Community Choice Energy:

What Is the Economic Impact of Local Renewable Power Purchasing?

San Joaquin Valley Case Study



by

fosterra llc

June 2017

for

center for climate protection

As part of its Clean Power Exchange program

CPX CLEAN POWER EXCHANGE

Introduction from the Executive Director

The Center for Climate Protection is pleased to present this report about potential local economic benefits from Community Choice Energy (CCE) in the San Joaquin Valley. It builds on our previous work in analyzing economic impacts of CCE in the City of San Jose in "Community Choice Energy: What is the Economic Impact? San Jose, California Case Study," published in September 2016 and available for download at the Center's website.

The purpose of this report is to provide information to city and county leaders in the Central Valley to assist in evaluating CCE for their constituents. The report supports Community Choice entities in realizing the vision to be game-changing innovation platforms, and to take strategic steps today to become increasingly competitive in the dynamic energy market of the future. To accomplish this, CCEs must perform differently than Investor-Owned Utilities.

Commendably, California's six operational CCEs currently provide electricity to their customers at overall lower rates with a higher mix of renewables and lower emissions than their competition. The many emerging CCEs aim to follow suit. By 2020, CCEs may serve as much as sixty percent of the eligible California service territory.

CCEs decide the mix of local and remote sources of electricity. What factors must CCEs consider when making the decision about their energy mix in addition to the cost of electricity? This study illustrates the value of developing local energy resources by quantifying the increasing economic benefits that result from expanding the procurement of power from local sources.

From a business-as-usual perspective, some of the scenarios we examine may seem aggressive, but energy market policies and system structures are all changing in California, and we believe Community Choice can help accelerate and take advantage of those changes. What seems challenging today will be much easier in just a few years.

This report focuses on solar photovoltaics because of this technology's proven track record for scalability, the beneficial experience that California CCEs have had with solar, and the existence of a tested model for estimating the local economic impact of solar deployment. Geographically, this study focuses on the San Joaquin Valley due to its importance to the statewide economy, its size, its socioeconomic challenges, and its status as an area that is disproportionately impacted by poor air quality and other pollution hazards.

This report provides input to a rich conversation about Community Choice Energy and we encourage further discussion based on a solid economic analysis of potential impact.

Sincerely,

Ann Hancock

Executive Director
Center for Climate Protection

Abstract

This report is intended to help policymakers, specifically those in California's San Joaquin Valley, realize the vision of Community Choice Energy (CCE[1]) as a game-changing innovation platform. It begins to address the question: *To what extent will increasing increments of local clean energy development enabled by a CCE program result in the community realizing commensurate increasing local economic benefits?*

The report evaluates three potential scenarios of local clean energy purchasing as part of a CCE strategy to increase renewable power supplied to residents in San Joaquin, Fresno, and Tulare Counties.[2] The report describes the rationale for each scenario as well as the approach and assumptions used in the analysis. Economic impacts focus on total incremental jobs and economic growth, with annual estimates over a six-year period through 2024. For the purpose of this analysis, the primary clean energy technology is solar photovoltaic, and the "local region" includes each of the three targeted counties, calculated individually and collectively.

In the San Joaquin Valley, growth of solar power for both utility-scale and smaller commercial and residential projects has been strong. This report finds that CCEs will accelerate the growth of larger scale solar installations from a variety of options such as direct procurement of utility-scale projects and feed-in-tariffs. Although not within the scope of this report, smaller net-metered systems will probably also continue to be installed provided that rate tariffs remain attractive.

This report evaluated three scenarios: 10% local, 20% local, and 33% local. Under Scenario 1: Conservative Target (10% local), the level of local solar deployment in just the three counties that were evaluated creates 8,400 jobs regionally from CCE purchasing activity, with an associated $845 million of incremental economic activity over six years, from 2019 to 2024.

A key finding of this report is that significant local economic benefit is directly correlated with local renewable energy investment.

[1] This paper uses Community Choice Energy and the abbreviation CCE to refer to the policy also known as Community Choice Aggregation or CCA.

[2] These three counties were chosen for this study due to the fact that they are the three counties with relatively high population centers, and they are the primary focus of Center efforts to expand CCE in the Central Valley.

Table of Contents

Acknowledgments

We thank the following people and organizations that made this report possible:

- Contributors from the following organizations whose input served as the foundation of this report: MCE Clean Energy, Sonoma Clean Power, Lancaster Choice Energy, Fresno State Office of Community and Economic Development, County of Fresno, County of Tulare, County of San Joaquin, CALSEIA, WattzOn, and Terra Verde Renewable Partners.

- Contributors who provided financial support for this report: OurGreenChallenge.org, Founder Veronica Jacobi; Mac and Leslie McQuown; the Hancock Family Fund; and the San Francisco Foundation.

The Center for Climate Protection's mission is to inspire, align, and mobilize action in response to the climate crisis. We work with business, government, youth, and the broader community to advance practical, science-based solutions for significant greenhouse gas emission reductions. *www.climateprotection.org*

Fosterra, LLC is a clean energy consulting firm dedicated to accelerating sustainable practices and projects worldwide for the public sector, large companies, and utilities. Its principal, Ben Foster, has worked in over 300 jurisdictions across the United States and in China on clean energy policy, programs, and projects from planning to implementation. *www.fosterra.com*

Report Background and Purpose

Policymakers considering Community Choice Energy[3] programs invariably ask two related questions: Will the program boost the local economy, and if yes, to what extent? Until recently, data to answer these questions was mostly unavailable due to a lack of operating CCE programs in California. In the absence of relevant data, technical analyses conducted for California CCEs estimated local economic benefits of renewables using models of general economic impact without consideration of locally-driven renewable deployment and its related impact. [4]

Now that eight operational CCE programs exist in the state,[5] data can begin to be extracted from them based on their current and projected energy procurement. To conduct the analysis of this data, the Center for Climate Protection engaged Fosterra, LLC, an independent consulting firm with expertise in economic impact analyses of clean energy deployment. Fosterra developed the approach, analyses, and findings for this report.

In 2002, the Community Choice law, Assembly Bill 117, was enacted in California. Under that legislation, Community Choice, once adopted by a community, becomes the default electricity service provider in its service territory. Customers who wish to remain with the incumbent utility must opt out of the CCE. Given this program design, when the service "cut-over" occurs at the launch of a CCE program, the millions of dollars of generation revenues are redirected from the control of the utility to the control of the newly formed CCE agency. In Fresno County for example, about $620 million each year would be redirected into the control of the county via CCE.[6] This is the single most powerful economic aspect of Community Choice because it can leverage billions in energy purchases over time to drive more local renewable energy generation.

Three common goals of California CCEs are to deliver competitive rates, reduce greenhouse gas (GHG) emissions, and increase local economic activity – goals that can conflict. For example, renewable energy generated locally may be more expensive than renewable energy generated remotely. This report is intended to fill a knowledge gap about the economic benefits of locally-generated renewables, help policymakers navigate the tradeoffs among goals, and support more informed decisions.

---

[3] This report assumes that readers are familiar with CCE basics. For readers who would appreciate more background information on CCEs, this is provided in the appendix.

[4] See, for example, a recent study from Peninsula Clean Energy that has calculated a range of potential total statewide economic impacts from a new CCE, but does not specifically contain local deployment scenarios. http://www.peninsulacleanenergy.com/resources/technical-study/

[5] Currently operational CCEs are MCE Clean Energy, Sonoma Clean Power, Lancaster Choice Energy, CleanPowerSF, Peninsula Clean Energy, Silicon Valley Clean Energy, Apple Valley Choice Energy, and Redwood Coast Energy Authority

[6] This figure represents the total annual energy purchases for the CCE and is based on the estimated CCE total sales of 6,200.8 million kWh per year times the average supply cost that PG&E currently pays per their latest annual report. Annual load data by County can be found here: http://www.ecdms.energy.ca.gov/elecbycounty.aspx

Distributed Energy Resources (DERs) represent a rapidly growing and evolving element in the power sector, and are changing the way that energy is produced, stored, transmitted, and used. CCEs are well-positioned to accelerate the integration of DERs into the energy system. Solar Photovoltaic (PV) installations, previously considered largely as replacements for grid-supplied power, are increasingly viewed as an integrated component in a suite of technologies benefiting customers, load serving entities, and other energy sector stakeholders. In addition to solar, the suite of DER technologies includes efficiency measures, battery storage, electric vehicles, EV charging infrastructure, automated controls, and more. Because DERs necessarily involve activity from many private sector stakeholders, economic activity can be expected to extend well beyond solar PV.

The purpose of this report is to support San Joaquin Valley policymakers and stakeholders as they consider potential CCE programs for their jurisdictions, and to enhance the broader dialogue about the benefits of Community Choice, using the Counties of San Joaquin, Fresno, and Tulare as examples. This report is intended to be indicative, not comprehensive, and focuses on local energy generation, one part of CCE activity and benefits. Although CCEs can create local programs in energy efficiency, storage, electric vehicle charging, and other new technologies, all of which foster local economic activity, this report addresses only the impact of new local solar PV development.[7]

This analysis projects the economic impact of local renewable energy development that communities in the San Joaquin Valley might make from a newly formed CCE. Renewable energy generated at large, remote solar and wind projects may cost less per kilowatt-hour than that from smaller-scale local sources, but there may also be drawbacks to this type of deployment such as ecosystem impact, significant cost of long distance transmission, and related line losses. Local renewable energy investments provide benefits in addition to clean electricity, such as local job creation and economic development, and avoided resource adequacy procurement[8] and other transmission and distribution system costs.

