EAST BAY COMMUNITY ENERGY

Notes regarding submitting comments on this Draft Work Product:

Comments are Due June 20, 2018.

Comments shall be no longer than 5 pages.

Comments should be submitted to LDBPcomments@ebce.org

Opportunities for Transportation Electrification

for

East Bay Community Energy

Prepared by:
Blue Strike Environmental
126 Bonifacio Place, Suite G
Monterey, CA 93940

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INTRODUCTION:

The promise of widespread adoption of electric vehicles (EV's) presents one of the most substantial opportunities to decarbonize the transportation sector, while simultaneously providing energy portfolio and grid benefits to utilities and load-serving entities (LSE's) like Community Choice Aggregators (CCA's).

As demand-side management programs (i.e., energy efficiency, demand response, etc.) continue to reduce load in a non-decoupled business mode—where every kWh of decreased demand results in lost revenue for the CCA—the opportunity for electrification through transportation fuel switching presented by EV adoption can provide East Bay Community Energy (EBCE) financial stability through increased electricity sales. If appropriately paired with rate incentives, such as Time of Use (TOU) charging, EV's can substantially contribute to valuable load shaping and shifting services through the ability to align EV battery charging with peak periods of renewable energy generation, when energy costs tend to be lowest for CCA's like EBCE. Mid-day and at work charging can support EBCE's efforts to flatten its load curve, allowing the organization to take advantage of low locational marginal pricing (LMP) that are typical during the so-called "duck belly" that has emerged due to peak solar photovoltaic generation, and to mitigate market price risk exposure during the evening ramping periods (the "duck neck") when market prices tend to spike.

At a state regulatory level, California has established roadmaps and targets for electrification of the transportation sector through a transition towards EV's. Through an executive order in 2012, Governor Jerry Brown set a target of 1.5 million zero-emission vehicles (ZEV's) on California roads by 2025.[1] Reaching this target has been supported in part by California's recognition that EV and grid integration can create mutual benefits to utilities and customers. The California Vehicle-Grid Integration (VGI) Roadmap: Enabling vehicle-based grid services highlights this goal by stating, *"Electric vehicle charging creates a reciprocal relationship between battery-powered cars and the power grid in a way that produces mutual benefits. Without compromising the driving habits of consumers, incentives should be pursued as a way to aggregate vehicle charging to develop valuable grid services."*[2]

While several CCA's and Investor Owned Utilities (IOU's) have explored the role of rebates and incentives as a practical strategy to drive individual consumers towards EV purchases, leases, and installation of electric vehicle charging infrastructure (EVCI), this section of the Local Development Business Plan (LDBP) recommends that EBCE focus on achieving significant near-term greenhouse gas and criteria pollutant reductions through medium and heavy-duty vehicle electrification programs. Taking an active role in supporting the electrification of the transportation system by working with commercial fleet owners, the freight and shipping industry, and public transit providers in the EBCE service territory through innovative public private partnership (PPP) strategies presents a substantial opportunity for mutually beneficial outcomes for EBCE, the communities and customers it serves, and the State of California as a whole. This section of the LDBP also points out that if such strategies are connected with distributed energy resource (DER) deployment at local schools, hospitals, fire stations, and emergency response centers (etc.), EBCE can also help enhance community resiliency to natural disasters and extended grid outages.

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[1] For information about California Executive Order B-16-2012, see: https://www.gov.ca.gov/2012/03/23/news17472/

[2] California ISO. June 8th, 2017. California Vehicle-Grid Integration (VGI) Roadmap enabling vehicle-based grid services. Retrieved from: http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-12/TN217997_20170608T151647_California_VehicleGrid_Integration_VGI_Roadmap_Enabling_vehicle.pdf

In the near-term, pursuing grant and foundation capital to offer grid-enabled charger pilots designed to test the waters of load shaping services can lay an early foundation for progressing EBCE towards the implementation of smart-grid functionality, real time price signals, and a transactive energy market paradigm that engages EV owners and fleet managers as partners in the long-term build out of a virtual power plant (VPP) strategy. This vision for strategic transportation electrification can provide aggregation opportunities and dispatchable load capacity able to support EBCE's management of wholesale procurement risks, providing new flexible resources to portfolio managers and scheduling coordinators that support Resource Adequacy (RA) and real-time energy procurement needs, which otherwise may have to be supplied by costly, carbon-intensive resources like fossil fuel-fired peaker plants.

BACKGROUND: EXISTING IOU AND CCA EV PROGRAMS:

CCA's and Investor Owned Utiltiies (IOU's) like Pacific Gas and Electric (PG&E) have already begun to implement EV pilot projects and programs. Sonoma Clean Power (SCP), MCE Clean Energy (MCE), and Lancaster Choice Energy (LCE) have each piloted innovative EV programs as outlined below.

