



100% RENEWABLE ENERGY STUDY FOR SEVEN CITIES

IN THE EAST BAY COMMUNITY ENERGY PROGRAM

Opportunities to Reduce Greenhouse Gas Emissions via Community Choice Aggregation

Sponsor: Bay Area Air Quality Management District

In Partnership with the Sequoia Foundation

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1. Study Background and Scope

Purpose

The climate crisis we are facing can be addressed, in part, by the rapid reduction in the burning of fossil fuels to produce electricity and to power transportation. Community Choice Aggregation (CCA), also known as Community Choice Energy (CCE), provides Californians with a powerful option for moving toward more renewable energy for electricity in our homes and businesses and reducing the amount of fossil fuels used for transportation. Enabled by Assembly Bill 117 (Migden) in 2002, CCEs allow local governments and some special districts to pool (or aggregate) their electricity load in order to purchase and/or develop power on behalf of their residents, businesses, and municipal electric accounts. California has been a leader in renewable energy by establishing an aggressive Renewable Portfolio Standard (RPS) and enabling programs to reduce climate altering greenhouse gases. Established in 2002 under Senate Bill 1078, and enhanced in 2015 by Senate Bill 350, California's RPS program requires investor-owned utilities (IOUs), publicly owned utilities, electric service providers, and CCEs to increase procurement from eligible renewable energy resources to 50% of total procurement by 2030. In September 2018, Governor Jerry Brown signed SB 100 which now requires all electric providers to increase the renewable content of electricity to 60% by 2030 and deliver electricity that is completely carbon free by 2045.

This study describes how cities can accelerate the transformation to carbon free renewable energy and meet their Climate Action Plan goals, while strengthening the local, regional, and state economies. Specifically, this study evaluates the implications for self-selected member cities of the East Bay Community Energy (EBCE) program that are interested in a 100% renewable energy default product for all electric accounts (municipal, commercial, and residential) within their cities.

Background

The Air District's goals and objectives are described in [Spare the Air – Cool the Climate](#), the Air District's regional clean air plan (Plan). The Plan contains a long-range vision of how the Bay Area could look and function in a 2050 post-carbon economy, and describes a comprehensive control strategy that the Air District will implement over the next three to five years to protect public health and protect the climate. This strategy includes supporting the efforts of local governments to transition to cleaner sources of electricity, in part by supporting CCE programs.

The first California CCE program, Marin Clean Energy (now called MCE Clean Energy), launched in 2010 followed by Sonoma Clean Power in 2014. By the end of 2018, 20 or more CCE programs could be delivering electricity to customers throughout the state. Most of the programs are multi-jurisdiction programs governed by a Joint Powers Agreement, but several CCE programs are administered by a single city, often called an "enterprise fund" model.

During 2017 and into 2018, EBCE was in the implementation process as one of the newest CCE programs in California (as part of a rapidly expanding group of CCEs across the Bay Area) with an excellent opportunity to provide clean energy options at very competitive prices to its customers. EBCE is made up the County of Alameda and eleven of its cities. In 2016, these 12 jurisdictions had a combined annual electric load of over 6,200 gigawatt hours (GWH). Albany and Berkeley were the first two cities to express an interest in participating in this study with Hayward, Oakland, Piedmont, Emeryville, and San Leandro joining later.

In general, the EBCE member cities that are a part of this study are seeking solutions that can be provided by EBCE to address their climate action plan goals for greenhouse gas (GHG) emission reductions from their community-wide electricity consumption. This study was prepared to help them understand the options in the context of their clean energy goals, the related impacts to customer bills, and EBCE financial stability. This study was also intended to provide lessons learned to the remaining EBCE jurisdictions and newly forming CCEs that may be interested in pursuing similar climate and clean energy goals.

Goals, Scope, and Tasks

Project Goal: Evaluate the potential impact for seven self-selected communities within EBCE to procure 100% renewable energy as a default for residents, businesses, and municipal accounts. This report uses the State's definition of renewable energy, which does not include large hydroelectric power stations.

Task 1: Research and evaluate current CCE renewable energy products and rates as a basis for comparison with the product offerings from EBCE. This includes reviewing energy mix options, related costs, and product pricing.

Task 2: Investigate and analyze the options, GHG impact, and costs for selecting a 100% renewable energy product as the default for all customer categories in the cities of Albany, Berkeley, Piedmont, Hayward, Emeryville, San Leandro, and Oakland.

Task 3: Develop an analysis of the findings from Tasks 1 and 2 to provide recommendations with rationale to the cities and EBCE to encourage faster achievement of GHG-reduction goals.

As a point of reference for potential impact from EBCE, the following table shows how switching to GHG or carbon-free electricity can achieve progress toward the existing climate action goals for a sample of three participating cities: Albany, Berkeley, and Hayward. The table below looks at GHG emissions from each city's electricity use as a component of their climate action plans' overall GHG reduction goals. As shown, for Albany and Berkeley, the electricity sector accounts for slightly more than half of the 2020 GHG emission reduction goals, while if Hayward were to eliminate electricity GHG emissions, it would surpass this goal by approximately 16%. At a high level, this indicates that there is a major opportunity to reach citywide GHG reduction targets through their newly formed CCE by making the appropriate selection of power supply options. All EBCE cities have that choice.

Table of GHG Reduction Targets and EBCE Potential Impact for Selected EBCE Cities

	Albany	Berkeley	Hayward
GHG Reduction Target Citywide – All Sectors	19,600 MT CO ₂ e “The community’s GHG emissions must be reduced by 25% below 2004 baseline emission levels by 2020.” <i>Source: 2010 Climate Action Plan</i>	239,300 MT CO ₂ e “The community’s target for the year 2020 is to reduce community-wide GHG emissions by 33% below 2000 levels.” <i>Source: 2009 Climate Action Plan</i>	147,909 MT CO ₂ e “The community’s target for the year 2020 is to reduce community-wide GHG emissions by 12.5% below 2005 levels.” <i>Source: 2010 Climate Action Plan</i>
2016 Electricity Usage Citywide Total	62,538,718 kWh	692,888,108 kWh	971,646,457 kWh
GHG Emissions Estimate from Electricity - Citywide	11,007 MT CO ₂ e <i>(PG&E Emissions Factor 2016)</i>	121,948 MT CO ₂ e <i>(PG&E Emissions Factor 2016)</i>	171,010 MT CO ₂ e <i>(PG&E Emissions Factor 2016)</i>
2020 GHG Target Achievable by Electricity Alone	56%	51%	116%

Key Findings

During the development of this report, several key findings emerged, along with some early wins and potential challenges, as described below.