Fortunately, the San Joaquin Valley has ideal conditions for varying scales of solar development and for developing solar power at very competitive rates. Future benefits for a CCE also include potential synergy between development of local resources and creation of grid services, storage and microgrids, low-carbon fuel standard credits for electric vehicle charging, and others, all of which could add value to customers.

A more precise assessment of the economic value of these benefits is crucial to CCEs that are developing their integrated resource plans that include assessments of their current and future energy supply and demand, and to local decision makers as they allocate resources. Tariff rate setting is not included in this analysis, nor any calculations of cost savings and related economic

---

[7] Although additional technologies were considered, solar photovoltaic was the only renewable energy source used in this analysis due to solar scalability, its broad potential for deployment, the successful track records with solar for existing CCEs, and the availability of outstanding solar resources.

[8] Resource adequacy is a mandatory planning and procurement process to ensure resources are secured by load serving entities to meet the ISO's forecast system, local, and flexible capacity needs. More information about topic in California can be found here: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Reliability%20Requirements

impact from various levels of customer retail electricity prices. While reduction of rates within a CCE are possible and have been realized by three of the CCEs that were studied, there are a large number of factors, both objective and subjective, that go into ratemaking. Therefore, we defer that aspect of the analysis to a full feasibility assessment for a potential CCE and future operational and business planning processes.

A question Central Valley community leaders are sure to ask as they consider CCE is, "How will CCE affect the many local energy projects and programs that already exist?" Based on CCEs' seven-plus years of experience, it is safe to say that CCE will not interfere with them. In fact, CCE can serve as a collaborator and even a customer for clean power fed to the grid as a result of existing projects, and can boost the rate of solar deployment.

Analytical Methods, Inputs, and Scenarios

This analysis began with interviews of representatives of three operational CCEs in California: MCE Clean Energy, Sonoma Clean Power, and Lancaster Choice Energy. The purpose of the interviews was to discover and understand the CCEs' goal-setting processes, local benefits, project tracking methods, and other factors used to guide their performance. Interview responses were combined with statewide goals to formulate three scenarios as a range of potential adoption levels for CCE local renewable procurement. Additional research and analysis was performed on recent studies for potential new CCEs in California including San Jose, Silicon Valley (operational as of April 2017), Alameda County, and Peninsula Clean Energy (operational as of October 2016.) The scenarios were used to forecast potential outcomes including economic impacts corresponding to each of the scenarios.

Figure 1 below summarizes selected attributes of each of the three potential CCE jurisdictions that were evaluated:

Figure 1: CCE Attributes

CCE Attributes	San Joaquin County	Fresno County	Tulare County	TOTAL
Territory Served	San Joaquin County	Fresno County	Tulare County	
Largest City	Stockton	Fresno	Visalia	
Land Area (sq. mi.)	1,391	6,011	4,824	**12,226**
Population	726,106	974,861	459,863	**2,160,830**
CCE Sales 2020 Est. (MWh)	3,712,609	6,200,780	3,750,094	**13,663,482**
Solar DG (MW as of Q3-2016)	124	262	123	**509**

Key concepts and terms used to build the scenarios are defined as follows:

CCE Territory Served – The defined service territory where CCE customers are served.

Land Area – The area where clean energy systems can be located to generate power for the CCE and drive local economic benefits, which includes the CCE territory. Local geographic,

agricultural, and built-environment constraints and costs may impact the amount of renewable energy generation from within this area.

CCE Sales – The total estimated annual aggregated electricity that is consumed and sold within the CCE territory to CCE customers (not including customers who remain as bundled customers of the incumbent utility). The CCE-specific consumption is the total volume of usage from customers that have opted-in to the CCE and therefore is available to be re-directed to incorporate more local renewables. For this analysis, each individual County's electricity consumption has been used based on 2015 data (less estimates for opt-out customers), with a further refinement that excluded Direct Access loads due to their low rate schedules and unique contracting requirements. If any customers in excluded categories opt-in to the CCE, the base aggregated load served by the CCE would increase.

Planning Horizon – This analysis forecasts potential impacts starting in 2019 and going through 2024. The basis for this timeframe is the forecast that a new potential CCE in each County could be fully in place and capable of effectively procuring local supply as early as the beginning of 2019, and that the incremental Investment Tax Credit for solar PV would be at its maximum under current law through 2020, and then declining until expiring in 2023.[9]

Solar Photovoltaics (PV) – Electricity production from direct conversion of sunlight into electricity. This is the technology selected for forecasting in this analysis due to its enormous growth and potential in California for both medium-scale and distributed generation (DG) at competitive costs in nearly every community. The type and size of solar PV deployment used for the forecasts in this report is primarily in the commercial to small utility-scale.

Current Trends – As of September 2016, total distributed solar deployment in the three county region was 509MW of combined capacity.[10] This forms the baseline for "business as usual" with the existing utility.

Population – Population within the CCE territory that may directly benefit from increased economic activity and CCE programs.

Assumptions used as inputs to the economic analysis are described in the reference section at the end of this report.

[9] Source: SEIA Solar Investment Tax Credit Factsheet accessed April 2016, http://www.seia.org/policy/finance-tax/solar-investment-tax-credit
[10] Source: California solar statistics website accessed December 2016, http://www.californiadgstats.ca.gov/downloads/

Scenario-Specific Assumptions and Inputs

Three scenarios were developed for renewables deployment in each county within the planning horizon through 2024, expressed in percentage of total CCE-only electricity consumption. It is assumed that total renewables provided to customers will be higher than the amounts in the scenarios because the CCE's power mix will include renewables generated both inside and outside the local region to meet minimum State RPS targets.

Development of these scenarios is based on the following goals for CCE resource planning:

- Desire to provide levels of renewable energy that exceed current statewide RPS goals
- Ability to direct project activity to local or preferred sites
- Improve the regional environment, economy, and energy choices
- Reasonable local deployment given availability of property, resources, and costs

As of the third quarter 2016, the combined total solar capacity of the three counties analyzed in this report reached 509 MW.[11] Business-as-usual (BAU) expectations are that solar deployment will continue to grow through voluntary customer action, but not at a sufficient rate to achieve local and state renewable energy goals[12].

Scenario 1: Conservative Target: 10% solar PV in local region by 2024
This scenario represents a "conservative target" for new locally-produced clean energy as a baseline for beginning to realize positive economic impact from CCE implementation.

Rationale: There is ample potential for deployment of solar PV across all scenarios. However, if significant obstacles are encountered due to permitting, interconnection, or other challenges, this 10% target represents a minimum, conservative goal for deployment that should be attainable within the planning horizon under nearly any circumstance. This level of deployment would be well below two of the currently operating CCE local renewable target levels but still result in faster implementation than current regional trends, and would likely be strongly supported as a baseline by CCE leaders and regional stakeholders.

[11] Sources: http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf and https://www.californiasolarstatistics.ca.gov/reports/locale_stats/

[12] Existing utility BAU assumptions for this analysis are that the majority of CCE impact does not include NEM deployment because consumers can and will largely continue to adopt solar on-site based on available rate tariffs which are not within the scope of this report. Rather, the addressable impact is for non-NEM deployment, specifically RPS-compliant solar project development, which has been included in the BAU baseline trend.

Scenario 2: Growth Target: 20% solar PV in local region by 2024
This scenario represents a "growth target" for locally-produced clean energy based on the potential for generating significant new local jobs and economic activity.

Rationale: As of October 2016, the State's IOUs had already reached 27% renewable energy content in their supply[13]. However, it is not sourced evenly statewide. In contrast, a CCE could direct power procurement dollars locally. Sonoma Clean Power (SCP) is close to reaching 20% locally-sourced renewables[14] and intends to continue supporting local deployment beyond this level. Based on MCE Clean Energy's (MCE) latest Integrated Resource Plan, including their forecast for total local net metered solar, feed-in-tariff projects, and direct PPA procurement will approach nearly 20% of total load by 2021.[15]

Scenario 3: Leadership Target – 33% solar PV in local region by 2024
This scenario is considered a "leadership target" because it aligns with statewide goals and enables significant progress toward overall clean energy deployment in California and nationally.

Rationale: This target tracks with the current statewide goal of 33% by 2020 for total renewables and supports the State's established target of 50% clean energy by 2030. It assumes that the CCE could procure solar PV within the local region using a variety of tools and project types while also procuring additional supply outside of the area. As a point of reference, the overall interim renewable energy goals for SCP and MCE by 2020 are 50% and 80% respectively.

It is assumed that the levels of local power electricity supply procurement described in the three scenarios would not be achieved if these three counties continue to receive power procured by PG&E or SCE, based upon the company's existing procurement practices and construction of utility owned generation. Also, it is assumed that all contracted renewable supply will be cost competitive with the blended average of alternatives and less than IOU average electricity supply costs.

