Nov	Draft Implementation Plan		Establish City Enterprise/JPA/governance model
Dec	File Implementation Plan with CPUC		Hire CEO, Procurement Manager, Finance Manager, Operations Manager
Jan-22	CPUC notifies PG&E CPUC confirms it has the Implementation Plan	CCA begins meetings with PG&E to confirm its operations will conform with PG&E's tariffs	Issue RFPs for: • Initial power provider • Scheduling coordinator (if separate) • EDI/ data management • Communications • Banking/finance services • Working capital loan
Feb-22	CCA provides draft customer notices to CPUC public advisor Within 15 Days, CPUC PA finalizes notice and returns to CCA CCA submit registration packet to CPUC (signed service agreement with		

Time	PER CPUC Requirements	COORDINATION WITH PG&E	Internal CCA
	PG&E, Bond amount currently $147,000)		
Mar-22	CPUC informs CCA regarding any Exit Fees If the registration packet is complete, the CPUC confirms Registration as a CCA.		Evaluate Responses to RFPs
Apr-22	April 1: CCA submits year ahead RA forecast		Negotiate with selected firms
Jun-22			Have key contracts in place
Jul-22			Begin public roll out
Aug-22	CCA submits its updated year ahead RA forecast	CCA Service Agreement EDI Agreements Electronic Funds Transfer agreements	Set rate policies; Net Energy Metering (NEM)
Sep-22	CCA demonstrates RA compliance	Issue Binding Notice of Intent	
Oct-22	October 15: CCAs submit their January load migration forecast for the Resource Adequacy program.	EDI Testing	
Mar-23	Send out 1st opt out notice		Lock in power prices

Time	PER CPUC Requirements	COORDINATION WITH PG&E	Internal CCA
Apr-23	Send out 2nd opt out notice	Dec 1: Receive Customers Mass enrollment information from PG&E	Set rates/ NEM compensation
May-23	Utility shall transfer all applicable accounts to the new supplier		
June 1, 2032	Begin Phase 1 service		

Although not listed on the table, the CCA must also interact with the CAISO. The CAISO is an independent, non-profit organization which coordinates, controls, and monitors the state's transmission, generation, and electric energy markets. The CAISO operates the CA wholesale power system which balances the need for higher transmission reliability with the need for lower costs. To become a CAISO market participant, a CCA must:

- Assign a certified Scheduling Coordinator (SC)[44] to manage bids in the CAISO ancillary service and energy markets. The SC must both be specially trained in CAISO procedures and must have access to a secure communications link to the CAISO system through either the Internet or through the Energy Communications Network (ECN).
- Develop and implement processes and systems to support resource interconnection
- Utilize appropriate metering and telemetry where required[45]
- Participate in CAISO energy markets and related market products[46]

The CCA's contracted power provider and/or SC would be responsible for addressing these requirements.

As described below, there are three main requirements associated with setting up a CCA: 1) participating in the CCA Open Season, 2) providing certain customer notifications, and 3) undergoing electronic communications compliance testing.

The CCA Open Season[47] is a specific calendar period within which a CCA can voluntarily notify PG&E of the planned implementation date of its program. This notification limits the CCA's exposure to additional stranded cost charges or exit fees. During Open Season, a CCA may submit a Binding Notice of Intent (BNI) informing PG&E of the number of customers by class and date that the CCA will serve, including arrangements for phased service. PG&E utilizes the BNI to modify power procurement forecasts to reflect loss of the CCA load. While Open Season participation is optional, it is an important tool for a CCA to limit customer cost exposure. Open Season occurs annually from January 1 through February 15 or as late as March 1 when the California Energy Commission (CEC) LSE Load Forecasts are due on or after May 1.

Pursuant to CPUC Section 366.2(c)(3), a CCA must inform potential customers at least twice within two months (60 days) prior to the customers' designated date of CCA enrollment as follows:

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[44] CAISO Scheduling Coordinators:
http://www.caiso.com/participate/Pages/SchedulingCoordinator/Default.aspx
[45] Metering and telemetry ensure operational accuracy:
http://www.caiso.com/market/Pages/MeteringTelemetry/Default.aspx
[46] CAISO market processes and products: http://www.caiso.com/market/Pages/MarketProcesses.aspx
[47] PG&E Rule 27.2 Community Choice Aggregation Open Season:
http://regarchive.PG&E.com/tm2/pdf/ELEC_ELEC-RULES_ERULE_27_2.pdf

- The customer is to be automatically enrolled in the CCA;
- The customer has the right to opt out of the CCA without penalty; and
- The terms and conditions of the services offered.