Entity	Program Type	Additional Features
SCP	• Grid-enabled EV Charger Incentives • Monthly Bill Credit • Passenger EV rebate pilot	• Increased incentives for CARE customer • Partnership with eMotorwerks • SWITCH educational outreach program[3]
MCE	• Residential Charger Incentive • Smart Charging Device Handout • Time of Use Rates modeled after PG&E	• Partnership with eMotorwerks
LCE	• $1000 EV reimbursement for local dealership leases/purchases • Public Transit Electrification	• Partnership with Air Quality Management District and Transit Authority • BYD electric bus program
PCE	• No current program, but EV programs are a stated goal[4]	• Education Workshop[5]
PG&E	• Non-Tiered TOU rate • Passenger EV rebate pilot • $500 Low Carbon Fuel Standard backed Rebate	• Resource webpage for passenger EV resources

Table 1: CCA and IOU EV Incentive and Program Comparison

[3] Sonoma Clean Power. January 10, 2018. *Sonoma Clean Power Programs Group Strategic Action Plan.* Retrieved from: https://sonomacleanpower.org/wp-content/uploads/2016/03/SCP-Programs-Strategic-Action-Plan-01-22-18-FINAL2.pdf

[4] Peninsula Clean Energy. *Goals and Policies.* Retrieved from: https://www.peninsulacleanenergy.com/learn-more/goals-and-policies/

[5] Peninsula Clean Energy. *Free EV Workshop.* Retrieved from: https://www.peninsulacleanenergy.com/events/free-electric-vehicle-workshop-everything-need-know-go-ev/

Example: Sonoma Clean Power Programs

Sonoma Clean Power (SCP) has demonstrated early EV leadership through their GridSavvy,[6] Drive EverGreen (DEG),[7] and SWITCH educational programs.[8] This suite of innovative CCA programs offers SCP customers benefits such as:

- Free EV eMotorwerks smart charging equipment to residential customers
- A $150 enrollment credit
- $5/month bill credit towards SCP Generation Charges
- Placement of electric cars in local highs schools as an educational opportunity

In exchange for these incentives, the customer agrees to participate in smart load management programs that enable SCP to control the charging of customer owned or leased EV vehicles to help SCP shape energy load and avoid expensive peak energy procurement. However, customers can opt-out of the control signal through their smart phones or digital device. Enrollment in the program is available through June 2018.

Sonoma Clean Power also offered a pilot program administered by the Center for Sustainable Energy between October 2016 and January 2017. The Center for Sustainable Energy States:

> *"The pilot program reduced the cost of acquiring EV's by issuing certificates to applicants that they could redeem at two participating dealerships at the time of purchase or lease. Eligible vehicles included the BMW i3 (including the i3 with Range Extender, REx) and Nissan LEAF. SCP wanted to provide special support for clean mobility options among lower-income customers and thus provided two levels of incentives: $5,000 for customers participating in California Alternate Rates for Energy (CARE) or Family Electric Rate Assistance (FERA) and $2,500 for other applicants. In addition, SCP negotiated price discounts with participating dealers."*[9]

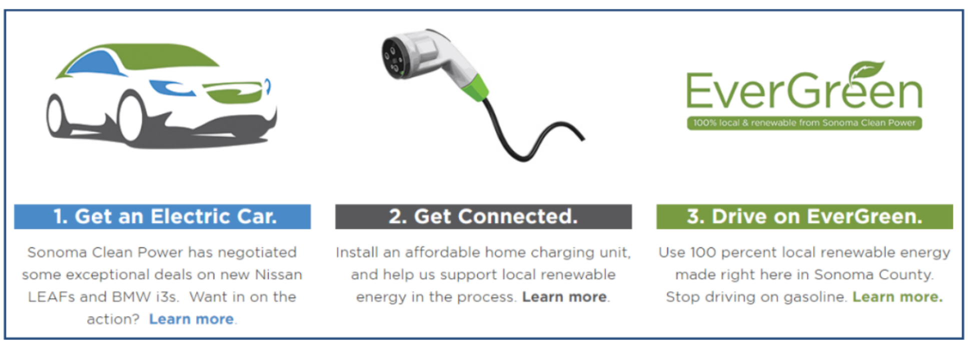

Figure 1: From Sonoma Clean Power's EverGreen webpage

This pilot rebate program and SCP's DEG program represents an early example of how EV smart charger incentives can be used in CCA territory to promote market adoption of passenger EV's, while also creating potential load shaping capacity and demand response build out. The inclusion of an increased incentive

[6] For detailed information about SCP's Gridsavvy program, see: https://sonomacleanpower.org/gridsavvy/
[7] For detailed information about SCP's DEG program, see: https://sonomacleanpower.org/drive-evergreen/
[8] For information about SCP's SWITCH program, see: https://sonomacleanpower.org/wp-content/uploads/2016/09/Press-Release-Switch-SCP-2015.KK-web.pdf
[9] Sonoma Clean Power. Center for Sustainable Energy. April, 2017. Drive EverGreen Electric Vehicle Incentive Pilot Program: Evaluation Report. Accessed here: https://energycenter.org/sites/default/files/docs/nav/research/Drive%20EverGreen%20EV%20Incentive%20Pilot%20Evaluation%20Report.pdf

for CARE customers in the pilot rebate program also demonstrates a planning framework that has been deployed to create equitable social benefit outcomes. Should EBCE pursue programs to promote passenger EV, SCP's DEG model provides relevant case study and program design features.