- Prior to April 18, 2018, only two electricity products were offered by EBCE – “Bright Choice” with a mix of 38% renewable and 47% large hydroelectric (85% GHG-free) electricity¹ and “Brilliant 100” with a mix of 40% renewable and 60% large hydro (100% GHG-free) electricity. The EBCE Board approved a 100% renewable product at its April 18, 2018 meeting that will be available to all customer classes in November 2018.
- While this report was intended to focus on a 100% renewable energy product, the focus was shifted to Brilliant 100 as a 100% GHG-free option, due to the early lack of availability of a 100% renewable option.
- The pricing offered for the optional Brilliant 100 product is the same price as PG&E power, although it is priced higher than some CCE peers in the Bay Area. This rate makes the decision for a city to set Brilliant 100 as the default option much easier because it does not require customers to bear any increased cost in their electricity bills.

¹ See Attachment 1 – “Evolution of Power Content of EBCE’s Bright Choice Product Offering”

- There appears to be some confusion by some local advocates about the various options, funding, and programs that will be made available by EBCE and their potential impact on customers due to a lack of detailed budget information in the planning phase.
- During the analysis and development of this report, early findings were shared with the seven interested cities and EBCE staff and Board of Directors. Those interactions with EBCE resulted in the Board voting to increase the GHG-free mix of electricity for Bright Choice from 70% GHG-free to 85% GHG-free at its April 18, 2018 meeting.
- Several cities relied on the analysis and information shared with them to opt up some or all of their customer classes to either Brilliant 100 or the recently announced 100% renewable product. Albany opted up all its customer classes to Brilliant 100. Hayward opted up all classes to Brilliant 100 with the exception of customers who receive a fixed discount (i.e. California Alternate Rates for Energy). Piedmont opted up its municipal accounts to Brilliant 100 and its residential accounts to the 100% renewable product. Some cities opted up their municipal accounts to Brilliant 100. Attachment 2 indicates the status of customer enrollment of the seven cities that participated in the study as of September 30, 2018.

2. CCE Program Research and Comparisons

This study and supporting analysis were developed using a phased approach that involved external stakeholders, EBCE staff, and the cities within EBCE. Specifically, for Tasks 1 and 2 the steps included:

1. Gathering information from CCE programs including Integrated Resource Plans, staff reports to the Board, budget documents, Implementation Plans, technical studies, published rates, published energy mix data, and staff interviews.
2. Analyzing product offerings and incremental costs relative to renewable content and overall GHG-free offers. This included rate comparisons for a sample of customer segments for seven Bay Area CCEs with investor owned utility (IOU) pricing for supply plus the Power Charge Indifference Adjustment (PCIA is the “exit fee” charged to all CCE customers to avoid stranded costs being assumed by PG&E’s remaining customers.)
3. Researching cost drivers for renewable power supply as an input to the forecasts for EBCE product prices and rates.
4. Comparing the latest renewable energy procurement trends and GHG-free power mix at the state level using IOU filings and the California Public Utilities Commission (CPUC) reports.
5. Conducting stakeholder meetings to share the goals and tasks of this report and gather input and feedback on the opportunities and challenges from various perspectives.
6. Analyzing the impact on EBCE customers under various scenarios including evaluating the impact on their electricity bills and customer retention rates.

Renewable and GHG-Free Power Procurement Trends

Shown below is a table from the August 2017 CPUC RPS Compliance Report that includes actual renewable power percentages (audited by the California Energy Commission) and future period forecasts based on data reported to the CPUC by the State’s three large IOUs.

Table Excerpt from CPUC RPS Compliance Report – August 2017

Actuals						Forecasted			
Compliance Period 1			Compliance Period 2			Compliance Period 3			
20% Requirement			25% Requirement			33% Requirement			
2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20%	20%	23%	28%	30%	35%	38%	42%	47%	50%

Data source: IOU RPS Compliance Reports, August 2017¹⁷

17 Note: The forward-looking data (2017-2020) of each IOU is treated as confidential information per D.06-06-066.

This table clearly indicates that not only have the IOUs exceeded the statewide renewable energy targets since 2013, but they are also forecasted to increase their percentage of renewables over the next few years. Based on the CPUC report, the driver is described as being primarily due to the volume of load departing from the IOUs that is, or will be, served by CCEs, leaving the IOUs with higher proportions of contracted renewables than originally planned or required. The stated goal of the CCEs is to increase their renewable and GHG-free power content above the IOU levels, which is likely to create healthy competition and increase clean power purchases statewide.

On a local level, as of February 20, 2018, PG&E announced that it was 79% GHG-free for its 2017 power supply (up from nearly 70% in 2016)². With this rapid progress by the IOU that operates in the EBCE service territory, a further analysis was performed to estimate the potential GHG-emissions factor and power mix for 2018 (and beyond) so that the proper baseline for comparison to PG&E was established. On a straight-line basis, from 2016 to 2017, PG&E increased its GHG-free percentage by 9%, so it is quite possible that on that trend PG&E may reach 88% for 2018. Also, in filings with the CPUC, PG&E indicated a rapid reduction in their emissions intensity from 2016 and 2017 to 2018.

² <http://www.pgecurrents.com/2017/03/16/nearly-70-percent-of-pge%E2%80%99s-electric-power-mix-free-of-greenhouse-gases/> and <http://www.pgecurrents.com/2018/02/20/pge-clean-energy-deliveries-already-meet-future-goals/>

PG&E’s own forecast, as shown in the table below from their ERRA filing³, indicates emissions intensity going down by 59% in 2018 alone. This formed the basis for the forecast for avoided GHG emissions in this report, which assumed that PG&E is likely to reach between 85% and 88% GHG-free power by 2018 and beyond.