A similar notification must be made twice within two billing cycles subsequent to a customers' enrollment in the CCA. The CCA must pay PG&E for providing these notices or can opt for direct mail notification.

Prior to launch, the electronic communications between the CCA and PG&E must be tested and verified. Communications with PG&E will be vital to ensuring successful CCA transactions related to electric meter reading and billing. PG&E uses the Electronic Data Interchange (EDI) standard to facilitate the electronic communications and data exchange with CCAs. As part of the process of working with PG&E to establish the CCA, PG&E will conduct EDI testing to ensure that operational data exchange is functioning prior to the CCA commencing service.

Requirements per CPUC Resolution 4907

As noted above, the CPUC must review certain actions of newly forming CCAs. CPUC Resolution E-4907 establishes the schedule for its process of review to coordinate the timeline of the mandatory forecast filings of the Commission's Resource Adequacy program to ensure that newly launched and expanding CCAs comply with Resource Adequacy requirements, as established by Section 380, before they serve customers. Table 37 outlines the implementation schedule based on CPUC Resolution 4907.

Table 37. CCA Implementation Schedule Per CPUC Resolution 4907

Date	Action
Day 1, Year 1 (On or before January 1 Year 1)	(1) The prospective or expanding CCA submits its Implementation Plan to Energy Division and serves it on selected docket service lists
Day 1 – 10, Year 1	(1) The CPUC notifies the Utility servicing the customers that are proposed for aggregation that an implementation plan initiating their CCA program has been filed.
Day 1 – 60, Year 1	(1) The CCA provides a draft customer notice to CPUC's Public advisor. (2) Within 15 days of receipt of the draft notice, the Public Advisor shall finalize that notice and send it to the CCA.
DAY 1 – 90, Year 1	(1) The CPUC sends a letter confirming that it has received the Implementation Plan and certifying that the CCA has satisfied the requirements of Section 366.2(c) (3). (2) The CPUC provides the CCA with its findings regarding any cost recovery that must be paid by customers of the CCA in order to prevent cost shifting. (P.U. Code Section 366.2 (c) (7).) (3) The CCA and the Utility should Meet-and-Confer regarding the CCA's ability to conform its operations to the Utility's tariff requirements.
DAY 1 – 90, Year 1	(1) The CCA submits its registration packet to the CPUC, including:

Date	Action
	a. Signed service agreement with the utility, b. CCA interim bond of $100,000 or as determined in R.03-10-003
Day 90 – 120, Year 1	(1) If the registration packet is complete, the CPUC confirms Registration as a CCA.
April, Year 1	(1) The CCA submits its year ahead Resource Adequacy forecast (P.U. Code Section 380)
August, Year 1	(1) The CCA submits its updated year-ahead RA forecast
October Year 1 (75 days before service commences)	(1) CCAs submit their Monthly load migration forecast for the Resource Adequacy program, filed about 75 days prior to the compliance month.
Within 60 days of the CCA's Commencement of Customer Automatic Enrollment	(1) The CCA shall send its first opt-out notice.
Within 30 days of the CCA's Commencement of Customer Automatic Enrollment	(1) The CCA shall send a second opt-out notice. (2) Once notified of a CCA program, the Utility shall transfer all applicable accounts to the new supplier
January 1, Year 2	(1) CCA begins service.

Conclusions

Overall, a CCA in Stockton appears feasible. Given current and expected market and regulatory conditions, a CCA should be able to offer its residents and business electric rates that are less than that available from PG&E.

Sensitivity analyses suggest that these results are relatively robust. None of the sensitivity cases explored resulted in the CCA not being able to offer rates that are competitive with PG&E. Nonetheless, the margins are tighter in the first few years.