It is worth noting here that the number of passenger vehicles in Alameda County is orders of magnitude higher than in SCP's territory. As a result, incentives for passenger vehicles in EBCE territory would require a substantially larger budget and wider outreach requirements than that used to deploy DEG in Sonoma to make a comparable impact. Therefore, it is recommended that EBCE target fleet, freight, public transit and other medium and heavy-duty transportation electrification strategies aimed at reducing emissions along the I-880 corridor would be more cost effective and environmentally beneficial for EBCE's service area in the near-term.

However, the grid-enabled charger incentives piloted by SCP as part of the DEG program do have near-term value in the EBCE setting due to the load shaping benefits and aggregation potential those smart devices present. This aspect of the DEG program can be leveraged by EBCE to support the longer-term vision of creating a VPP, as well as the potential for vehicle-to-grid (V2G) technologies and related real-time pricing and transactive energy market capabilities. These nascent but emerging technology advances have the potential to enable EBCE to move away from the rebate and bill credit incentive methodology altogether, and support a transition to a dynamic price methodology. A dynamic pricing model could alternatively send customers a price signal to generate an energy dispatch response. This approach would ultimately allow for EBCE to interact beyond managed charging, and extract value at the energy storage level.

It is important to note that deployment of V2G technologies may create some challenges with manufacture warranty due to real or perceived degradation to the vehicle batteries (especially in the light-duty auto market segment).[10] However, as the technology matures these issues are likely to be mitigated and V2G can play an integral role in any transactive energy platform, which can transform EBCE's EV customers into distributed energy resource partners. The aggregation of V2G through grid-enabled chargers can offer meaningful real-time energy shaping services by providing customers with price signals and revenue generation potential for participation in the resulting transactive market. This future is dependent upon the creation of a a robust integrated data platform, able to facilitate bi-directional exchange of settlement quality data and real-time financial transactions between EBCE, CAISO, and distributed EV owners (i.e., using blockchain and/or crypto-currency technologies).

[10] See: https://cleantechnica.com/2017/05/16/vehicle-grid-discharge-even-constant-power-detrimental-ev-battery-performance-study-finds/

Example: MCE Clean Energy Programs

MCE also has implemented passenger EV incentives through partnership with eMotorwerks and provided a $150 discount on grid-enabled EV charging stations.[11] eMotorworks also provided their JuicePlug product (a universal adapter that turns existing EV chargers into smart enabled chargers),[12] at no cost to customers. MCE has transitioned away from this early strategy, and recently established a non-tiered TOU rate for residential EV charging.[13] This model uses rates as an incentive to help move customer charging behavior towards times when energy generation costs are low and comprised of a larger renewable mix. The program is directly modeled off of PG&E's rate tariffs.

Example: Lancaster Choice Energy Programs

Lancaster Choice Energy (LCE) is working in close partnership with the Antelope Valley Air Quality Management District (AVAQMD) to promote passenger EV adoption. AVAQMD's Alternative Fuel Vehicle (AFV) incentive offers $1,000 reimbursement to local residents who make a vehicle purchase or lease agreement at a local Antelope Valley dealership.[14] The incentives are motivated by a zero emission, 100% electrification goal from the transit authority (TA).

In addition to the incentive program, Lancaster is home to the Build Your Dream (BYD) manufacturing center which boasts the production of a 60-passenger electric bus with a range of 275 miles, inductive charging, and charging times of between two to three hours. The presence of BYD in the LCE service area has spurred federal and state grant funding and "In 2016, The Board of Directors for the Antelope Valley Transit Authority (AVTA) set a goal of becoming the nation's first fully electric fleet by the end of 2018, and plans to convert all of the agency's aging diesel buses to a 100% battery electric bus fleet with up to 85 new all-electric buses." [15] This has led to an innovative partnership between LCE and AVTA, which provides mutual benefits to both organizations that have enabled this bold commitment to bus fleet electrification.

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[11] eMotorWerks. November 15, 2016. eMotorWerks and MCE Clean Energy Announce SmartCharge Electric Vehicle Program to Maximize Renewable Energy Capacity in Northern California. Retrieved from: https://emotorwerks.com/about/enewsso/press-releases/286-prmce

[12] For details about the Juiceplug adapter, see: https://emotorwerks.com/about/enewsso/press-releases/267-emwks

[13] See: https://www.mcecleanenergy.org/electric-vehicles/

[14] Antelope Valley Air Quality Management District. *Alternative Fuel Vehicle Program.* Retrieved from: https://avaqmd.ca.gov/alternative-fuel-vehicle-program

[15] Antelope Valley Transit Authority. January 2018. *Electric Bus Fleet Conversion.* Retrieved from: http://www.avta.com/index.aspx?page=482

Example: PG&E Programs

PG&E is currently offering several programs designed to promote adoption of passenger EV's including:

- A $3000 Nisan Leaf Rebate and $10,000 BMW i3 Rebate, until May 31, 2018
- The EV Charge network program. "A three-year program to install 7,500 Level 2 electric vehicle (EV) chargers at multi-unit dwelling and workplaces"[16]
- Non-Tiered TOU rates for residential charging
- A Low Carbon Fuel Standard backed $500 Clean Fuel Rebate

Nisan and BMW Rebates:

In March 2018 PG&E announced rebates at partnered Nisan and BMW dealerships for rebates on the Nisan Leaf and BMW i3. The program is running through May 31, 2018 and grants PG&E customers who show their PG&E bill to a partnered dealership a $3000 rebate on the Nisan Leaf or a $10,000 rebate on the BMW i3. When combined with State and Federal incentives the program creates a substantial contribution to the purchase of an EV.[17]

EV Charge Network Program:

PG&E's EV Charge Network Program places a total of 7,500 EV chargers in multifamily, government facilities, and commercial parking spaces. At the end of installation, the chargers can either be owned by PG&E or the building owner depending on customer preference. The table below shows the ownership options for the charger and emphasizes a focus on siting chargers in Disadvantaged Communities as defined by CalEnviro Screen.

[16] PG&E. *The EV Charge Network Program.* Retrieved from: https://www.pge.com/en_US/business/solar-and-vehicles/your-options/clean-vehicles/charging-stations/program-participants/about-the-program.page

[17] PG&E. April 24, 2018. *PG&E Customers Eligible to save $3,000 on a new Nissan LEAF Electric Vehicle.* Retrieved from:https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20180424_pge_customers_eligible_to_save_3000_on_a_new_nissan_leaf_electric_vehicle

SUMMARY OF OWNERSHIP OPTIONS

	EV Charge Owner (Program participant owns chargers)	EV Charge Sponsor (PG&E owns chargers)
Eligibility	All program participants are eligible.	Multi-unit dwellings (MUDs) and program participants in disadvantaged communities are eligible.*
Costs	Program participant pays for installation of EV chargers and ongoing costs; receives partial rebate.	Program participant submits a one-time participation payment.
Charger selection	Program participant chooses from full list of approved vendors.	Program participant chooses from limited list of approved vendors.
Key benefits	Offers more charger options and greater control of maintenance and operations.	Offers lower overall costs.

* Disadvantaged communities are defined as the top 25% of communities in PG&E's service area that are disproportionately burdened by multiple sources of pollution, as defined by the California Environmental Protection Agency's CalEnviroScreen. For more information, visit CalEnviroScreen.

Please note that for the purposes of this program, workplaces of companies in the Fortune 1000 will not be considered part of a disadvantaged community, even if they are located in one.

Figure 2: PG&E's EV Charge Network Ownership Breakdown[18]

PG&E's Non-Tiered TOU Rates:

PG&E's residential TOU rates are broken into two brackets, the EV-A rate combines participating customers' EV charging costs with the cost of electricity for the customers' entire residence. While the EV-B rate involves the installation of another meter, which separates the customers' EV charging costs from other electricity loads in the residence.[19]

Both EV-A and EV-B are non-tiered, time-of-use plans, which means that the rate you pay is based on the time of day you use the electricity. Costs are lowest from 11 p.m. to 7 a.m. when demand is lowest, making this the best time to charge your vehicle. Electricity is more expensive during Peak (2-9 p.m.) and Partial-Peak (7 a.m.-2 p.m. and 9-11 p.m.) periods. See graphic below for detailed information on EV rate costs and times." The figure below shows the hourly breakdown of the rate design.

[18] For more information, see: https://www.pge.com/en_US/business/solar-and-vehicles/your-options/clean-vehicles/charging-stations/ev-charge-network.page
[19] For detailed information about PG&E's EV rate options, see: https://www.pge.com/en_US/residential/rate-plans/rate-plan-options/electric-vehicle-base-plan/electric-vehicle-base-plan.page