For example, according to PG&E's 2015 financial report, their current average cost of procured electricity is $0.10/kWh.[16] Looking forward, PG&E's latest general rate case filing requests and subsequent settlement agreement indicate increases to total electric generation revenue of 7.8%, 4.0%, 3.2%, and 3.1% for 2017 through 2020 respectively,[17] indicating that costs will continue to

---

[13] This data was published in the annual California Energy Commission renewable energy update, accessed January 2017 http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf
[14] SCP was in the unique position of being able to procure at launch geothermal power from the world's top resource, The Geysers in Sonoma County.
[15] MCE had a relatively long ramp-up period due to hurdles they faced as the first CCE in California. Subsequent CCEs benefit from MCE's effort, as well as from decreased renewable energy costs, and therefore can achieve these baseline targets sooner.
[16] Source: PG&E 2015 Annual report accessed April 2016, http://s1.q4cdn.com/880135780/files/doc_financials/2015/2015-Annual-Report-Final.pdf
[17] Source: http://www.ora.ca.gov/general.aspx?id=2034

increase, despite low natural gas prices. While SCE's cost base and rate increases are somewhat different, the overall trend is similar. Fortunately, both MCE and SCP are seeing new solar PPA supply contracts for large-scale projects currently being offered at prices that are very close to average wholesale system energy supply costs, and are likely to continue to be cost competitive through 2019 and beyond. Additionally, both MCE and SCP have net metering and local procurement programs (including feed-in-tariffs and collaborative development with municipal partners) to further encourage local solar PV supply. Even though these distributed generation resources cost more than some other supply choices, their development supports important regional goals for renewable energy deployment and creates local economic stimulus that utility-scale renewable energy outside of the region does not.

Economic Impact Analysis – JEDI Model

Incremental economic impact estimates were made using the National Renewable Energy Labs Jobs and Economic Development Impact model (NREL JEDI)[18] starting with new solar PV capacity requirements for each scenario listed above using average solar system productivity levels in the region. Regional impacts are divided into three categories for both jobs and economic growth:

1. Direct - created directly from new project activity. These jobs are primarily in construction and trades working on-site or in preparation for on-site activities.
2. Indirect - created in support of new project activity. These jobs are primarily in project development, financing, services, and sales.
3. Induced - created as a result of the incremental spending and activity from the Direct and Indirect categories. These jobs are in a large variety of areas including services and retail where direct and indirect employees spend their earnings.

Jobs creation estimates are based 'full time equivalents" (FTE) which are calculated using average work hours per year and may include full time jobs, part time jobs, or partial year jobs. (For example one person working for six months on new solar projects would be counted as 0.5 FTE.) Totals for jobs created in the three categories listed above are provided, but specific job durations (full time or part time) are not broken out because there are many different approaches to staffing and workload management across the solar project value chain.

Inputs and assumptions for the JEDI model calculations took into consideration California-based pay scales, permitting, taxes, costs, and induced impacts from local purchasing. Equipment sourcing assumptions were adjusted for local sources of solar panels, inverters, equipment, sub-contractors and financing. The San Joaquin Valley is fortunate that there are many options for solar deployment, although it is important to avoid development of agriculturally productive lands. Sonoma County has an active CCE with similar concerns and has created a renewable energy ordinance to ensure that development, whether CCE-related or not, conforms to acceptable usage.[19] Detailed inputs for

[18] *Latest NREL JEDI Model 03.24.14 was used for this analysis*
[19] *Sonoma County's renewable energy ordinance and reference documents can be found here: http://www.sonoma-county.org/prmd/docs/renewable_energy/*

the economic modeling have been tailored to this unique region and are provided in the Reference section of this report.

Additional Considerations Regarding the Existing Investor-Owned Utilities

CCEs exist in a dynamic business environment that has a multitude of interested parties and market participants, including regulatory bodies, local officials, and competitive utilities. These forces will impact CCE operations, customer offers, costs, and prices. While this report contemplates a fairly consistent set of market rules and alternative offers from PG&E and SCE (the Investor Owned Utilities serving the San Joaquin Valley) future developments that may impact this analysis include:

- *Programs for customers* – the IOU may expand its offers for customers to serve their desire for more clean energy at affordable price points. They may also provide value-added services in new technologies in novel ways that a CCE may not be able to match.

- *Competition for renewable energy development* – As the IOU seeks to meet California's 50% mandate for clean power, their efforts may become more aggressive in local power purchasing, both increasing economic activity and perhaps driving costs of development up if available space, equipment, and labor becomes scarce. Beyond 2020, renewable incentives within the federal investment tax credit (ITC) are scheduled to sunset from the current 30% level and return to standard levels of 10%.

- *Negative economic incentives for CCEs* – In response to the increasing volume of customers that are served by a CCE instead of an IOU, the CPUC/IOUs may begin to adopt requirements for CCEs that further increase costs of launch, operations and electricity purchases for CCEs and their customers. These may include higher program bonds, a CPUC requirement that is posted to cover the costs in the event that the CCA program fails and customers are forced to return to the incumbent utility, and/or exit fees, aka power charge indifference adjustments, which can make it more difficult for CCEs to compete on rates.

- *Interconnection for distributed generation* – The current processes are controlled and managed by the IOU in CCE territory under CPUC Rule 21,[20] and are subject to future changes, restrictions, and incremental costs that could discourage solar project development either because of complexity, additional requirements, or upgrade costs making project not economically feasible in both residential and non-residential sectors.

- *Rate tariff changes* – The various applicable tariffs for interconnected solar projects are undergoing revisions that over time may or may not be favorable to solar project owners. In addition to the potential impact to pure cost-benefit calculations, the uncertainty about future rates can also discourage investment in new projects.

[20] *http://www.cpuc.ca.gov/General.aspx?id=3962*

- *Collaboration opportunities* – IOUs and CCEs may find ways to collaborate on customer services, local programs, electric vehicle charging, and other opportunities that enable better outcomes for all parties

Economic Impact Findings

This section summarizes the findings and economic activity calculated through 2024 based on the scenarios described above for three counties within the eight-county San Joaquin Valley. The entire region has significant potential for siting of new renewables – driving economic and environmental benefits for residents including potential electricity cost savings, new jobs, improved capture of clean energy resources. In total for Scenario 1: Conservative Target (10% local), more than $845 million in new economic impact is possible in the San Joaquin Valley from a CCE in only these three counties.

Figure 2: Scenario 1 (Conservative Target) Summary for Three Counties

Scenario 1 (10% Local) Impact By County	Total Jobs (FTE-years)	Total Economic Output	Annual Local Energy Spending ($)	Equivalent Solar PV Capacity (MW)
San Joaquin County	2,307	233,010,655	37,126,088	233
Fresno County	3,766	380,339,186	62,007,798	380
Tulare County	2,296	231,869,955	37,500,938	232
TOTAL	**8,369**	**845,219,795**	**136,634,823**	**845**

Detailed inputs, data, and estimated economic impacts are provided for each county in the sections below with all three scenarios presented. These include estimated energy purchases within a potential CCE, local solar deployment estimates, job creation forecasts, and related economic activity.

San Joaquin County

San Joaquin County has a significant opportunity to increase jobs and economic activity through locally purchasing new renewable energy. Over $233 million of total new economic activity could be realized over a six-year period in Scenario 1 (10% local renewables), driving over 2,300 job-years in the clean energy sector. To determine total and annual impact in the region, each scenario's total deployment level was spread across the six-year planning horizon for this report with a ramp-up as the CCE builds its organizational capacity. We anticipate significant opportunity beyond 2024, but a defined period or six years for the analysis provided clear boundaries for estimations and forecasts. The chart below compares the economic impact of all three scenarios over the planning horizon.