A Stockton CCA would also be well-positioned to help facilitate the installation of greater amounts renewable generation in the County. Because the CCA would have a much greater interest in developing local solar than PG&E, it is much more likely that such development would actually occur with a CCA than without it.

The CCA can also reduce the amount greenhouse gases emitted by the County, but only under certain circumstances. Because PG&E's supply portfolio has significant carbon-free generation (large hydroelectric and nuclear generators), the CCA must contract for significant amounts of carbon-fee power above and beyond the required qualifying renewables in order to actually reduce the County's electric carbon footprint. Therefore, if carbon reductions are a high priority for the CCEA, a concerted effort to contract with hydroelectric or other carbon-free generators would be needed.

A CCA can also offer positive economic development and employment benefits to Stockton. At the peak, the CCE could create approximately 300 new jobs in the Stockton area.

Stockton's three options for CCA are forming a City-only enterprise, joining with an existing CCA, of forming a new JPA with neighboring jurisdictions. The primary benefits of forming a Stockton-only CCA are more local control over procurement practices and budgets, being able to offer services that are better tailored to Stockton, and faster implementation. The primary benefits of forming or joining a JPA are the reduced risk and in the case of an existing CCA, the security of joining with an already-operating entity and reduced administrative burden on City Staff, both in CCA formation and in ongoing management

Although this study suggests CCA program options could produce both environmental and economic benefits for Stockton, continuing service with PG&E remains an option for not only a community but also for any individual or business whose community has selected CCA service. PG&E is an experienced power provider and is regulated by the state. Furthermore, remaining with PG&E takes no city action.

Appendix 1: Summary of CCA Programs

Table 38. CCA Programs Currently Active

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
Sonoma Clean Energy	Advanced Energy Build	New Con-struction	Enhancement of CAHP, $7,500 for Advanced Energy Home, $12,500 for All Electric Home, 20% above T24	✓						Advanced Energy Build	Open
	Gridsavvy - Heat Pump Water Heater Rebate	Res and Non-Res	In partnership with Bay Area Regional Energy Network (BAYREN), SCP is offering its customers a $1,700-$2,000 rebate for replacing their existing water heater with a heat pump water heater	✓						Heat Pump Water Heater Rebate	Open
	GridSavvy - EV Charger Rebate	EV chargers	Pay 50% of the cost of an EV vehicle charger, and once it is installed and activated SCP reimburses the customer for the charges (installation charges not included)	✓	✓					SCP Electric Vehicle Charging Equipment	Open
	Induction Cooking	Res	Small, portable induction cooktop units to borrow and try out at home				✓			Induction Cooktop Check Out	Closed
	Lead Locally	Other	16 local homes to receive free energy & money saving technology upgrades. Upgrades are valued at $5,000 or more		✓				✓	Lead Locally Program	Open

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
Marin Clean Energy	MCE Healthy Homes Program	Res	Provides upgrades to improve the health, safety, and efficiency of Marin homes (up to $5,000 in incentives) and multifamily properties (up to $2,250 in incentives per unit in addition to the Low-Income Family and Tenants Program rebates)	✓						MCE Healthy Homes	Open
	Home Energy Savings Program	Res	Provides qualifying homeowners with free energy savings gift-box (includes a smart thermostat, kitchen faucet aerator, & other energy savings items), and a free virtual home energy assessment with a trained energy advisor	✓			✓			Energy Savings for Your Contra Costa, Marin, Napa, or Solano Home (mcecleanenergy.org)	Open
	Heat Pump Water Heater Rebates	New Con-struction	MCE, in partnership with Bay Area Regional Energy Network (BAYREN), is offering cash incentives to qualified contractors and installers on the purchase & installation of heat pump water heaters	✓						MCE Heater Pump Water Heater Rebate	
	MCE's Solar Rebate	Solar	MCE has allocated $535,000 in rebates to income qualified MCE customers and property owners who install solar	✓						MCE solar Rebates	Open
Silicon Valley Clean Energy	Lights on Silicon Valley	Res	Develops a network of customer-sited solar and storage systems	✓					✓	Lights On Silicon Valley - SVCE (svcleanenergy.org)	Open
	Battery Storage Assistant	Res and Non-Res	Helps install battery storage, solar, and/or other clean power technologies for homes and businesses	✓	✓	✓				Battery Assistant (svcleanenergy.org)	Open