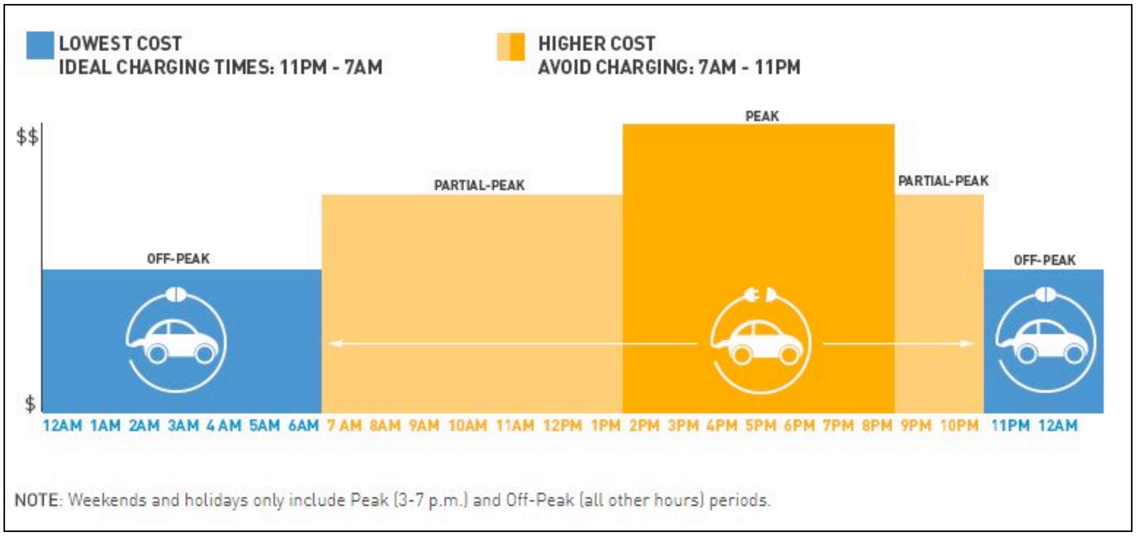

Figure 3: PG&E's Residential EV TOU Rates

PG&E's Clean Fuel Rebate:

PG&E's residential customers can also access a $500 Low Carbon Fuel Standard backed Clean Fuel Rebate. This incentive rewards ratepayers who use clean electricity to fuel their vehicles.[21]

Example: State and Federal Programs

State and Federal Tax Credit and Rebate Programs also help lower the upfront cost of purchasing a passenger EV.

- A limited funding opportunity exists for up to $7,500 in federal tax credits for EV purchases[22]
- A California Air Resource Board Program offers a $2,500 rebate for the Nisan leaf[23]
- HOV lane Access
- ARB's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project HVIP, which offers vouchers ranging in value form $30,000-$50,000[24]

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[21] For more information, see: https://www.pge.com/en_US/residential/solar-and-vehicles/options/clean-vehicles/electric/clean-fuel-rebate-for-electric-vehicles.page

[22] IRS. *Plug-in Electric Drive Vehicle Credit at a Glance*. Retrieved from: https://www.irs.gov/credits-deductions/individuals/plug-in-electric-drive-vehicle-credit-section-30d

[23] California Air Resources Board. *California Clean Vehicle Rebate Project.* Retrieved from: https://cleanvehiclerebate.org/eng

[24] BAQMD. December 2013. *Bay Area Plug-In Electric Vehicle Readiness Plan*.

TRANSPORTATION ELECTRIFICATION PROGRAM OPTIONS

Rate Design as Incentives for EV’s, Smart EV Charging, and V2G Technologies:

While other sections of the LDBP reference rate design extensively, rates structures designed to spur the use of Electric Vehicle (EV) charging infrastructure provide a way for EBCE to shape customer energy use behavior and subsequent load profiles. EV’s can create long-term financial stability benefits for EBCE through electrification and fuel switching which will increase the total demand for electricity within the service area. Additional load from EV charging will result in additional revenue from retail sales, and has the potential offset any self-cannibalization of load that occurs form energy efficiency and other demand-side management programing that EBCE offers. Ultimately, if EV usage is scaled within the service area and the related charging activities are managed in a way that aligns this substantial new load with peak solar photovoltaic generation periods, EBCE can realize significant environmental, social, and economic benefits.

Two main use cases for EV’s are emerging that can promote improved grid stability while also providing the potential to generate procurement savings for EBCE that can be passed on to rate payers, including:

1. TOU rate structures for grid-enabled EV charging that has the potential to shape energy demand curves and reduce procurement risks (if EV owners charge during off-peak hours, EBCE’s procurement costs would be lower).
2. Vehicle to Grid (V2G) interface to enable EV’s to provide valuable energy and grid services through bi-directional power flows (the EV batteries can supply energy to the grid in times of peak demand).

In the first use case, using TOU rates or real time price signals to influence customer behavior, EV’s have the potential offer load shaping or shifting services able to flatten load curves and more closely align consumption patterns with renewable generation. This is why both PG&E and MCE have adopted a non-tiered TOU rate structure for residential EV chargers. If priced with current and future energy needs in mind EBCE can use EV charging times to reduce procurement costs and risks and address the emerging “duck-curve” issue as load growth occurs for EV charging.

EBCE’s load curve (shown in Figure 4 below) does not yet exhibit the pronounced duck-curve that is beginning to emerge within much of California’s energy market. However, as the amount of PV generation continues to increase within the service area, without widespread adoption of energy storage designed to shift the solar PV supply into the early evening hours the duck-curve issue is likely to become an issue that negatively affects EBCE and its customers. For this reason, this report recommends that EBCE look to deploy TOU rates that incentivize charging during periods during the middle of the day when PV generation is at its peak and power imports are less likely to result in congestion or cause reliability issues.