Figure 3: Cumulative Total Economic Impact by Year for San Joaquin County

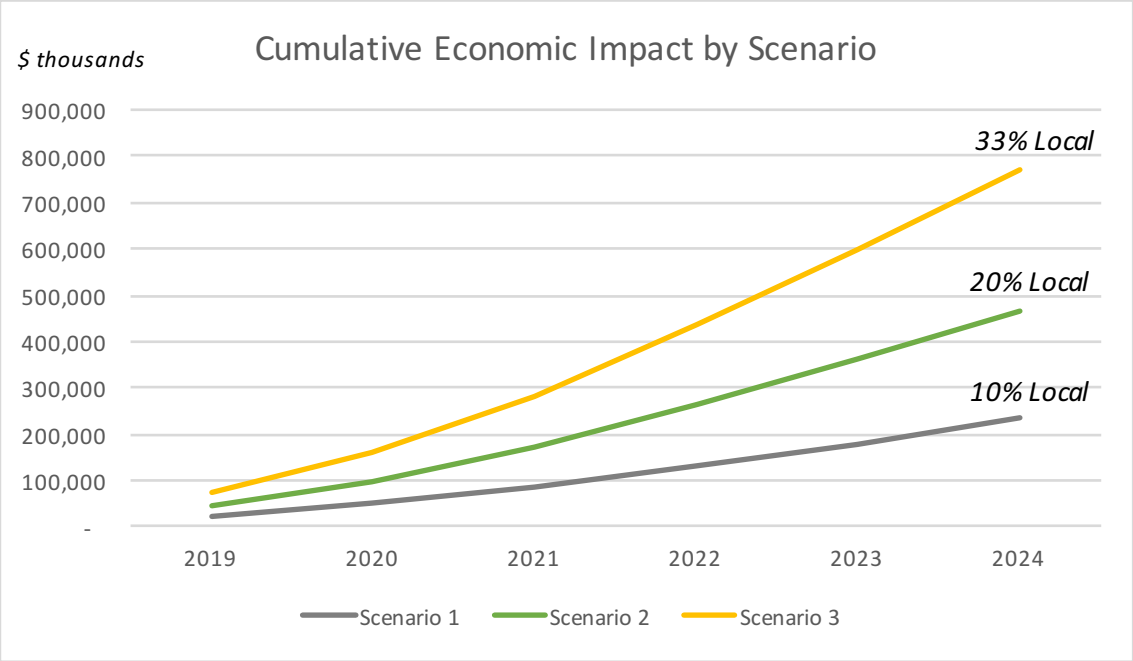
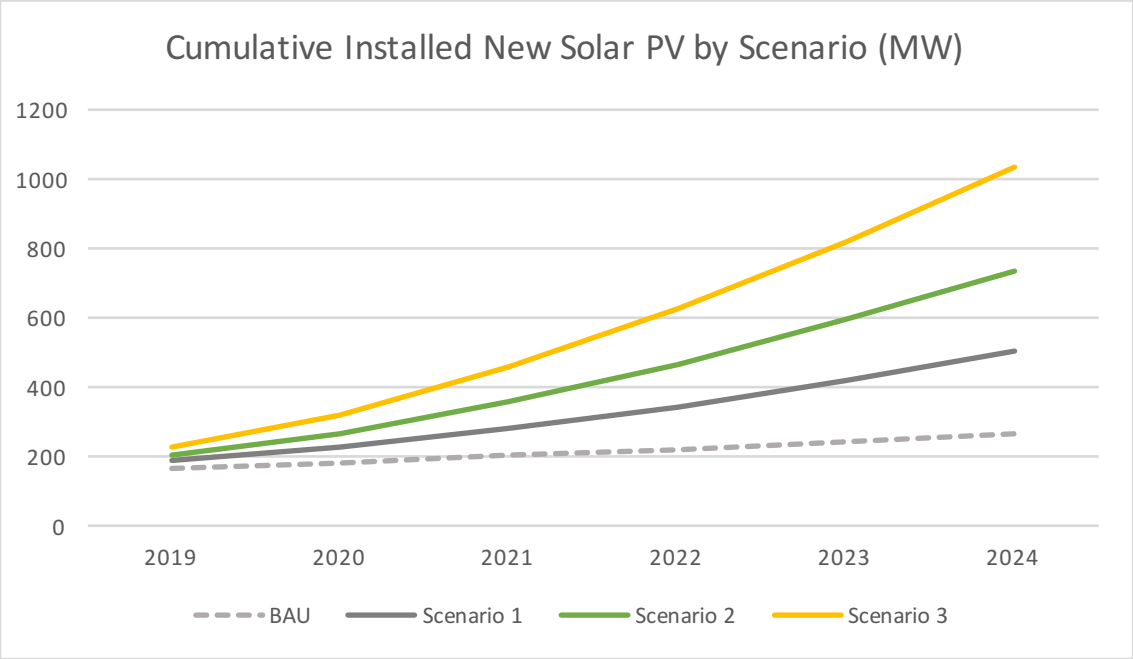


Figure 4 below shows the cumulative new solar PV deployment for each scenario along with the baseline trend for solar deployment within the County. The directly comparable BAU activity is forecasted to grow from 124MW in 2016 to 266MW by 2024 as a baseline assumption[21] before incremental CCE activity is included. Each line represents the forecast new solar capacity under each respective scenario by year.

[21] *This volume of distributed solar in each county is based on CPUC renewables reporting with a forecast that increases total regional deployment to reflect ongoing activity, but at a much lower level than required to meet either of the three scenario targets. The latest renewable statistics were gathered as of September 30, 2016, from: http://www.californiadgstats.ca.gov/downloads/*

Figure 4: Total New Solar Installations by Year for San Joaquin County



Shown in Figure 5 below are the key findings for the three scenarios in terms of total and average annual deployed new solar PV, along with the economic impact from those deployment levels over the entire planning horizon. Each scenario is based on the ability of the CCE to make its own purchasing decisions to shift to new local sources for renewable power. Electric customers in San Joaquin served by the IOU [22]currently consume over 4,300 Gigawatt hours of electricity annually (GWH). The assumption is that CCE customer load retention is 85%, which is then broken down into three scenarios based on 10%, 20%, or 33% of that CCE load is purchased from local renewable energy.

[22] *Only electricity consumption from the IOU was included in this analysis. Data from a local municipal utility was excluded because that territory is not eligible to be served by a CCE.*

Figure 5: Summary of Findings by Scenario for San Joaquin County

San Joaquin County Electricity Consumption (2015 GWh)	
Residential	1,555
Non-Residential	2,750
Total	**4,305**
2020 Estimated CCE Sales *(85% Retention)*	**3,713**

	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (33%)
Local Clean Power Purchases (GWh)	**371**	**743**	**1,225**
Shift to Local Energy Spending (annual)	$ 37,126,088	$ 74,252,175	$ 122,516,089
Equivalent Solar PV Capacity (MW)	233.1	466.1	769.1
Average Annual Solar Installations (MW)	38.8	77.7	128.2
Average Annual Economic Impact	$ 38,835,109	$ 77,670,218	$ 128,155,860
Average Annual Jobs	385	769	1,269

Shown below are charts for each scenario with annual job creation and incremental economic activity in the categories of direct, indirect, and induced activity. (Definitions for each category are provided in the references section of this report.)

Figure 6: San Joaquin County Scenario 1 – 10% Local Solar PV – Jobs and Economic Activity

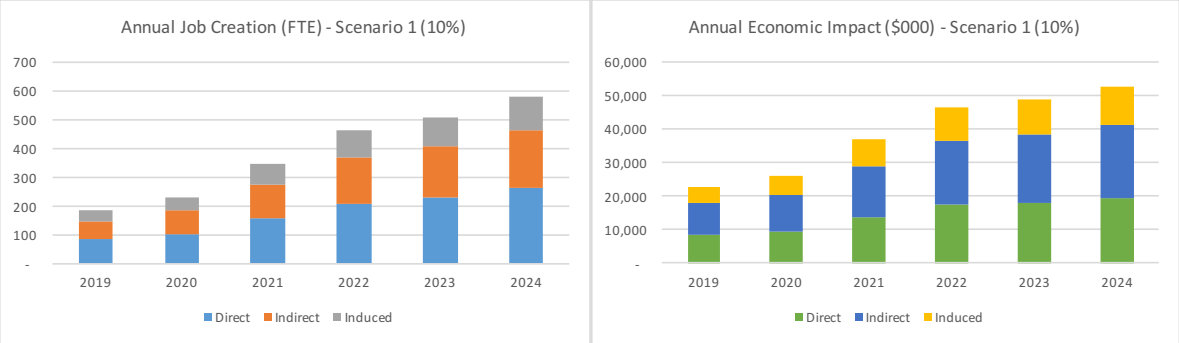


Figure 7: San Joaquin County Scenario 2 – 20% Local Solar PV – Jobs and Economic Activity

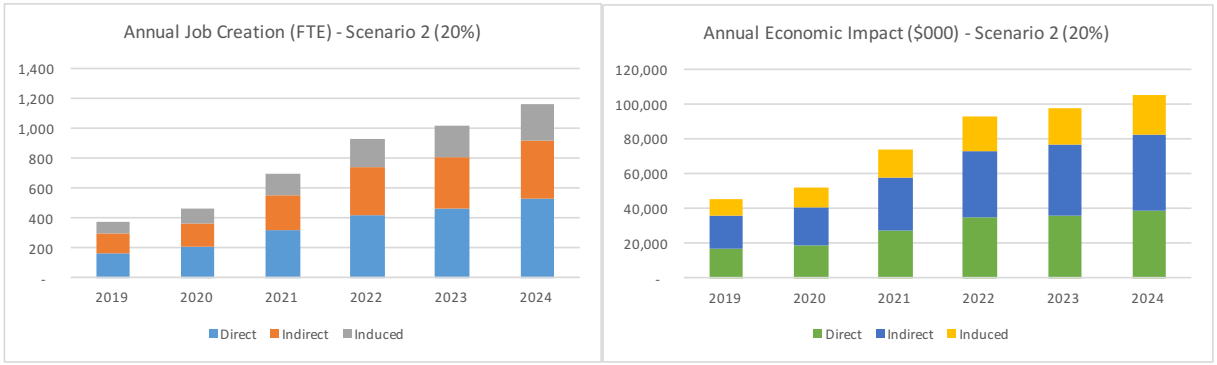


Figure 8: San Joaquin County Scenario 3 – 33% Local Solar PV – Jobs and Economic Activity

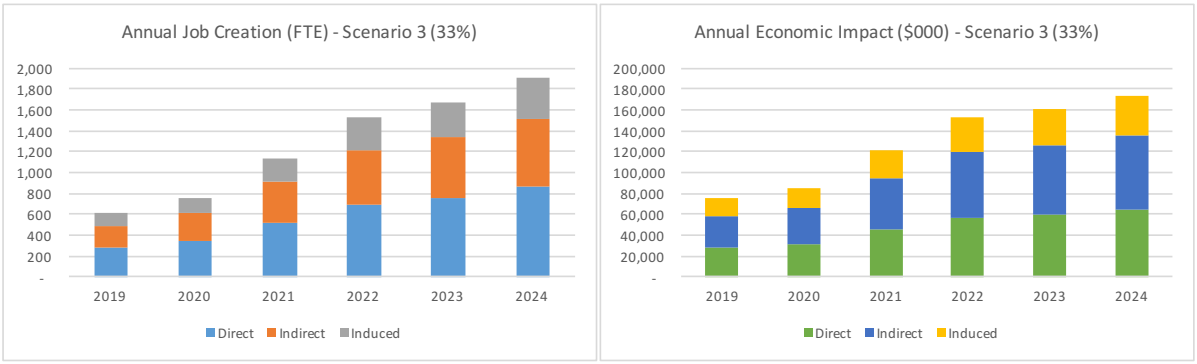


Figure 9: San Joaquin County Scenario Summary

San Joaquin County	Total Jobs (FTE-years)	Total Economic Output ($)	Annual Local Energy Spending ($)
Scenario 1	2,307	233,010,655	37,126,088
Scenario 2	4,615	466,021,309	74,252,175
Scenario 3	7,614	768,935,160	122,516,089

Fresno County

Fresno County has a significant opportunity to increase jobs and economic activity through locally purchasing new renewable energy. Over $380 million of total new economic activity could be realized over a six-year period in Scenario 1 (10% local renewables), driving over 3,700 job-years in the clean energy sector. To determine total and annual impact in the region, each scenario's total deployment level was spread across the six-year planning horizon for this report with a ramp-up as the CCE builds its organizational capacity. We anticipate significant opportunity beyond 2024, but a defined period or six years for the analysis provided clear boundaries for estimations and forecasts. The chart below compares the economic impact of all three scenarios over the planning horizon.