TABLE OF GREENHOUSE GAS HISTORY OF REVENUE, COSTS AND EMISSIONS INTENSITY (TEMPLATE D-5)							
Line No.	Description	Recorded 2013	Recorded 2014	Recorded 2015	Recorded 2016	Forecast 2017	Forecast 2018
(THOUSANDS OF DOLLARS)							
1	Total GHG Revenues (Net available for customers) ^(a)	\$294,008	\$578,743	\$456,431	\$366,996	\$225,652	\$412,456
2	Total GHG Costs	\$212,867	\$199,628	\$212,062	\$164,735	\$155,098	\$54,253
(MT CO ₂ e/MWh)							
3	Emissions Intensity ^(b)	0.202	0.210	0.216	0.176	0.165	0.068

(a) Line 1 is derived from Table 13-1, line 17.
 (b) The emissions intensity shown here is calculated by dividing total GHG emissions reported on Line 13 of Tables 11-1 and 11-2 by the total energy load requirement to serve PG&E’s bundled electricity customers for the corresponding year.
 The emissions intensity is not the same calculation as the CO₂ emissions rate reported by PG&E to The Climate Registry (TCR).

It is important to note that once a CCE program sets a default power supply option, it may take years before the GHG content of that default product is reduced to zero. For example, the 2011 power mix for MCE Clean Energy’s default product was 33% renewable and 53% GHG free. In 2016, its power mix was 55% renewable and 68% GHG free. And for 2018, MCE Clean Energy’s most recent Integrated Resource Plan⁴ (IRP) forecasts 57% renewable and 78% GHG-free power. However, Silicon Valley Clean Energy began operations with a default product that has a 100% GHG-free energy mix, demonstrating that starting at this level, rather than ramping up into it over an extended period of time can be done. MCE Clean Energy promises to achieve 100% GHG-free power by 2025⁵.

Customer Willingness to Pay

The most frequently stated concern about making a 100% renewable product the default for all customer categories is that it would create a cost burden for customers and increase the risk of customer opt outs – thus putting the overall program at risk.

A recent study has shown that when survey respondents have a better understanding of the societal and environmental benefits of electricity produced from renewable sources, they are much more willing to pay more than if asked only if they were willing to pay more for electricity produced from renewable sources.⁶ Other studies show that Americans overwhelmingly believe that global warming

³ PG&E ERRA filing with CPUC on December 6, 2017. See, <http://www.kyotousa.org/documents/view/110>

⁴ <https://www.mcecleanenergy.org/wp-content/uploads/2017/11/MCE-2018-Integrated-Resource-Plan-FINAL-2017.11.02.pdf>

⁵ MCE Integrated Resource Plan 2018 (November 2, 2017) at page 37

⁶ Bessette, Douglas L. & Arvai, Joseph L., 2018. “Engaging attribute tradeoffs in clean energy portfolio development,” *Energy Policy, Elsevier*, vol. 115(C), pages 221-229.

is happening and that human activities are responsible. Americans believe that corporations, individuals, and governments should be taking a greater role in reducing GHGs. One major determinate of whether people will pay more for clean electricity is not their economic status or race, but rather their political affiliation. More specifically, Democrats and moderate Republicans are willing to pay more while more conservative Republicans are not.⁷

While we have not been able to identify a specific study or survey that indicates that businesses and residents of the East Bay would pay more for electricity produced from 100% renewable sources, a number of studies and surveys demonstrate that Americans are willing to pay more for programs that will reduce our reliance on fossil fuels, reduce GHGs, improve health, and provide economic benefits. EBCE and other emerging CCEs may wish to conduct local surveys to determine if cost alone is a factor in a customer's willingness to pay for a 100% renewable electric product. It is also important to note that all price sensitive customers would have the opportunity to "opt down" to a less expensive product or "opt out" entirely and remain with the local IOU.

CCE Power Product Comparisons

Findings from the research of the CCEs in PG&E territory is provided in the table below. This data includes the 2017 default energy mix and the "premium" product offerings of 6 additional CCE programs in northern California gathered from published sources of information⁸, as of September 24, 2018. The table also indicates the 2018 default and premium product offering for EBCE for comparison.

⁷ "7 Trends in Americans' View on Climate and Energy, Energy", Policy Institute at the University of Chicago, October 9, 2017, <https://epic.uchicago.edu/news-events/news/7-trends-americans-views-climate-and-energy>

⁸ Link to PG&E joint CCE comparison program names, energy mix, and rates website: https://www.pge.com/en_US/residential/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/community-choice-aggregation.page

Key Metrics of Operational CCE Programs in PG&E Territory

(As of September 24, 2018)	2017							2018	
	PG&E**	MCE	SCP	PCE	CPSF	SVCE	SJCE	EBCE Bright Choice	EBCE Brilliant 100
Renewable content % - default product	33%	61%	45%	52%	43%	55%	40%	38%	40%
Carbon Free Content % - default product	78%	87%	94%	85%	100%	100%	95%	62%***	100%
Energy Sources for 100% renewable product (opt up)	100% solar	50% solar; 50% wind	100% geothermal	50% solar; 50% wind	99% solar; 1% wind	80% wind; 20% solar	TBD	N/A	TBD
Incremental 100% Renewable Price for Residential customers (\$/KWh)*	~\$0.02	\$0.01	\$0.025	\$0.01	\$0.015	\$0.008	TBD	N/A	\$0.01

* The incremental price for renewables is added to the suppliers' price for its default product. For EBCE, the 100% renewable product will be \$0.01 over PG&E's standard rates.

** Per PG&E press release:

https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20180220_pge_clean_energy_deliveries_already_meet_future_goals

*** Per EBCE's Joint Rate Mailer sent to commercial customers (Sept. 2018). EBCE is proposing to use "unspecified" power for a portion of its power mix from an approved "Asset Controlling Supplier" which provides power from large hydro resources in the Pacific Northwest with a much lower emissions content than power provided by CAISO's unspecified system power. EBCE's carbon free content of 62% is likely to be higher than indicated in the Joint Rate Mailer.

It became clear during this review of other northern California CCEs that EBCE's Bright Choice program would offer GHG-free content that was lower than all other peers, and likely lower than PG&E in 2018. Further, the Brilliant 100 program would, at best, match the renewable content of peers, and be lower than most.