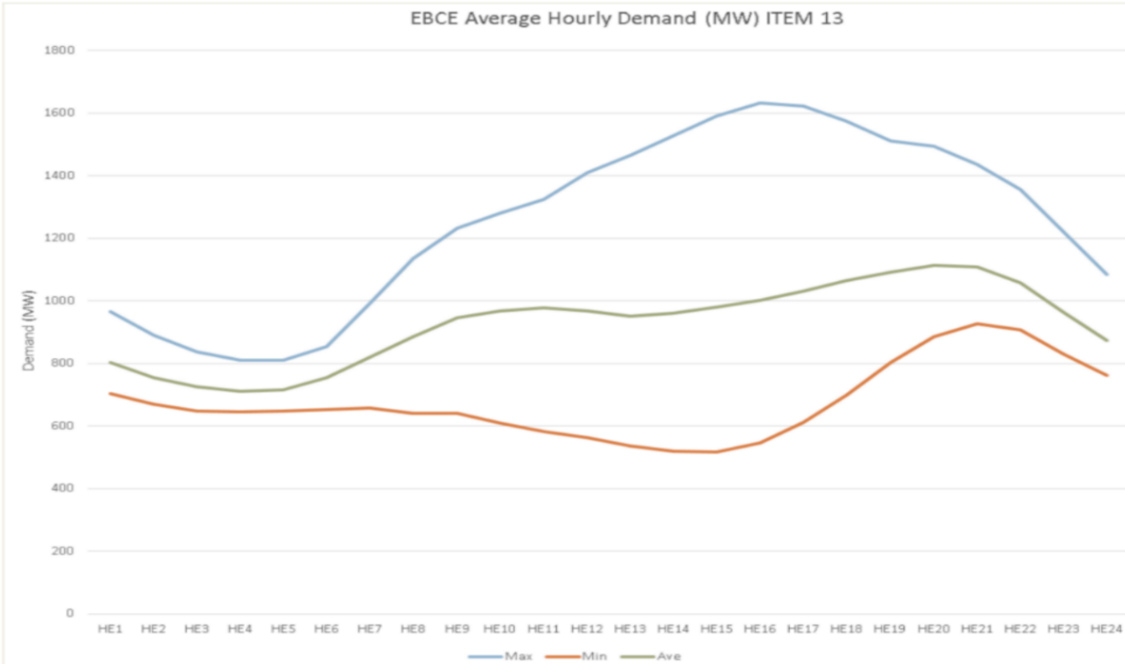

Figure 4: EBCE average Hourly Demand

The use of flat or evening-weighted residential charging rates is less beneficial because, while overnight residential charging may be the most convenient for EV owners, evening charging does not align with the PV generation. Aligning EV charging with PV production is anticipated to reduce reliability concerns, be less expensive than mid-day power, reduce carbon-intensity on the grid by increasing the direct renewable energy content of EV fueling.

EV's have been framed as mobile batteries which can be deployed as standalone energy storage while parked. For EBCE this framing is useful as the rate design, smart control features, and price signal features recommended for energy storage can be extended to Vehicle to Grid (V2G) program design. Additionally, V2G offers similar benefits as energy storage and has the potential to allow EBCE to access stored energy in EV batteries reduce congestion (increasing congestion revenue) and offset expensive procurement needs in the real time ISO market.

Specifically, in order to enable the full measure of benefits V2G and/or dynamic pricing for EV charging behavior, the following capabilities and infrastructure must be deployed:

- The ability to interface with an integrated data platform able to share real time energy readouts on the state of charge and charging data through an encrypted transfer
- Control features built into IT infrastructure and chargers to allow EBCE to offer price signals in exchange for control over charge or discharge behavior
- The ability for EBCE to send notification of price signal opportunity to customers
- The ability for EV owner to opt-out of a price signal so they can avoid range anxiety and use the vehicle for transportation when needed.
- Smart programing dashboards allowing the customer to pre-define their charging needs and program charging times so that they have adequate range when they want to use the car for transportation.

Despite the promise of V2G technology and continuing funding interest from federal and state grant sources, the technology is still, nascent and controversial given the risks of voiding warranties on vehicle batteries that can occur under V2G programs. As a result, the LDBP team views the technology as unlikely to reach market readiness in the near term (i.e., the next 2-3 years). In the near term, it is recommended that smart charging incentives be offered and managed at the charger level (i.e., offering rebates for grid-enabled chargers, and compensating customers for participation in demand response programming), rather than at the EV battery level, allowing time for the battery technology and interface controls to mature. Until V2G technologies is ready for widespread commercial deployment, utilization of external grant funding and/or pay for performance (P4P) contracting strategies are recommended to protect EBCE from the apparent risks of adopting the nascent technology. This approach would support the development of pilot V2G projects that can yield valuable data from real-world deployments, which can provide a solid foundation for future EBCE programs.

Sonoma Clean Power's GridSavvy program demonstrates an EV charging incentive program that can be administrated cost-effectively by EBCE. The GridSavvy program offers free EV smart charging equipment to customers in exchange for the ability for SCP to adjust, or briefly interrupt charging activity on those chargers. Customers receive financial benefit from participation in the through a $150 enrollment credit and a $5/month bill credit. While the SCP program can be expanded to offer real time incentives tied to the cost of energy through demand response programming, adopting a flat rate incentive structure acts as an early iteration of EV load shaping that can be expanded in the future.[25]

If smart charging infrastructure is paired with non-tiered TOU rates, EBCE will realize increased benefit from promotion of EV adoption in the light-duty passenger vehicle market segment.