Figure 10: Cumulative Total Economic Impact by Year for Fresno County

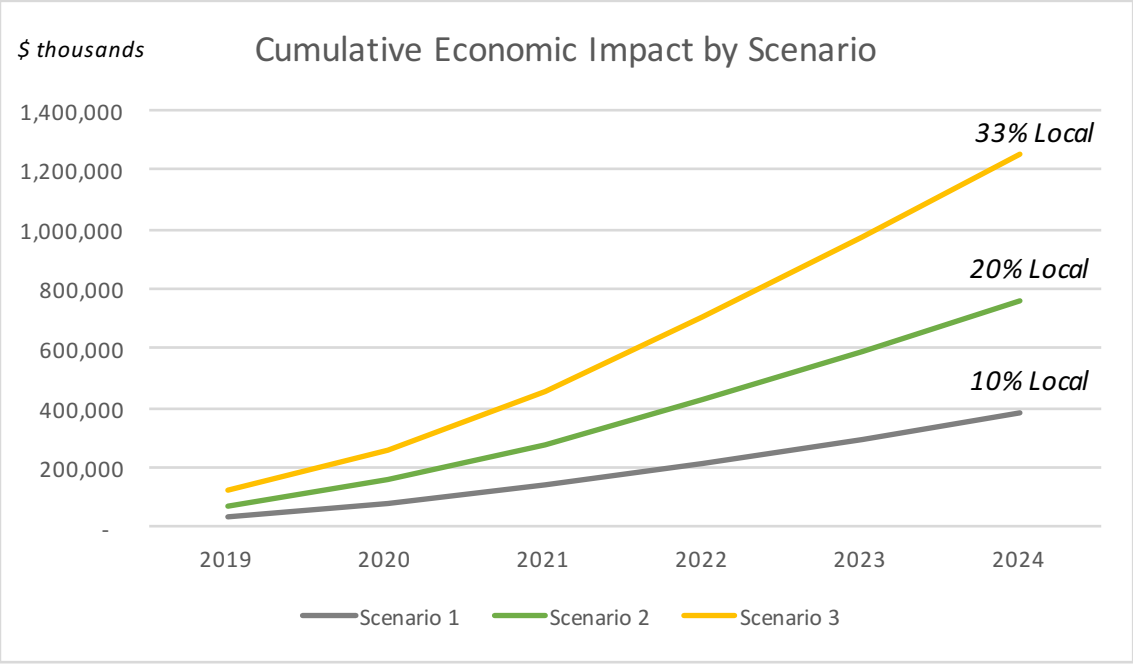
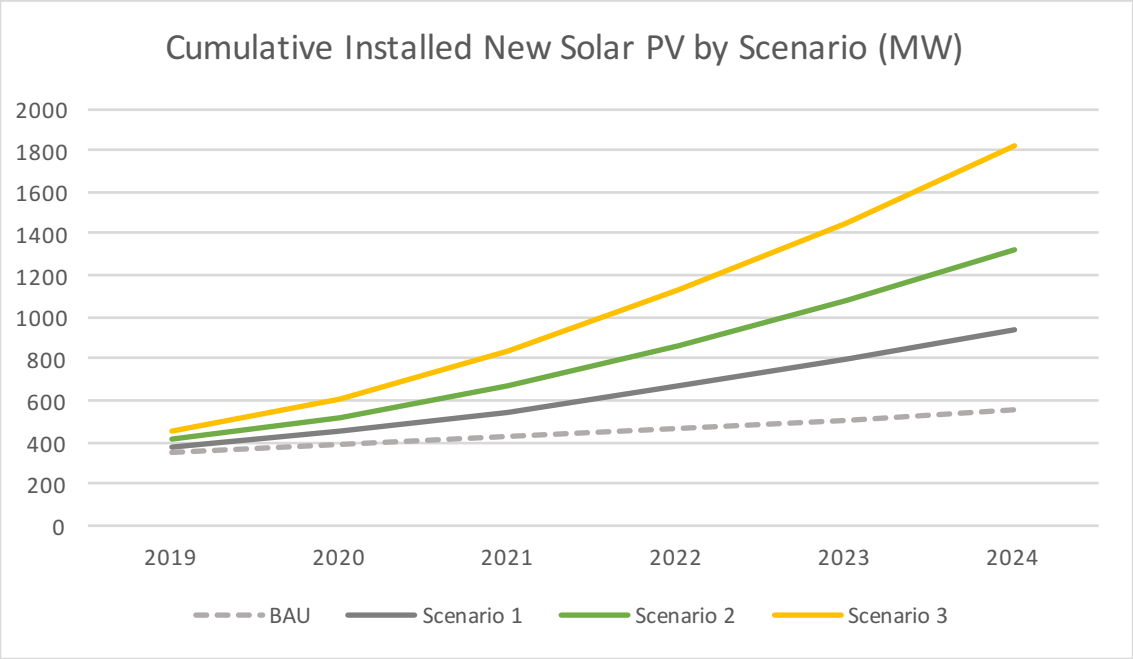


Figure 11 below shows the cumulative new solar PV deployment for each scenario along with the baseline trend for solar deployment within the County. The directly comparable BAU activity is forecasted to grow from 262MW in 2016 to 562MW by 2024 as a baseline assumption[23] before incremental CCE activity is included. Each line represents the forecast new solar capacity under each respective scenario by year.

[23] *This volume of distributed solar in each county is based on CPUC renewables reporting with a forecast that increases total regional deployment to reflect ongoing activity, but at a much lower level than required to meet either of the three scenario targets. The latest renewable statistics were gathered as of September 30, 2016, from: http://www.californiadgstats.ca.gov/downloads/*

Figure 11: Total New Solar Installations by Year for Fresno County



Shown in Figure 12 below are the key findings for the three scenarios in terms of total and average annual deployed new solar PV, along with the economic impact from those deployment levels over the entire planning horizon. Each scenario is based on the ability of the CCE to make its own purchasing decisions to shift to new local sources for renewable power. Electric customers in Fresno County served by the IOU currently consume over 7,100 Gigawatt hours of electricity annually (GWH). The conservative assumption is that CCE customer load retention is 85%, which is then broken down into three scenarios based on 10%, 20%, or 33% of that CCE load is purchased from local renewable energy.

Figure 12: Summary of Findings by Scenario for Fresno County

Fresno County Electricity Consumption (2015 GWh)	
Residential	2,557
Non-Residential	4,610
Total	**7,167**
2020 Estimated CCE Sales *(85% Retention)*	**6,201**

	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (33%)
Local Clean Power Purchases (GWh)	**620**	**1,240**	**2,046**
Shift to Local Energy Spending (annual)	$ 62,007,798	$ 124,015,595	$ 204,625,732
Equivalent Solar PV Capacity (MW)	380.4	760.8	1,255.4
Average Annual Solar Installations (MW)	63.4	126.8	209.2
Average Annual Economic Impact	$ 63,389,864	$ 126,779,729	$ 209,186,552
Average Annual Jobs	628	1,255	2,071

Diving deeper into the local impact, we calculated the local spending control within a CCE for the City of Fresno based on actual energy usage from 2015. If the City were to participate in a CCE, then over $326 million[24] in total annually would be controlled by CCE officials, rather than the IOU, and could thus be directed to support local renewables and other customer programs.

Shown below are charts for each scenario with annual job creation and incremental economic activity in the categories of direct, indirect, and induced activity. (Definitions for each category are provided in the references section of this report.)