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
	Priority Zone DC Fast Charging Incentive	Multi-family & Non-Res	Deployed near-certain clusters of multi-unit dwelling developments as a way to provide more access to charging for residents	✓	✓	✓				DC Fast Charging - SVCE (svcleanenergy.org)	Open
	FutureFit Assist- EV Charging	EV	Silicon Valley Clean Energy is providing qualifying customers with free assistance to install EV charging on the customer's premises			✓				FutureFit Assist - EV Charging - SVCE (svcleanenergy.org)	Open
	Building Electrifi-cation Tech.Asst	Non-Res	Free technical assistance for design of new buildings and upgrades			✓				Building Electrification Technical Assistance - SVCE (svcleanenergy.org)	Open
	REACH Code Develop't	Codes and Standards	Develops reach codes that help encourage the construction of sustainable buildings and homes			✓				Reach Codes - SVCE (svcleanenergy.org)	Open
	Innova-tion Onramp	Other	Working with local partners, such as research institutions and startup incubators who are deeply embedded in the innovation ecosystem of Silicon Valley		✓	✓	✓	✓		Innovation - SVCE (svcleanenergy.org)	Open
	Comm'ty Engage= ment Grants	Other	Awarded $75,000 in grant funding to six local nonprofits to reach underrepresented members of our community		✓	✓	✓	✓		Programs - SVCE (svcleanenergy.org)	Open
Penins ula	Used EV Rebate Program	EV	Provides qualifying customers with free assistance to install EV charging.	✓	✓		✓			Used EV Incentives | Peninsula Clean Energy	Open

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
	New EV Rebate Program	EV	Peninsula Clean Energy will offer a $700 rebate for new plug-in hybrid electric vehicles or a $1,000 rebate for new all-battery electric vehicles.	✓	✓		✓			New EV | Peninsula Clean Energy	Open
	REACH codes	Codes and Standards	Provides extensive technical assistance plus a $10,000 incentive to each city that brings reach codes to their councils	✓						Reach Codes | Peninsula Clean Energy	Open
	Power On Peninsula - Medical Device	Res.	Free portable backup batteries for medical needs	✓							Open
	Power On Peninsula	Res.	Up to $1,250 rebate on a solar and battery back-up system	✓						Power On Peninsula: Homeowner (peninsulacleanenergy.com)	Open
	Heat Pump Water Heater Program	Res.	Peninsula Clean Energy is partnering with the Bay Area wide BAYREN Home+ program to offer additional rebates for installing Heat Pump Water Heaters for San Mateo County residents	✓						Heat pump water heater (HPWH) | Peninsula Clean Energy	Open
	Commu-nity Pilot Awards	Other	PCE has awarded grants of up to $75,000 for innovative local pilot projects that reduce GHG emissions and deliver benefits to San Mateo County.	✓		✓			✓	Community Pilot Awards	Open

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
Lancaster Choice Energy	Energy Advisor Program	Res.	Free survey to highlight ways to use less energy around the house, including special financing programs for energy saving appliances and equipment.			✓	✓			Energy Advisor Program - Lancaster Choice Energy	Open
	Grocery Workers Appreci-ation Program	Other	Provided eligible grocery workers who are LCE customers with a one-time credit (valued up to $50) toward their current LCE charges on their next electric bill during the hot summer months of COIVD-19.	✓						Grocery Workers Appreciation Program - Lancaster Choice Energy	Closed
	Ready, Set Charge	EV	$250,000 in vouchers to eligible LCE customers to be used towards the purchase or lease of a qualifying Electric Vehicle or Plug-in Hybrid Vehicle.	✓						Programs & Rebates - Lancaster Choice Energy	Open
	Small Com DI Program	Other	Free energy saving products and free installation, such as lighting and refrigeration upgrades.						✓	Small Commercial Direct Install Program - Lancaster Choice Energy	Open
Central Coast Community Energy (formerly	Project Sushine: Affordabl e Housing Solar	Res	Provides funding for 20 income-qualified homeowners to receive no-cost solar. Connects people to clean energy jobs by incorporating workforce development into each project.	✓				✓	✓	Project Sunshine - 3CE (3cenergy.org)	Open
	REACH Code Incentive Program	Codes and Standards	Onetime incentive payment of $15,000 to member jurisdictions to offset staff costs associated with the adoption of a reach code ordinance	✓						Reach Code Incentive Program - 3CE (3cenergy.org)	Open