On February 7, 2018, the EBCE Board reviewed the two product offerings presented by staff for implementation in Q2 2018. These included Bright Choice with 70% GHG-free power, of which 38% would be renewable, and Brilliant 100 with 100% GHG-free power, of which 40% would be from renewable sources. The additional GHG-free content in both products is attributed to large hydroelectric sources. Prior to the meeting, preliminary analysis and CCE comparisons from this study were shared with the Board and staff, resulting in a healthy discussion about EBCE's power mix for the default Bright Choice product, ultimately resulting in an increase in the GHG-free content to 85% (up 15% from the proposed 70%) while maintaining a slight discount for EBCE customers. *Our calculations estimate that this action alone will reduce the region's GHG emissions by over 92,000 metric tons of CO₂e per year.* The renewable power content was also increased to 38% for Bright Choice (up from 35%). However, even with these changes, the GHG emission reductions from Bright Choice will still be below some CCE peers and may fall below PG&E in 2018.

The Brilliant 100 product (100% GHG free) will be offered at pricing parity with PG&E and the new 100% renewable product (not yet named) will be offered by EBCE in November 2018 at a \$0.01/kWh premium over the Brilliant 100 product. These are the only products that will assure GHG-emissions reductions compared to PG&E's standard product for the twelve EBCE jurisdictions. However, Brilliant 100 has only 40% renewable content, which is below most other northern California CCE programs. EBCE staff considered the costs that might be incurred if all twelve jurisdictions chose Brilliant 100 as their default power options, instead of Bright Choice, and indicated that the net impact to EBCE financials would be negligible.

EBCE staff has looked at the potential costs for 100% renewable power and determined that while 100% renewable power would add a material amount to power supply costs, it would not be prohibitive. Deeper analysis on this point is provided in section four of this report.

Stakeholder Input

To complete the data gathering and analysis planning, we conducted stakeholder interviews to gather additional input on the challenges and opportunities to dramatically increase the GHG-free power in EBCE’s electricity products. Stakeholders provided a diversity of perspectives and concerns that were categorized and consolidated for clarity.

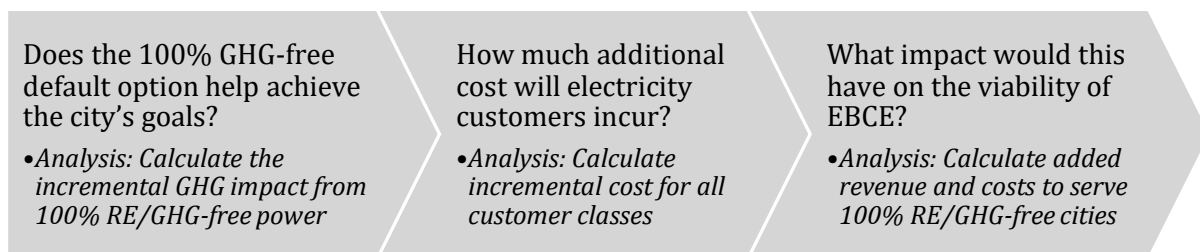
While not all concerns could be addressed in this study, many areas have been included in the analysis. The table below summarizes each stakeholder concern by topical area along with the approach that the authors have taken in addressing them, if possible, within the context of the project scope and analytical processes.

Stakeholder Input	Report Approach
Cost and Customer Questions	
1. How much would the 100% renewable energy (RE) product cost for all customers (Residential, Commercial, Municipal, CARE)?	Analyze customer-level impact from 100% RE program option by scenario.
2. How does this option impact low and moderate income customer equity concerns?	Analyze the cost impact for CARE customers, keeping in mind that all customers should be eligible to choose GHG-free power.
3. Does a 100% RE default eliminate choice for customers?	Describe the opt-down option where customers will always have the opportunity to select a lower impact option or opt-out to PG&E.
4. If all CCEs have an opt-up option to 100% RE already, why would a default be needed?	Review opt-up rates for existing CCEs and ways to increase participation in a 100% renewable program.
5. Could the 100% RE default option help accelerate a City’s GHG reduction targets?	Review GHG reduction potential from 100% RE program.
CCE and Program Management Questions	
6. What is the potential risk for increasing CCE opt outs?	Review examples from existing CCE programs and analyze impact from various 100% RE options.
7. Will the 100% RE default complicate messaging, website content and call center training requirements?	Review existing CCE programs and capture their experience with various program implementation models.
8. How would the increased volume of RE purchases impact market prices up or down?	Review statewide RE deployment and costs trends and compare to expected 100% RE volume.
9. How could the 100% RE default help increase renewable deployment and consumption?	Estimate needed renewables to meet expanded 100% RE volume.
10. What is the net impact of 100% RE sales and costs to the CCE?	Estimate additional CCE revenue and costs from 100% RE default.
External and Market Questions	

11. If State requirements are already pushing CCEs to reach new RE targets (50% by 2030), why is this option needed?	Compare State RPS goals to expected impact from a CCE 100% RE option.
12. As PG&E customers' load departs, how will their renewable buying behavior change?	Potential actions taken by the investor-owned utility will not be forecast as part of this analysis.
13. Solar and wind can have additional requirements for balancing and grid integration. How do other low-carbon, low-cost resources (e.g. Hydro) that can alleviate these issues fit in?	Consider EBCE purchasing of low-carbon energy as part of an overall renewables strategy.
14. How are Renewable Energy Credits (RECs) factored into the options?	RECs not considered. Focus on CA-sourced RE products only for EBCE 100% RE default.

Decision Making Steps

The final step in the planning phase of this study was to think through the decision path for cities to ensure that it was aligned with their needs. Shown below are the three key criteria, with their respective analytical requirements, to provide sufficient information for leaders to select the appropriate default option for each of the seven cities' constituents.



Initial findings from this study have already been provided to the seven cities, as well as the EBCE Board and staff, to facilitate each city's decision-making process. Based on this early input, certain jurisdictions have selected a carbon free product as the default for some or all of their customer classes (see the table below). Cities will have another opportunity to consider opting up additional customer classes when EBCE formally reviews its electricity products and rates in early 2019. Cities may want to begin having this discussion internally and with EBCE now, so that there is sufficient time to analyze the cost and impacts of any proposed changes.