[24] *This calculation is based on a total of 3,255 GWH in annual electricity consumption between residential and non-residential customers in the City of Fresno as provided by City officials for 2015.*

Figure 13: Fresno County Scenario 1 – 10% Local Solar PV – Jobs and Economic Activity

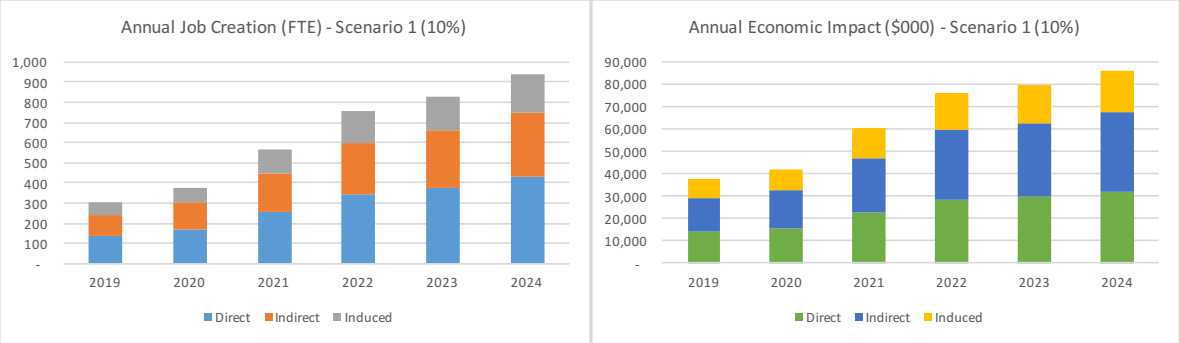


Figure 14: Fresno County Scenario 2 – 20% Local Solar PV – Jobs and Economic Activity

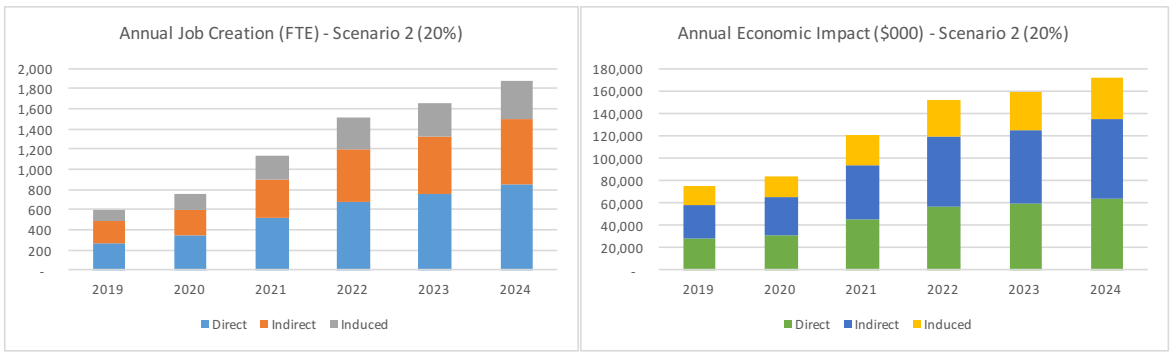


Figure 15: Fresno County Scenario 3 – 33% Local Solar PV – Jobs and Economic Activity

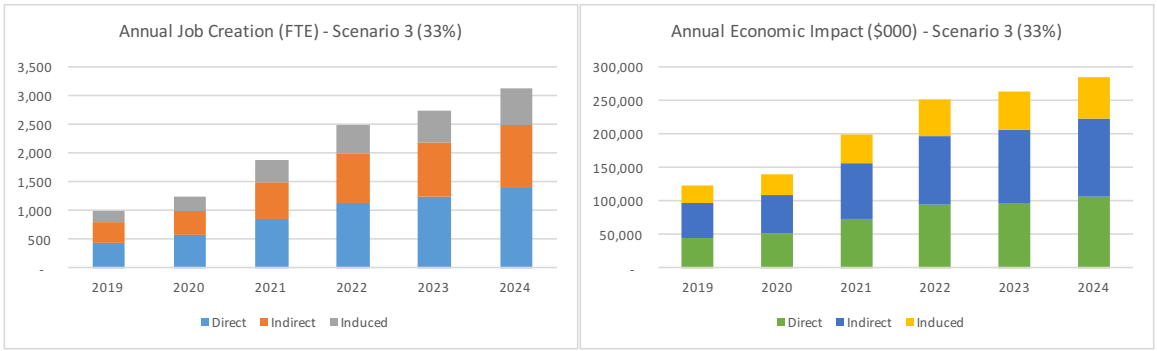


Figure 16: Fresno County Scenario Summary

Fresno County	Total Jobs (FTE-years)	Total Economic Output ($)	Annual Local Energy Spending ($)
Scenario 1	3,766	380,339,186	62,007,798
Scenario 2	7,532	760,678,373	124,015,595
Scenario 3	12,428	1,255,119,315	204,625,732

Tulare County

Tulare County has a significant opportunity to increase jobs and economic activity through locally purchasing new renewable energy. Over $231 million of total new economic activity could be realized over a six-year period in Scenario 1 (10% local renewables), driving over 2,200 job-years in the clean energy sector. To determine total and annual impact in the region, each scenario's total deployment level was spread across the six-year planning horizon for this report with a ramp-up as the CCE builds its organizational capacity. We anticipate significant opportunity beyond 2024, but a defined period or six years for the analysis provided clear boundaries for estimations and forecasts. The chart below compares the economic impact of all three scenarios over the planning horizon.

Figure 17: Cumulative Total Economic Impact by Year for Tulare County

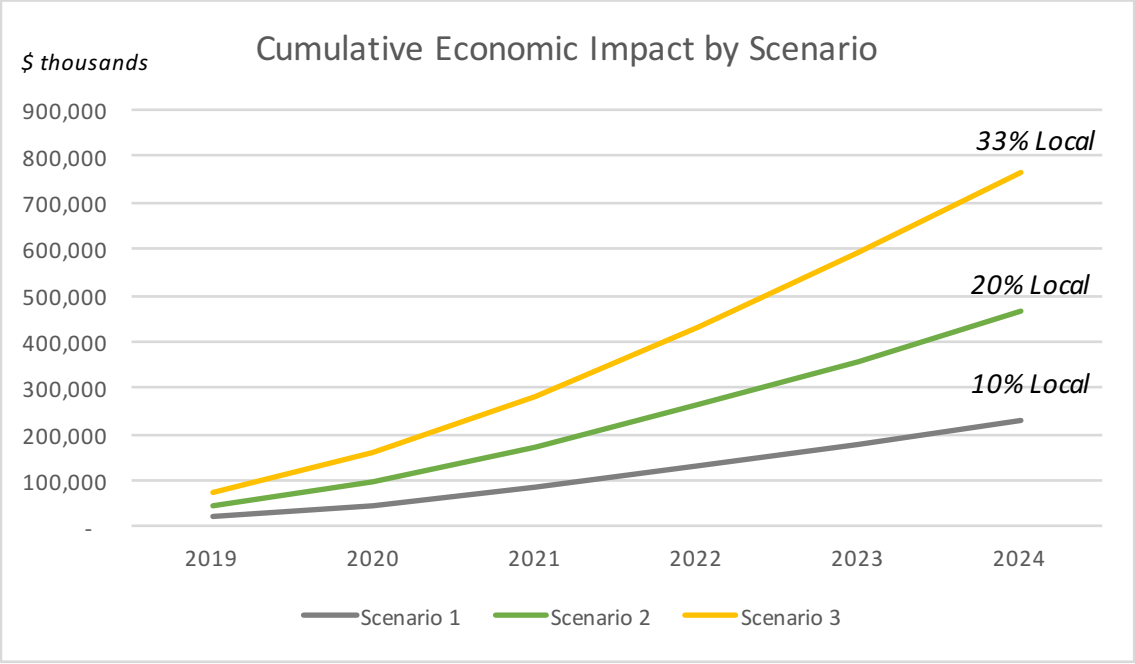
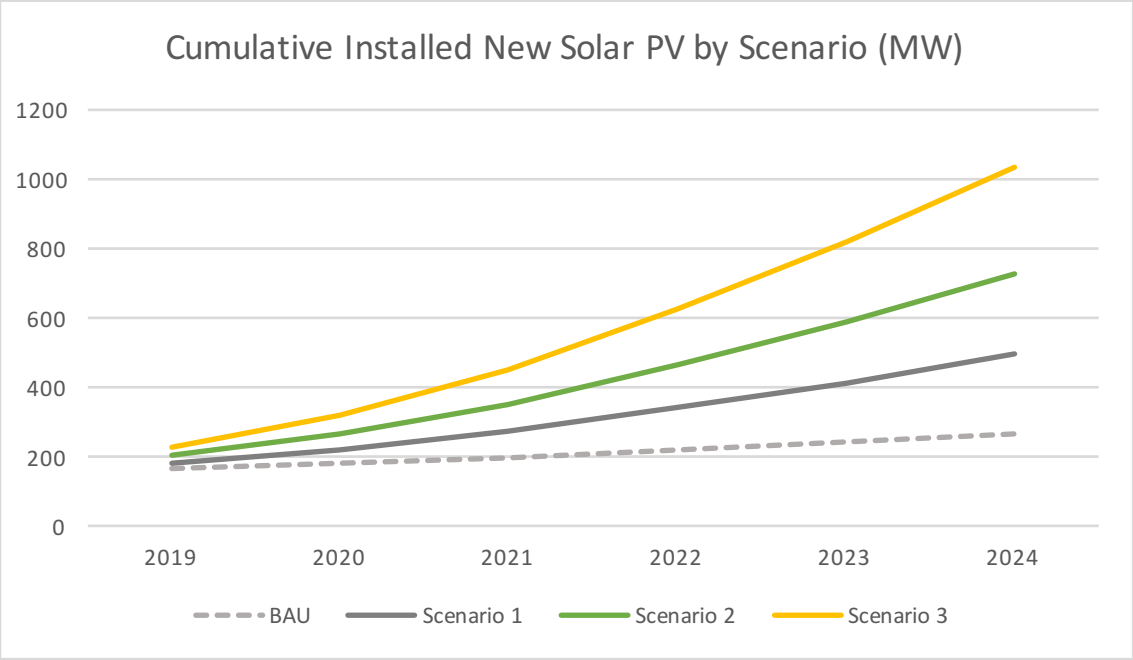


Figure 18 below shows the cumulative new solar PV deployment for each scenario along with the baseline trend for solar deployment within the County. The directly comparable BAU activity is forecasted to grow from 123MW in 2016 to 264MW by 2024 as a baseline assumption[25] before incremental CCE activity is included. Each line represents the forecast new solar capacity under each respective scenario by year.