CCA	Program	Market	Description	Program Type						Link	Program Status
				Incentives	Financing	Tech. Assist.	Info. & Ed.	WE&T	Direct Install		
	Multi-Unit Electrifi-cation Grant Program	Res	Supports housing developers with incentives to choose all-electric residential building designs.	✓						Multi-Unit Dwelling Electrification Grant Program - 3CE (3cenergy.org)	Open
	Ag Electrifi-cation Grant Program	Non-Res	Providing incentives to the Agricultural sector for the purpose of fuel switching heavy duty equipment and farm tools from fossil fuels to cleaner all-electric alternatives	✓						Ag Electrification Grant Program - 3CE (3cenergy.org)	Closed
	Zero Emission School Bus Program	EV	Partnership with Monterey Bay Air Resources District to fund 100% of the cost to replace 6 traditional school buses with electric buses	✓						Zero Emission School Bus Program - 3CE (3cenergy.org)	Open
	UPS Program for Critical Infra-structure	Other	Central Coast Community Energy allocated $25 million to create the Uninterruptible Power Supply Fund to accelerate the adoption of reliable backup power for eligible public and private entities operating critical facilities.	✓						Uninterruptible Power Supply Fund Program - 3CE (3cenergy.org)	Open
East Bay Community	Communi ty Innovatio n Grant	Other	Offers up to $160,000 in funding to non-profit and community organizations "for projects designed to deliver energy-related social and environmental benefits to residents of Alameda county.	✓						Community Innovation Grant	Open

Appendix 2: Supplemental Information

Table A-1. Select County Metrics

Region	County	Average of CES 3.0 Score	% CARE Eligibility	% of Electricity as Non-Res	% Multifamily	Estimated Per Capita Public Purpose Funds Paid
Central Valley	San Joaquin	41.2	40.1%	66%	12%	$93
	Madera	35.1	45.4%	72%	5%	$106
	Fresno	43.0	46.3%	62%	15%	$72
	Merced	44.8	47.2%	81%	8%	$143
Mid Coast	Contra Costa	19.8	23.3%	70%	17%	$86
	Monterey	20.4	35.4%	73%	18%	$53
	Santa Cruz	14.2	29.1%	54%	13%	$55
	San Francisco	17.6	23.2%	74%	47%	$81
	Alameda	23.0	25.7%	72%	27%	$63
	San Mateo	16.2	18.1%	64%	27%	$70
	Marin	8.8	18.9%	51%	20%	$46
Central Coast	Santa Barbara	15.4	35.7%	72%	20%	$77
	San Luis Obispo	12.0	29.4%	62%	10%	$79

Table A-2. San Joaquin County Fuel Use

Fuel	Units	Unit Cost	Units Consumed	Total Fuel Cost
Electricity	kWh	$0.21	5,583,337,799	$1,172,500,938
Natural Gas	Therm	$1.69	259,375,883	$438,345,242
Gasoline	Gallons	$3.99	347,000,000	$1,384,530,000
Diesel	Gallons	$3.92	126,000,000	$493,920,000
Total Annual				$3,489,296,180

Table A-3. Distribution of Electricity Savings by Sector for Program Years 2016-2019

	PG&E	San Joaquin County			Stockton		
Sector	MWh	SJ Co.MWh	% of PG&E Savings	% of Consump-tion	MWh	% of PG&E Savings	% of Consump-tion
Residential	49,904	2,329	4.7%	6.8%	1,489	3.0%	2.3%
Commercial	471,377	9,448	2.0%	7.4%	4,082	0.9%	2.0%
Total	521,285	11,778	2.3%	7.2%	5,572	1.1%	2.1%

Table A-4. Distribution of Electricity Savings by Sector for Program Year 2019 Details