Table of Default Supply Product by Customer Class for Selected EBCE Cities

Customer Class	Albany	Berkeley	Emeryville	Hayward	Piedmont	San Leandro	Oakland
Municipal	Brilliant 100	Brilliant 100	Brilliant 100	Brilliant 100	Brilliant 100	Brilliant 100	Brilliant 100
Residential	Brilliant 100	Bright Choice	Bright Choice	Brilliant 100	100% Renewable	Bright Choice	Bright Choice
Commercial	Brilliant 100	Bright Choice	Bright Choice	Brilliant 100	Bright Choice	Bright Choice	Bright Choice
CARE	Brilliant 100	Bright Choice	Bright Choice	Bright Choice	Bright Choice	Bright Choice	Bright Choice

See Attachment 2 – “Emissions Reductions Impacts of Decisions by Cities to Opt Up Some/All Customer Classes” for a description of the anticipated carbon reductions based on each city’s decision to opt up some or all of its customer accounts.

3. Review of 100% Renewable/GHG-Free Options

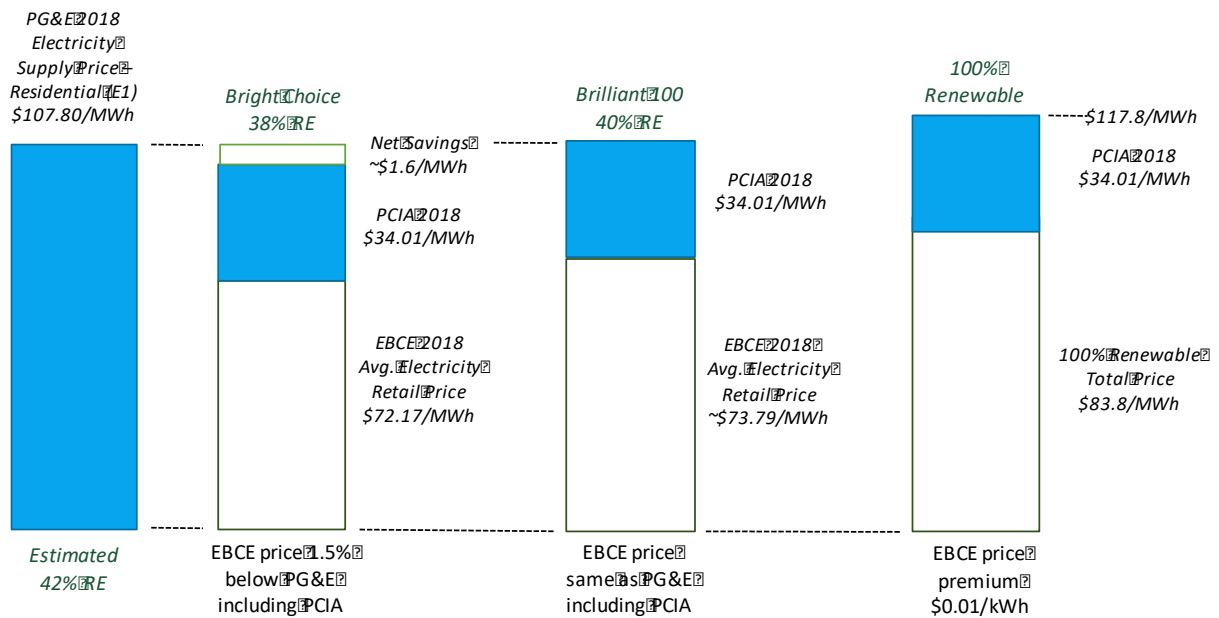
As described in the study approach above, this analysis began by considering 100% renewable power options, based on EBCE’s December 2017 CPUC-approved Implementation Plan. However, because a 100% renewable power option was not offered in the initial product line-up, we focused primarily on the best available option of the 100% GHG-free Brilliant 100 product.

In early 2018, EBCE staff performed an initial analysis of the cost impact from a truly 100% renewable power product and presented their estimates at the February 7, 2018 Board meeting. We used this information to determine the incremental costs and revenues from a new 100% renewable product that we labeled “Brilliant 100+”.

Brilliant 100: The incremental costs and required prices for 100% GHG-free are very modest and would not have any increase (or reduction) in average electricity bills compared to PG&E. However, this product is only 40% renewable energy which is below most CCE peers and potentially below PG&E renewable rates by 2018. The analysis for the impact on customer costs is shown below in Section 4.

Brilliant 100+: This future 100% Renewable product is based on EBCE analysis⁹ of a truly 100% renewable offering which indicated approximately \$16.7M in incremental costs or ~\$3/MWh when provided to all customers. This option would have a low impact on power supply costs and per EBCE staff recommendation on May 16, 2018 the customer premium for 100% renewable will be \$10/MWh.

To put this in perspective on a per-kWh basis, we compared costs from PG&E-supplied power to EBCE's product offerings, including a potential 100% renewable option. The chart below includes only supply-related costs and not delivery costs, which are controlled and billed by PG&E including PG&E's latest March 2018 price increase.



4. Default Product Energy Mix Impact and Recommendations

Looking at the impact from cities electing to have Brilliant 100 as their default power product option rather than Bright Choice, we calculated the load for each of the seven cities by customer type using 2016 utility data. In total the load for these seven cities represents 66% of the total expected EBCE load when fully implemented. Then we used a 90% retention rate, which is conservative compared to the recent CCE experience, to calculate the expected power purchases. Opt out rates for new multi-jurisdictional CCEs is in the range of 2% to 4% while single City CCEs have a slightly higher opt out rate.

The load by customer class is shown in the table below for each of the seven cities along with the incremental GHG emissions reduction potential if they select Brilliant 100 (GHG-free) power citywide. Note that the CARE customer class represents PG&E's California Alternative Rates for

⁹ From EBCE Board Meeting 02-07-18: 18% margin impact (approximately \$16.7M/year or \$3/MWh).

Energy program that provides reduced rates for low income customers. These calculations are based on a base case of Bright Choice as the default with 90% retention for Bright Choice plus 3% opt-up to Brilliant 100. For the alternative of Brilliant 100 as the default option, we estimated 85% retention for the Brilliant 100 product and 5% opt-down to Bright Choice. The net impact if all seven cities selected Brilliant 100 as the default instead of Bright Choice would be an annual reduction of over 264,000 metric tons of CO₂e.