Figure 18: Total New Solar Installations by Year for Tulare County



Shown in Figure 19 below are the key findings for the three scenarios in terms of total and average annual deployed new solar PV, along with the economic impact from those deployment levels over the entire planning horizon. Each scenario is based on the ability of the CCE to make its own purchasing decisions to shift to new local sources for renewable power. Electric customers in Tulare County served by the IOU currently consume over 4,200 Gigawatt hours of electricity annually (GWH). The assumption is that CCE customer load retention is 85%, which is then broken down into three scenarios based on 10%, 20%, or 33% of that CCE load is purchased from local renewable energy.

[25] *This volume of distributed solar in each county is based on CPUC renewables reporting with a forecast that increases total regional deployment to reflect ongoing activity, but at a much lower level than required to meet either of the three scenario targets. The latest renewable statistics were gathered as of September 30, 2016, from: http://www.californiadgstats.ca.gov/downloads/*

Figure 19: Summary of Findings by Scenario for Tulare County

Tulare County Electricity Consumption (2015 GWh)	
Residential	1,094
Non-Residential	3,175
Total	**4,269**
2020 Estimated CCE Sales *(85% Retention)*	**3,750**

	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (33%)
Local Clean Power Purchases (GWh)	**375**	**750**	**1,238**
Shift to Local Energy Spending (annual)	$ 37,500,938	$ 75,001,875	$ 123,753,094
Equivalent Solar PV Capacity (MW)	231.9	463.8	765.3
Average Annual Solar Installations (MW)	38.7	77.3	127.6
Average Annual Economic Impact	$ 38,644,992	$ 77,289,985	$ 127,528,475
Average Annual Jobs	383	765	1,263

Shown below are charts for each scenario with annual job creation and incremental economic activity in the categories of direct, indirect, and induced activity. (Definitions for each category are provided in the references section of this report.)

Figure 20: Tulare County Scenario 1 – 10% Local Solar PV – Jobs and Economic Activity

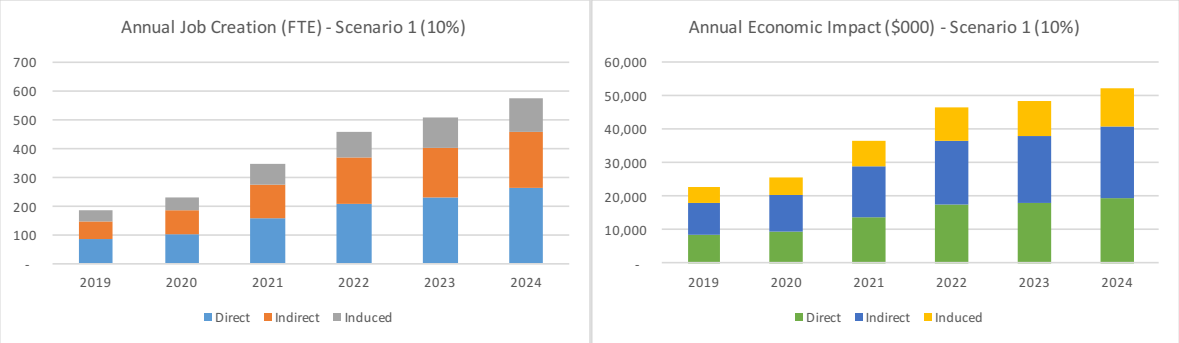


Figure 21: Tulare County Scenario 2 – 20% Local Solar PV – Jobs and Economic Activity

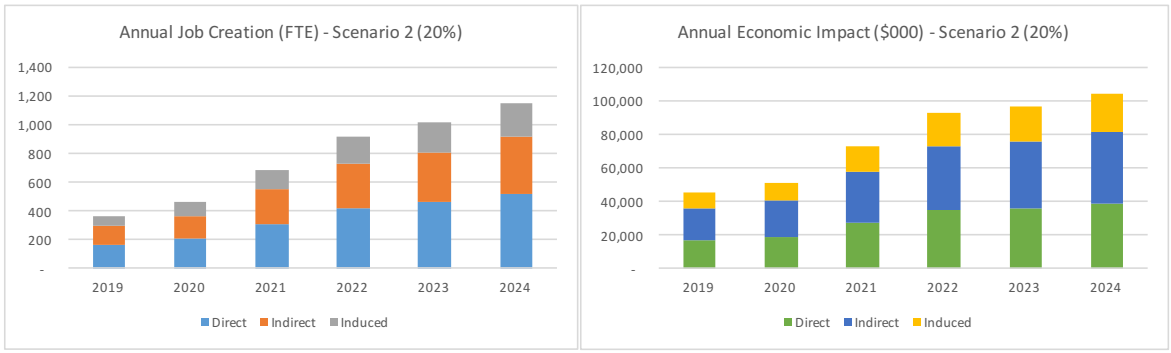


Figure 22: Tulare County Scenario 3 – 33% Local Solar PV – Jobs and Economic Activity

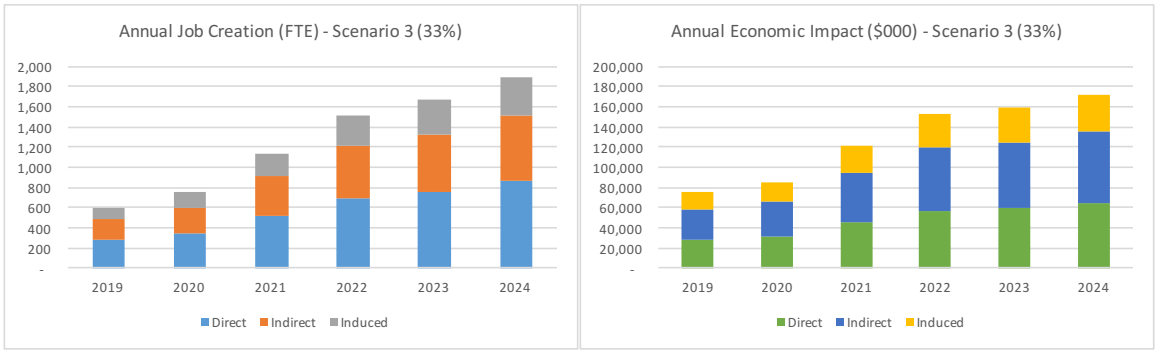


Figure 23: Tulare County Scenario Summary

Tulare County	Total Jobs (FTE-years)	Total Economic Output ($)	Annual Local Energy Spending ($)
Scenario 1	2,296	231,869,955	37,500,938
Scenario 2	4,592	463,739,909	75,001,875
Scenario 3	7,577	765,170,850	123,753,094

Conclusion

Based on this report's findings, if these three counties commit to purchase local clean power, they would realize major regional economic benefits. CCE can help communities reach their economic goals without investing public funds. By tapping an existing revenue stream in the hundreds of millions of dollars per year and shifting spending to clean, local sources, the CCE generates new economic activity driven by and in collaboration with the private sector. The sources of power may be developed through programs such as feed-in-tariffs, net metering, Power Purchase Agreements (PPAs), and direct development efforts by the CCE.

To best serve CCE customers, policymakers in the San Joaquin Valley must still balance local clean power procurement with the need for competitive rates, financial reserves, and other goals. However, it is clear that there are real, significant, positive economic benefits to CCE business and residential customers and the community at large when local jobs and renewable energy projects are encouraged and supported.

CCE Programs and Goal Setting

CCE agencies can implement numerous programs to drive renewable deployment locally and realize the related benefits, often faster and more efficiently than a traditional investor-owned utility.[26] These programs can be operationalized via an integrated resource planning process that incorporates specific goals, timelines, and budgets based on target levels of local impact using the scenarios provided in this report, or others. Examples of CCE-driven programs, both solar and non-solar, include the following:

- Annual "open season" for new regional project development
- Aggregated project development for residential and/or commercial sectors
- Feed-in-tariffs
- Enhanced net metering tariff
- Electric vehicle adoption programs
- Aggregated demand management programs
- Targeted project financing programs
- Low-income customer solar discounts
- Electric storage purchasing programs
- Collaborative efforts with local officials to streamline permitting

[26] *For links to specific CCE programs, existing and prospective, see:* *http://cleanpowerexchange.org/resources/programs/*

References, Resources, and Assumptions

Listed below are key references, resources, and assumptions used to develop the scenario estimates and forecasted impact from local renewable deployment in this report.

Economic impact is expressed in three categories:

1) *Direct* – jobs and output that are created in the region directly from project development activity
2) *Indirect* - jobs and output in sectors within the region that supply goods and services to project development
3) *Induced* – jobs in the region that are related to household spending of the added income to direct and indirect workers

San Joaquin, Fresno, and Tulare Counties' total electricity consumption data was provided by the California Energy Commission for 2010 through 2015 including IOU-supplied power for each county. http://www.ecdms.energy.ca.gov/elecbycounty.aspx

Distributed solar power data was gathered from the California Solar Statistics website and was used to evaluate current growth rates for local renewables:
http://www.californiadgstats.ca.gov/downloads/

PG&E average annual electricity supply costs were based on their 2015 annual report to shareholders and were used to establish a baseline avoided cost for electricity supply:
http://s1.q4cdn.com/880135780/files/doc_financials/2015/2015-Annual-Report-Final.pdf

Various county-level demographics were gathered from Wikipedia statistics.