Similarly, waiving demand charges and offering rate design that incentivizes electric vehicle adoption and off-peak charging in the commercial and fleet setting can also drive beneficial transportation electrification and EV adoption in harder-to-reach market segments.

Medium and Heavy Duty Vehicle Fleet Strategy:

Existing rebates, incentives, and tax credits have created a reasonably well-developed passenger EV market segment. EBCE should continue to track these programs and connect customers to established programs through their website and outreach and community engagement strategies.

In addition to promoting existing programs to EBCE customers, substantial opportunities for electrification and emission reduction can be found through fleet electrification strategies and programs designed to target medium and heavy duty vehicles. Such vehicle fleets also present the best near-term opportunities for vehicle grid integration (VGI) given larger battery size than passenger EV's that can endure the increased cycling with less degradation, reducing concerns about warranty invalidation.

It is notable that despite the potential for the medium and heavy duty market segment to represent an opportunity for EBCE to "get to scale" cost-effectively, fleet electrification can also present risks if large fleets are able to freely charge during the most expensive intervals of peak load days. Large fleets of medium and/or heavy duty electric vehicles ultimately represent substantial new electricity loads, that could end up charging during peak demand and/or peak pricing periods. This poses a risk that could result

[25] Sonoma Clean Power. *GridSavvy.* Retrieved from: https://sonomacleanpower.org/gridsavvy/

in increased procurement risk scenarios, and could also require peaker plant response that increase the carbon intensity of an LSE's portfolio. It's therefore not unreasonable for a CCA to be concerned that poorly managed charging behavior relating to a large fleet of medium and/or heavy duty EV's could destroy the cost savings and/or emission reductions potential that could otherwise occur from fleet electrification.

Concerns about charging demand risk can be effectively addressed through negotiating mutually beneficial control clauses provide valuable customer incentives in exchange for allowing EBCE to manage charging behavior during times of extreme grid demand and/or extreme pricing periods on the CAISO markets (i.e., during unexpected heat waves, or other such events that lead to spikes in demand or prices).

Potential partners for Medium and heavy duty vehicle fleet programs in Alameda County include:

- School bus programs: which represent large opportunities for improving human health outcomes, and traditionally have low route utilization allowing for V2G pilots in the summer and during afternoon in-between morning and evening routes
- Fire stations and emergency response vehicles: which present opportunities for improved resilience capacity in event of earthquake, fire, or disruptive energy event
- Commercial Fleet Managers: Include East Bay corporate fleets such as Frito Lay
- Municipal and government fleets: Although Alameda County's fleet is already aggressively pursing an EV strategy. Charging pilots and special rates may appropriate among EBCE's member jurisdictions.

Programs can be piloted with these potential partners through pursuit of grant funding in the near term.

Recent grant funding opportunities provided by organizations such as the California Energy Commission (CEC) and the Bay Area Air Quality Management District (BAAQMD) have supported transportation electrification strategies that intersect with building resilience capacity, locational benefit, human health benefits, and reducing tailpipe emissions. These opportunities can provide a cost-effective way for EBCE to pilot a fleet electrification strategy, and can also attract State, Federal, and philanthropic foundation investments as well. A grant-funded pilot could also enable EBCE to generate baseline datasets relating to real-world outcomes in Alameda County applications, which can provide a solid foundation for implementation of future EBCE programs for fleet electrification.

Potential opportunities to engage medium and heavy duty vehicle fleet owners and operators for EBCE fleet electrification strategies include:

- Grant project-based Private Public Partnerships
- Pilot projects to explore mutually beneficial applications of dynamic pricing and transactive energy platforms that incorporate price signals (i.e., through V2G and VGI technologies)
- Offering automated demand response and/or favorable TOU Rate structures that support and incentivize beneficial fleet electrification
- Waiving demand charges for fleet owners/operators who agree to EBCE managed charging during peak load and/or peak pricing periods

Promoting Private Sector Innovation and Pilot Opportunities:

In addition to partnering with medium and heavy duty vehicle fleet managers, it is recommended that EBCE consider the role of implementing pilot projects in partnership with private EV product and/or service providers already serving Alameda County. The fast pace of technological advancement in the EV market has led to examples of continued innovation that (if appropriately harnessed) can benefit EBCE, its customers, and California in general.