EBCE 2019 Load Estimate: 6,201,000,000 Per EBCE Implementation Plan Aug-2017 - Retail Load

City	Population (2016)	Total Citywide Load (kWh)	Residential (kWh)	Non-Residential (kWh)	CARE Customers (kWh)	Municipal Accounts (kWh)	CARE % of All Res	Incremental GHG Reduction (MT CO ₂ e)
Albany	19,688	62,538,718	20,650,017	38,355,071	2,256,344	1,277,286	9.9%	3,628
Berkeley	121,240	692,888,108	138,321,059	522,430,291	20,302,483	11,834,276	12.8%	40,170
Piedmont	11,353	31,326,480	26,551,929	3,575,853	322,995	875,704	1.2%	1,820
Hayward	158,937	971,646,457	163,471,014	723,011,629	75,770,813	9,393,000	31.7%	56,257
Emeryville	11,671	198,279,194	19,350,425	173,751,258	3,098,781	2,078,730	13.8%	11,482
San Leandro	90,465	587,778,031	122,351,054	415,343,978	41,105,046	8,977,953	25.1%	34,065
Oakland	420,005	2,004,734,629	484,288,634	1,259,871,710	184,779,001	75,795,284	27.6%	116,647
TOTAL	833,359	4,549,191,617	974,984,131	3,136,339,790	327,635,463	110,232,233	25.2%	264,068
EBCE Est. Retention @ 90%		4,105,295,679	877,485,718	2,822,705,811	294,871,916	110,232,233		
% of EBCE 2019 Load		66.2%						

The following tables provide GHG calculations for Albany, Berkeley, and Hayward to illustrate the potential impact for an individual city from selecting either Bright Choice or Brilliant 100 as their default power mix. As shown, selecting Brilliant 100 as the default mix instead of Bright Choice, results in a massive potential for GHG reductions that would not be easily achievable in any other way. Both Albany and Hayward have committed to Brilliant 100 for their commercial, residential, and municipal loads, reducing a combined 65,000 metric tons of CO₂e annually.¹⁰

City	ALBANY
Population	19,688

	2016 kWh	% of Total
Total Citywide Load	62,538,718	100%
Residential	20,650,017	33%
Non-Residential	38,355,071	61%
CARE Customers	2,256,344	4%
Municipal Accounts	1,277,286	2%

Opt-in Model ~90% Retention in Bright Choice + 3% @ Brilliant 100

GHG Reduction - Base EBCE	109	MT CO ₂ e (2019)
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Opt-out Model ~85% Retention in Brilliant 100 + 5% @ Bright Choice

Total GHG Reduction	3,628	MT CO ₂ e (2019)
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¹⁰ See Attachment 2 - Emissions Reductions Impacts of Decisions by Cities to Opt Up Some/All Customer Classes

City	BERKELEY
Population	121,240

	2016 kWh	% of Total
Total Citywide Load	692,888,108	100%
Residential	138,321,059	20%
Non-Residential	522,430,291	75%
CARE Customers	20,302,483	3%
Municipal Accounts	11,834,276	2%

Opt-in Model ~90% Retention in Bright Choice + 3% @ Brilliant 100

GHG Reduction - Base EBCE	1,205	MT CO ₂ e (2019)
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Opt-out Model ~85% Retention in Brilliant 100 + 5% @ Bright Choice

Total GHG Reduction	40,170	MT CO ₂ e (2019)
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City	HAYWARD
Population	158,937

	2016 kWh	% of Total
Total Citywide Load	971,646,457	100%
Residential	163,471,014	17%
Non-Residential	723,011,629	74%
CARE Customers	75,770,813	8%
Municipal Accounts	9,393,000	1%

Opt-in Model ~90% Retention in Bright Choice + 3% @ Brilliant 100

GHG Reduction - Base EBCE	1,688	MT CO ₂ e (2019)
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Opt-out Model ~85% Retention in Brilliant 100 + 5% @ Bright Choice

Total GHG Reduction	56,257	MT CO ₂ e (2019)
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These findings address the first of the three decision-making criteria listed above “Does the Brilliant 100 product as a default help to achieve the city’s GHG emissions reduction goals?” with an affirmative answer that it will have a major positive impact.

Does the 100% GHG-free default option help achieve the city’s goals?

- YES

How much additional cost will electricity customers incur?

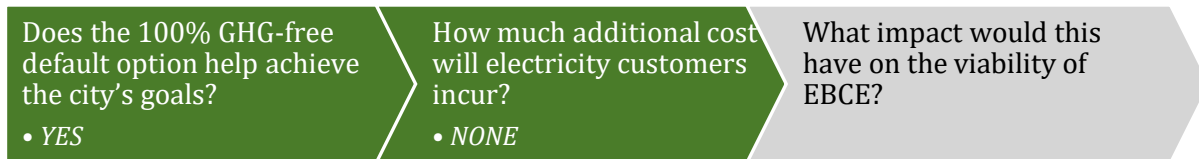
What impact would this have on the viability of EBCE?

The next step was to evaluate the impact on individual customer classes from each of the power products to determine how much it would affect their average monthly bills. EBCE did not have published rates or rate comparisons to PG&E at the time of the analysis, however, we used similar operational CCEs for some of the inputs to complete the analysis. Specifically, we took the average of Sonoma Clean Power and Peninsula Clean Energy as the basis for the average electricity usage by customer class, PCIA charges, and PG&E comparative rates. We then used EBCE staff guidance, as presented to the Board, for the average pricing to determine the estimated increase, or decrease in customer bills for the Bright Choice and Brilliant 100 products, relative to PG&E rates. These calculations are shown in the table below for four primary customer rate classes.