Sector	PGE	SJV		Stockton	
	kWh	kWh	% PG&E	kWh	% PG&E
Residential	35,761,411	522,333	1.46%	317,744	0.89%
Commercial	77,511,661	3,943,449	5.09%	2,419,873	3.12%
Agricultural	12,550,342	1,301,922	10.37%	0	0.00%
Public	35,787,111	950,178	2.66%	391,523	1.09%
Industrial	5,202,788	746,149	14.34%	0	0.00%
Total	166,813,314	7,464,031	5.09%	3,129,140	3.12%

Table A-5. Distribution of Savings by Measure Type, Program Years 2016 - 2019

Measure Category	Residential			Commercial		
	PG&E	SJ Co.	Stockton	PG&E	SJ Co.	Stockton
Lighting	14.9%	7.3%	8.5%	22.1%	60.1%	67.8%
HVAC	21.0%	48.5%	56.7%	9.0%	9.6%	9.6%
Process	0.0%	0.0%	0.0%	11.7%	13.9%	8.3%
Refrigeration	8.0%	1.2%	1.6%	3.7%	6.5%	11.2%
Whole Building	4.8%	15.8%	15.4%	1.6%	6.7%	2.6%
Other	51.2%	27.3%	17.8%	51.8%	3.2%	0.6%
Total	100%	100%	100%	100%	100%	100%

Appendix 3: Data Sources

Data Set Name	Contents	Owner	Link
American Communities Survey (ACS)		US Census Bureau	https://data.census.gov/cedsci/
California Vehicle Survey (CVS)	"The California Vehicle Survey provides information on shifting transportation choice trends by capturing consumer preferences of various vehicle attributes. The California Energy Commission uses the survey to forecast transportation fuel needs in the state and to provide insights on key topics that inform transportation policy."	CEC	https://www.energy.ca.gov/assessments/vehiclesurvey/
CalEnviroScreen 3.0 (CES)	CalEnviroScreen identifies California communities by census tract that are disproportionately burdened by, and vulnerable to, multiple sources of pollution.	OEHHA	https://oehha.ca.gov/calenviroscreen
CPUC Income Qualified Assistance Programs		CPUC	https://www.cpuc.ca.gov/iqap/
CARE Population Data		CPUC	https://www.cpuc.ca.gov/general.aspx?id=12154

Data Set Name	Contents	Owner	Link
California Energy Consumption Database	Offers data on electricity usage by county. Can specify data by sector (residential, non-residential, or total)	CEC	Electricity Consumption by County (ca.gov)
California Electric and Gas Utility Cost Report (AB 67)	Written report on the costs of programs and activities conducted by the four major electric and gas companies regulated by the CPUC.	CPUC	California Electric & Gas Utility Cost Report
California Motor Vehicle Fuel Types		DMV	https://www.dmv.ca.gov/portal/dmv-research-reports/research-studies-reports/
California DMV Estimated Fee Paid Vehicle Registrations by County		DMV	https://www.dmv.ca.gov/portal/dmv-research-reports/research-studies-reports/
California Electricity Data	California Energy data includes data on the following: electricity generation and production, generation reports, renewable energy maps, supply & demand outlook planning, consumption databases, infrastructure and transmission planning data, maps, reliability resources, California electric utilities	CEC	Energy Almanac (ca.gov)
CA Solar Statistics	NEM Solar PV, California Solar Initiative, Low-Income Solar PV, Rule 21, SOMAH	CPUC	CA Solar Statistics

Data Set Name	Contents	Owner	Link
Energy Maps of California	"The California Energy Commission develops and maintains maps and geospatial information on California's energy infrastructure and related activities. This public information is accessible through the cloud-based ArcGIS Hub, ArcGIS Online, PDF Maps, and interactive web maps."	CEC	CEC data & Reports
CARB Online Fleet Database	This tool provides access to on-road vehicle population estimates for California at the Census Block Group level. The estimates are generated based on vehicle registration data from California Department of Motor Vehicles.	CARB	CARB Online Fleet Database
Residential Energy Consumption Survey (RECS)	Includes various tables and datasets for the following categories: housing characteristics, consumption & expenditures, microdata, methodology	EIA	Residential Energy Consumption Survey
Residential Appliance Saturation Survey (RASS)	The California Residential Appliance Saturation Study (RASS) is a comprehensive look at residential energy use. The California Energy Commission (CEC) manages the study, which is based on the California Home Energy Survey. The survey collects information from residents about appliances, heating and cooling equipment, electric vehicles, and energy.	CEC	Residential Appliance Saturation Study