Examples of EV product and service providers serving the greater Bay Area:

- Electric Trees: A multifamily charging solution with flat rate charging and several facilities operational in San Francisco[26]
- GridScape: A microgrid, EV charging system, and smart features and controls provider based in Fremont that has deployed a grant backed program at Fremont Fire station 11[27]
- PowerFlex Systems: Adaptive charging networks offering specialized EV charging management[28]
- eMotoWerks: Grid enabled charging stations and software[29]
- ENGIE: Recently aquired Green Charge Networks (now ENGIE Storage), offers Energy Storage paired with DC fast chargers[30]
- ChargePoint: Networked chargers and monitoring and data analytics[31]
- NextEnergi: An Emeryville-based company providing modular nanogrid, microgrid, integrated grid-enabled EV charging, and building management systems[32]
- BYD: Electric Buses developed in Lancaster[33]
- Wave: Wireless Inductive Chargers[34]

Community Education and Outreach

Community-based EV education and outreach programs—such as ride and drives and Sonoma's SWITCH program—have used community interest in EV's to help nudge their customers towards switching to an EV. With a wide reach of programs, rebates, and incentives available for EV's, basic communication and outreach strategies can help promote market adoption with minimal cost or risk to EBCE.

Examples of potential program ideas include:

- Compiling rebate and incentive offerings available to EBCE customers on EBCE's website
- Hosting ride and drive programs
- Using EV's as an engagement tool at local schools and community centers
- Marketing and outreach plans surrounding any EBCE EV program launch

[26] http://www.electrictrees.com/
[27] http://grid-scape.com/
[28] http://powerflexsystems.com.s3-website-us-west-1.amazonaws.com/
[29] https://emotorwerks.com/
[30] http://www.engiestorage.com/products-services/
[31] https://www.chargepoint.com/
[32] http://www.nextenergi.io
[33] http://en.byd.com/usa/bus/
[34] http://wave-ipt.info/

- Outbound calling from EBCE’s Customer Service Center to promote EBCE programs and incentives

Building Codes and EV Readiness Requirements

As a CCA, EBCE is in a unique position to exercise influence over municipal land-use authority held by its member jurisdictions. By facilitating a regional discussion with the elected officials from EBCE’s member jurisdictions (who comprise EBCE’s Board of Directors) and their respective planning and building permitting staff, EBCE can help promote the development and adoption of new land use codes and standards that can effectively promote widespread EV adoption. This unique influence that CCA’s have over building codes and standards is an underutilized ability. By working to create reach codes and policies that require new construction and/or retrofits to pre-wire parking lots, garages, residential, and non-residential land-use developments in a way that makes them ready for EV charging infrastructure (EVCI) substantial progress can be made in the expansion of available charging infrastructure.

Fremont has established EV Readiness requirements that go beyond the 2016 CALGreen building codes, which requires that: [35]

- “Residential and non-residential new construction projects and additions where additional parking spaces are provided must include "EV Ready" parking spaces equipped with the electrical raceway, wiring, and electrical circuit. (FMC 15.48.030 & FMC 15.48.040)
- Single-family residential projects must provide one EV Ready parking spaces per each dwelling unit. (FMC 15.48.050)
- Multifamily residential projects of 3 units or more and all non-residential projects must provide EV Readiness for approximately 10 percent of the total number of new parking spaces. This is equivalent to the Tier 2 CALGreen option for non-residential developments. (FMC 15.48.050 & FMC 15.48.060)
- All "EV Ready" parking spaces must also be equipped with the EV charging unit. (FMC 18.183.172 & FMC 18.183.174)”

The Fremont reach codes also deploy a mandatory solar requirement,[37] and when combined with EV readiness requirements the two building codes have the potential to drive large emission reduction and fuel switching outcomes in the jurisdiction. This example of local leadership provides a foundation for working collaboratively to develop a regionally consistent set of reach codes and standards in EBCE territory that promotes accelerated EVCI infrastructure deployment throughout the CCA service area.

[35] City of Fremont California. *Green Building EV Readiness.* Retrieved from: https://fremont.gov/2173/Green-Building
[37] City of Fremont. 2016. *Mandatory Solar Requirement.* Retrieved from: https://fremont.gov/DocumentCenter/View/35511/Mandatory-Solar-Requirement

RECOMMENDATIONS FOR TRANSPORTATION ELECTRIFICATION

Phase 1: 2018-2020

1. Pursue grant money to pilot medium and heavy duty vehicle fleet electrification strategy program. Potential funding possible from CEC, Low Carbon Fuel Standard, IOU's, Strategic Growth Council, and philanthropic foundation sources
2. Implement TOU non-tiered rate structure for commercial EV fleets and residential EV owners
3. Offer Incentives for grid-enabled chargers
4. Offer ongoing education and outreach for the personal EV market segment (i.e., Ride and Drive events)
5. Facilitate regional forum for the development of reach codes, standards, and land use policies to build on early leadership demonstrated by EBCE members and stakeholders (i.e., the City of Fremont's EV Readiness program)

Phase 2: 2021-2022

1. Launch a transportation electrification program based on the Phase 1 fleet electrification pilot findings
2. Studying additional program options, including trucking, metro buses, and light duty vehicles
3. Expand pilots to explore new and emerging EV technologies and additional market segments
4. Study potential for aggregating grid-enabled chargers for demand response and virtual power plant applications

Phase 3: 2023- beyond

- Implement Vehicle to grid V2G and virtual power plant technologies that aggregate and shape and shift EV load through price signals, dispatchability, and automated demand response technologies
- Deploy transactive energy platforms that enable dynamic pricing and move beyond simple TOU rate structures

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