Average Estimated Customer Impact						
Customer Group (Tariff)	Monthly kWh	PG&E Monthly Bill	PCIA Estimate In EBCE Bill	EBCE Bright Choice 38% RE Total Bill	EBCE B100 40% RE Total Bill	% Change B100 vs. PG&E
Residential (E1)	460	\$ 109.00	\$ 15.60	\$ 108.13	\$ 109.00	0.0%
CARE (E1L)	349	\$ 48.00	\$ 11.84	\$ 47.62	\$ 48.00	0.0%
Small Commercial (A1)	1,533	\$ 691.00	\$ 38.33	\$ 685.47	\$ 691.00	0.0%
Large Commercial (E19S)	237,324	\$ 41,474.00	\$ 5,062.12	\$ 41,142.21	\$ 41,474.00	0.0%

Consistent with EBCE guidance and approved Board actions, Bright Choice is expected to save 1.5% on average compared to PG&E supply (including PCIA), while Brilliant 100 will be priced at parity with PG&E (including PCIA). The price points that EBCE is offering make the decision to select Brilliant 100 as a default very compelling for cities because there would be no net impact to their customers' bills while dramatically increasing achievement of GHG targets.

The second criteria "How much additional cost will customers incur?" has been addressed with a commitment by EBCE to no increased costs for the Brilliant 100 product.



Finally, we reviewed the overall budget impact to EBCE to determine its ability to support Brilliant 100 as a default without any material impact on the overall finances of the organization. EBCE's full year prospective budget for 2019/2020 is from its August 2017 Implementation Plan, as confirmed during the March 21, 2018 Board meeting¹¹. We reviewed the major categories of revenue, supply costs, and overheads by city and in total if they all selected Brilliant 100 for their customers. The summary of the analysis is shown in the table below indicating that higher levels of renewables do not have a material impact on net surplus.

¹¹ Subsequent to this analysis, on May 16, 2018, EBCE staff proposed a short-term budget for the upcoming fiscal year of operation 2018 to 2019. However, this budget does not include a full year of operations because all customers will not be served until November 2018. Comparisons of this current year budget with the full-year 2019-2020 forecast does not indicate any significant deviations that would materially change this report's findings.

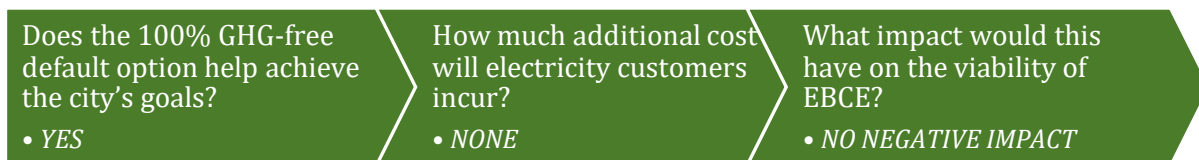
Incremental Revenue and Cost Estimates for EBCE

Brilliant 100: 40% RE plus 60% Large Hydro = 100% GHG-free

Per Impl. Plan 08-2017	EBCE Budget	7 City Subtotal	New Total	% Change
2019 Revenues	\$ 391,701,537	\$ 6,157,944	\$ 397,859,481	1.6%
2019 Supply Costs	\$ 299,159,237	\$ 6,157,944	\$ 305,317,181	2.1%
2019 All Other Costs*	\$ 32,561,773	\$ 307,897	\$ 32,869,670	0.9%
Net Surplus + Reserves	\$ 59,980,527	\$ (307,897)	\$ 59,672,630	-0.5%
	15.3%		15.0%	

Even with added administrative costs to support different default products across EBCE territory, the net impact to the overall budget is a 1.6% increase to revenue, with a corresponding increase in supply costs, while maintaining essentially the same overall contribution to net surplus and reserves of nearly \$60 million per year or 15% of revenue.

This then provides the insight into our third criteria “*What impact would this have on the viability of EBCE?*” with a clear response that if all seven cities selected the default of Brilliant 100, there would be no negative impact on EBCE’s financial condition, and revenues increase.



Observations and Recommendations for EBCE cities

- During our research with other CCE programs and industry stakeholders, we found that renewable energy is more affordable than ever, with longer-term contracts providing the best cost advantages, although EBCE’s initial purchasing strategy is initially focused on short-term contracting.
- Investor owned utilities are rapidly increasing their GHG-free supply percentages, largely due to the load and supply responsibilities shifting to CCEs.
- The Brilliant 100 option (100% GHG-free) will help cities make major progress toward their own climate action plans and GHG emissions reductions goals, while having no net increase in average customer bills.
- The default product, Bright Choice, is likely to miss its stated targets and have no incremental reduction in GHG emissions compared to PG&E with only a very small discount offered to customers.
- A product with 100% renewable power could be priced very competitively and have only a modest impact on customer bills with little or no impact on EBCE’s net surplus.

- The opt-up adoption rate for 100% GHG-free and 100% renewable products, even in well-established CCE programs, is a very small percentage (up to 3% of customers), therefore, selecting Brilliant 100 as the default option will have a much faster and ultimately larger impact on citywide GHG reduction goals.
- Electricity customers are willing to pay more for electricity sourced from 100% renewable sources, especially when the environmental and societal benefits are clearly explained.

5. Lessons Learned

During the development of this report and the underlying analyses, several key observations emerged that can help inform new CCE programs looking to maximize their GHG impact and avoid potential issues during their implementation phase.

Tremendous impact: There is a remarkable potential for environmental benefits from CCE purchasing strategies, as can be seen from this report’s analysis for EBCE. Some CCEs already provide 100% GHG-free power for their entire customer base as a default with discounts off the basic power offered by their IOU, clearly indicating that CCEs can effectively eliminate GHG-emissions from the power supply today.

Competing priorities: The key decision-making criteria for green power options and rates can be different for cities participating in a CCE than for the CCE’s management, due to their potentially different individual goals and priorities. For example, a new CCE program needs to get to financial viability quickly and reduce its risks by including conservative estimates, recovering start-up costs quickly, and increasing reserves for financial strength. These goals are not always directly aligned with the individual cities who have already insulated their financial risk via the JPA structure and typically join the CCE to achieve GHG-emissions reduction goals while delivering cost-effective, locally controlled power purchasing. For example, the GHG-impact analysis from the Bright Choice product indicates that even at 85% GHG-free, selecting this default is unlikely to have a positive impact on a city’s GHG reduction goals when compared to PG&E in 2018 due to PG&E’s increased delivery of GHG-free power. EBCE, as an agency, may exceed PG&E’s percentage of GHG-free power in 2018 when all electricity sales to all member jurisdictions are combined as a result of certain cities selecting Brilliant 100 for some of their customer classes. However, individual cities that have retained the Bright Choice default may not exceed PG&E’s GHG-free level for customers in their respective jurisdictions.