The customer retention rate for a potential CCE implementation is conservatively estimated at 85%, meaning that 85% of eligible customers will choose to be a customer of the CCE. This conservative estimate is based on data from the five operational CCE agencies which collectively average 92% retention.

Existing CCE energy consumption data was gathered from their respective organizations and external references to historical and forecasted values:
http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf

MCE Clean Energy's 2015 Integrated Resource Plan: https://www.mcecleanenergy.org/wp-content/uploads/2016/01/Marin-Clean-Energy-2015-Integrated-Resource-Plan_FINAL-BOARD-APPROVED.pdf

Links to other existing and potential CCE's that were used for background research:
Sonoma Clean Power: http://sonomacleanpower.org/
Lancaster Choice Energy: http://www.lancasterchoiceenergy.com/
Peninsula Clean Energy: http://www.peninsulacleanenergy.com/
CleanPowerSF: http://sfwater.org/index.aspx?page=748

Silicon Valley Clean Energy: https://www.svcleanenergy.org/
East Bay Community Energy: http://www.ebce.org/
San Jose Community Energy: http://sanjosecommunityenergy.org/

A Clean Power Exchange resources page is dedicated to addressing the relationship between CCE and solar. It includes links to operational CCE solar programs:
http://cleanpowerexchange.org/resources/solar/

NREL JEDI version PV03.24.14 was used for detailed impact analysis including direct, indirect and induced job creation and increased economic activity (output): http://www.nrel.gov/analysis/jedi/

Key NREL JEDI model inputs include the following:

System size: the average system sizes used for this analysis assume deployment primarily of medium commercial scale (250kW with silicon modules and fixed mounting) up to small utility scale (5MW, ground mounted) reflect a balance between smaller and larger systems that would be required to reach the total deployment targets contemplated in each scenario.

Average solar PV system costs: the analysis used $1.77/W as the overall average total installed system costs, in nominal dollars for the first year in the planning horizon (2019), taking into consideration relatively lower land and development costs in the San Joaquin Valley compared to the national average. For reference in Q4 2015, average national costs for solar projects (according to the 2015 GTM Solar Market Insight Report) were slightly below $1.50/W for utility-scale systems, near $2.10/W for non-residential systems, and at $3.50/W for residential systems. Each subsequent year was forecasted to decrease in total costs by 5% per year for all sectors. The average mix of systems by sector was assumed to be 15% residential, 45% commercial, and 40% utility by installed capacity.

System Yield: Average annual solar system productivity was estimated between 1,593 and 1,630 kWh/kW depending on the county and was used to calculate the equivalent solar capacity in the local region based on clean energy purchasing requirements. The NREL PVWATTS calculator was used with typical system design inputs for the region and application type to generate the annual yield.

System Components and Labor: Assumptions for local purchasing included 75% local for electrical components, 50% for mounting systems, and 100% local for installation labor. None of the components were assumed to be manufactured locally, but purchased from local vendors. Any local manufacturing would increase the total economic impact and job creation estimates.

Taxes: Sales taxes were included at local rates, but no property taxes were included assuming that the solar systems would be exempt. These tax revenues go directly back to the local jurisdictions where projects are installed.

Financing: Projects would be financed using 50% debt, which impacts total economic activity and project costs.

O&M Costs: These were estimated at $14/kW/year on average based on typical project costs, and were used to calculate ongoing job creation and economic activity over a solar project's lifetime of at least 20 years.

Appendix: Background on Community Choice Energy

What is Community Choice?

Community Choice Energy (CCE) programs, legally called Community Choice Aggregation (CCA), are local programs that buy and can generate electricity for residents and businesses. CCEs' statutory authority includes rate-setting, owned-asset development, energy efficiency program implementation, purchasing decisions, and program design. The incumbent investor-owned utility (IOU) continues to provide transmission, distribution, and maintenance services, and handles the metering and the billing for CCE customers. In California, Assembly Bill 117 (2002) empowers local governments to aggregate the electricity ratepayers in their jurisdictions. Senate Bill 790 (2011) provides a code of conduct that requires the distribution utility to cooperate with the Community Choice program. Seven states currently have Community Choice laws including California.

CCE allows local control of the revenue stream and selection of electricity providers in communities that have traditionally been controlled by regulated monopolies. Community Choice allows a locally appointed board (usually comprised of elected officials) to direct the expenditure of millions of dollars of an existing revenue stream in any given jurisdiction. Currently most communities have limited ability to influence decision-making about electricity rates and policies. Community Choice brings that decision-making closer to home in a public arena accessible to businesses and residents.

SOURCE

CCE Operator

buys and builds cleaner energy supplies

DELIVERY

Investor Owned Utility

delivers energy, repairs lines

CUSTOMER

You

choice, cleaner energy, local control and competitive rates

Why is CCE Important? Benefits to Communities and to Modernizing the Grid

As of April 2017, there are five operational CCEs in California and several more in the final stages of development. The opt-out rate for those customers wishing to remain with the incumbent IOU has been decreasing, and most recently is below 6%. In these CCE authorities, electricity rates are all competitive with the IOUs' and are typically 2 to 3% lower than the IOUs' rates even after a recent increase in the exit fees. The renewable energy portion of portfolios range from 36% at Sonoma Clean Power (SCP) and Lancaster Choice Energy to 50% at MCE Clean Energy (MCE). In contrast, California's three large IOUs – Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric provide an average of 27.6% renewable energy to their customers.[27] All of the existing CCAs offer a 100% renewable energy product to their customers as well, usually at a small premium on their bill (~$0.01/kWh to $0.025/kWh). PG&E currently offers a Solar Choice program with up to 100% renewable power from solar projects at an incremental cost between $0.015/kWh and $0.026/kWh[28].

CCEs have helped develop local renewable energy programs on behalf of their customers in several ways. First, they offer enhanced net metering programs that give solar customers more value than they receive from the IOUs for the surplus renewable power they generate. They also have Feed-in Tariff programs that pay a premium for solar installations up to about a megawatt that feed power back into the grid. Finally, both MCE and Sonoma Clean Power are investing in larger local projects. MCE has contracted for a 10.5 MW project in the City of Richmond, and SCP has contracted for a 12.5 MW "floatovoltaic" project in partnership with the Sonoma County Water Agency, where photovoltaic panels are used to cover wastewater treatment ponds. MCE also has a program called Local Sol where customers who are willing to pay a premium ($0.142/kWh) support the development and operation of a solar project currently under construction in Novato.

A key economic benefit to local communities is the retention of capital in the community. In the case of Sonoma Clean Power, since their launch they have increased spending in Sonoma County from 3% by PG&E, to over 25% by SCP, equal to about $35 million today. And local spending likely will increase over time. This demonstrates that although it is important to offer competitive rates at launch, the decision-making control over millions of dollars over time – the products, projects, and programs the agency is able to develop – is another significant consideration for decision makers when deciding how much power to develop locally.

Additional benefits exist for both the local distribution grid and customers from developing distributed energy resources (DER). In a recent paper "A Pathway to the Distributed Grid," SolarCity identifies twelve categories of avoided costs from DER deployment.[29] One of the ways that DER provides savings is deferring expansion or upgrades of the transmission and distribution

---

[27] California Public Utility Commission, California Renewables Portfolio Standard http://www.cpuc.ca.gov/RPS_Homepage/
[28] More information about PG&E's program rates can be found here: https://www.pge.com/en_US/residential/solar-and-vehicles/options/solar/solar-choice/rate-calculator.page
[29] "A Pathway to the Distributed Grid," SolarCity Grid Engineering http://www.solarcity.com/sites/default/files/SolarCity_Distributed_Grid-021016.pdf

system to meet peak loads. Legislation has been introduced in the 2017-18 session (SB 692, Allen) to address transmission-related costs that have been estimated to be as high as $0.04/kWh with Transmission Access Charges (TAC), alone being three-quarters of that on a 20-year levelized basis, and line and congestion losses comprising the remainder. With a modest reform of the Transmission Access Charges increased DER development could save customers up to $26 billion in avoided costs over a 20-year period.[30] As we modernize the energy grid and improve service quality and reliability, decision makers can factor in the advantages of local resource deployments that are not currently part of the equation.

Growth of Community Choice Energy in California

Growth in CCE implementation is expected to increase significantly as is shown in the map below.[31] This trend has the potential to impact the majority of the California population via the CCE model and accelerate reduction of California's greenhouse gas emissions while building the clean energy economy. As these CCE programs invest in local resources and clean technologies such as energy storage and electric vehicle charging infrastructure, they will help move California toward a more democratized, decentralized, and sustainable power system.

Two other concurrent reports by the Center for Climate Protection explore CCE growth and impact in California:

Community Choice Aggregation Expansion in California and its Relation to Investor-Owned Utility Procurement, by Tyler Bonson and June Brashares

and

Community Choice Energy Programs in California: Greenhouse Gas and Customer Cost Savings, by Ken Wells

Please contact us for information about these reports.

[30] The Clean Coalition's opening comments in the California Independent System Operator Energy Storage and Distributed Energy Resources Phase 2 Stakeholder Initiative April 18, 2016. http://www.clean-coalition.org/regulatory-filings/caiso-transmission-access-charges-tac-comments-in-esder-phase-2/
[31] Map provided from CleanPowerExchange.org website, April 2017.

Community Choice Energy growth in California. The map below is a screenshot of the dynamic, interactive map available at www.cleanpowerexchange.org. The map is unique in that it provides information about the status of Community Choice Energy development for all 58 counties and all 482 cities in the State. It is updated weekly and we welcome comments, suggestions, and updates.