Data Set Name	Contents	Owner	Link
Commercial Buildings Energy Consumption Survey (CBECS)	The Commercial Buildings Energy Consumption Survey (CBECS) is a national sample survey that collects information on the stock of U.S. commercial buildings, including their energy-related building characteristics and energy usage data (consumption and expenditures). Commercial buildings include all buildings in which at least half of the floorspace is used for a purpose that is not residential, industrial, or agricultural. By this definition, CBECS includes building types that might not traditionally be considered commercial, such as schools, hospitals, correctional institutions, and buildings used for religious worship, in addition to traditional commercial buildings such as stores, restaurants, warehouses, and office buildings	EIA	Commercial Buildings Energy Consumption Survey
Commercial End-Use Survey (CEUS)	The California Commercial End-Use Survey (CEUS) is a comprehensive study of commercial sector energy use. The California Energy Commission uses the survey to collect commercial sector energy consumption and end-use profiles.	CEC	California Commercial End-Use Survey
Carbon Dioxide Emissions Coefficients		EIA	CO2 Emissions Coefficients by Fuel
California Energy Data and Reporting		CPUC	CEDARS Home

Data Set Name	Contents	Owner	Link
System (CEDARS)			
Annual Database Revenue Vehicle Inventory	Contains information on revenue vehicles by mode and type of service (TOS) on agency property at the end of each fiscal year.	NTD	2017 Annual Database Revenue Vehicle Inventory
State by State Fuel Taxes	Info on federal and state-level taxes on gasoline, diesel, and misc. fuels	EIA	State by State Fuel Taxes
CA EV and Charger by County	Live data on California's vehicle population, new electric vehicle sales, electric vehicle chargers, and hydrogen stations. Organizes data by county.	CEC	Vehicle Population in California
CARB database applications		CARB	California Air Resources Board Resource Directory
PVRAM - PG&E DER grid conditions		PG&E	https://www.pge.com/en_US/for-our-business-partners/distribution-resource-planning/distribution-resource-planning-data-portal.page?ctx=large-business
PG&E PSPS info		PG&E	Learn about Public Safety Power Shutoffs (PSPS) (pge.com)

Data Set Name	Contents	Owner	Link
PG&E PSPS maps		PG&E	https://www.pge.com/en_US/large-business/services/economic-development/opportunities/sitetool.page
CAISO current outlook	Includes data on available capacity (MW), current demand (MW), forecasted peak (MW), historical peak (MW), today's peak (MW), tomorrow's forecasted peak (MW)	CAISO	Current & forecasted demand & Net demand graphs
Gasoline and diesel sales by county	CEC gasoline data		https://ww2.energy.ca.gov/almanac/transportation_data/gasoline/
Natural gas use by county	Tool to create gas consumption by county report	CEC	Gas Consumption By County
Electricy use by county	Tool to create electricity use by county report	CEC	http://ecdms.energy.ca.gov/elecbycounty.aspx
EPA stats	This page describes the calculations used to convert green power electricity (kilowatt-hours) into various types of equivalencies.	EPA	Green Power Equivalency Calculator - Calculations and References | Green Power Partnership | US EPA

Data Set Name	Contents	Owner	Link
Solar irradiance data	The National Solar Radiation Database (NSRDB) is a serially complete collection of hourly and half-hourly values of meteorological data and the three most common measurements of solar radiation: global horizontal, direct normal, and diffuse horizontal irradiance.	NSRDB	Home - NSRDB (nrel.gov)
NASA map viewer	The POWER Data Access Viewer contains meteorology and solar related parameters formulated for assessing and designing renewable energy systems.		POWER Data Access Viewer (nasa.gov)
Estimated Vehicles Registered by County	Data regarding estimated vehicles registered by county and miscellaneous DMV reports	DMV	ESTIMATED VEHICLES REGISTERED BY COUNTY (ca.gov)