Information availability: While researching the comparative costs and rates from the active CCEs in California, we found that some information was well organized, available, and very useful, including the rate comparisons and power mix statements (as posted on the IOU websites.) In general, the operational budgets were published and had sufficient detail to understand the major components for comparative purposes. However, one information gathering challenge was in determining the actual power supply costs by type of generation (e.g., hydro, wind, solar, natural gas,

etc.). The rationale offered from CCEs was that providing cost information to external parties could create an issue with their ability to compete for beneficial contracts and pricing.

PCIA restricts progress: We found that all CCEs strive to overcome the PCIA charge on behalf of their customers, meaning that they provide supply pricing that is low enough to cover IOU- imposed PCIA charges. For EBCE, that equates to \$166 million per year in costs that their customers incur in excess of their CCE-supplied power prices. If EBCE did not have to cover PCIA costs by reducing rates, then not only would they be able to offer 100% renewable power, but they would also be able to provide tens of millions of dollars for local renewables development and still reduce customers' bills. While the drivers for PCIA charges were not in scope for this report, they clearly have a major impact on CCE decisions.

Stakeholder competition: There are various stakeholder viewpoints about how a CCE can positively impact its customers and community, from creating green jobs and clean power, to providing cost savings and economic development. However, this can create misalignment on advocacy, priorities, recommendations, Board actions, and key operational decisions. Better information sharing and guided sessions to discuss the various pros and cons among diverse stakeholders would likely yield a better set of priorities over the long-term.

Renewable pricing strategy: Analysis of the implementation budget for EBCE and comparisons to selected peer CCEs made clear that further study would be beneficial to better understand and document the pricing strategies for 100% renewable products compared to incremental costs. Both in aggregate for overall CCE margins and for individual customer prices, the prices offered and cost assumptions can be refined and better documented for transparency and clearer decision making.

ATTACHMENT 1 – Evolution of EBCE Bright Choice Power Content

ATTACHMENT 1 - Evolution of Power Content of EBCE's *Bright Choice* Product Offering

Action: Date	Carbon Free Content	Source
Proposed: Feb. 2018	70%	35% renewable 35% hydro 30% unspecified
Adopted: April 2018	85%	38% renewable 47% hydro 15% unspecified
Proposed: Sept. 2018	62%*	38% renewable 24% hydro 38% unspecified**

* These percentages appear on the Power Content Label sent to EBCE customers.

** Some portion of the "unspecified" power would come from an Asset Controlling Supplier (ACS) that has a much lower carbon content than the standard unspecified power. EBCE would use this ACS source of power to reach its promise to provide electricity that is 85% carbon free.

ATTACHMENT 2 – Emissions Impact from City Opt-up Decisions

ATTACHMENT 2 - Emissions Reductions Impacts of Decisions by Cities to Opt Up Some/All Customer Classes

	Jurisdictions that opted up one or more customer classes	Customer Class	Bright Choice - 85% GHG free (kWh) DEFAULT *	Brilliant 100 - 100% GHG free (kWh) OPT UP *	100% renewable (kWh) OPT UP *	Carbon emissions - PG&E (metric tons)**	Carbon emissions - EBCE (metric tons)***	Change in GHG emissions: EBCE vs. PG&E (MT)
1	Albany							
		Municipal		1,277,286		87	0	(87)
		Residential		20,650,017		1,404	0	(1,404)
		Commercial		38,355,071		2,608	0	(2,608)
		CARE		2,256,344		153	0	(153)
	TOTALS			62,538,718		4,253	0	(4,253)
2	Berkeley							
		Municipal		11,834,276		805	0	(805)
		Residential	138,321,059			9,406	9,406	0
		Commercial	522,430,291			35,525	35,525	0
		CARE	20,302,483			1,381	1,381	0
	TOTALS		681,053,833	11,834,276		47,116	46,312	(805)
3	Emeryville							
		Municipal		2,078,730		141	0	(141)
		Residential	19,350,425			1,316	1,316	0
		Commercial	173,751,258			11,815	11,815	0
		CARE	3,098,781			211	211	0
	TOTALS		196,200,464	2,078,730		13,483	13,342	(141)
4	Hayward							
		Municipal		9,393,000		639	0	(639)
		Residential		163,471,014		11,116	0	(11,116)
		Commercial		723,011,629		49,165	0	(49,165)
		CARE	75,770,813			5,152	5,152	0
	TOTALS		75,770,813	895,875,643		66,072	5,152	(60,920)
5	Piedmont							
		Municipal****		875,704		60	0	(60)
		Residential			26,551,929	1,806	0	(1,806)
		Commercial	3,575,853			243	243	0
		CARE	322,995			22	22	0
	TOTALS		3,898,848	875,704	26,551,929	2,130	265	(1,865)
6	San Leandro							
		Municipal		8,977,953		611	0	(611)
		Residential	122,351,054			8,320	8,320	0
		Commercial	415,343,978			28,243	28,243	0
		CARE	41,105,046			2,795	2,795	0
	TOTALS		578,800,078	8,977,953		39,969	39,358	(611)
7	Oakland							
		Municipal		75,795,284		5,154	0	(5,154)
		Residential	484,288,634			32,932	32,932	0
		Commercial	1,259,871,710			85,671	85,671	0
		CARE	184,779,001			12,565	12,565	0
	TOTALS		1,928,939,345	75,795,284		136,322	131,168	(5,154)

* Consumption data based on PG&E's 2016 load report

** Based upon PG&E carbon intensity forecast for 2018 of .068 metric tons CO2e/MWh (see, PG&E ERRR FORECAST (2018) p. 66 - <http://www.kyotousa.org/documents/view/110>)

*** EBCE's Bright Choice should be 85% GHG free. PG&E's carbon intensity forecast for 2018 would put PG&E electricity at approximately 88% GHG free

**** Piedmont municipal accounts will be enrolled at 100% renewable in next enrollment phase