

Office of the City Manager

INFORMATION CALENDAR

September 10, 2013

To: Honorable Mayor and Members of the City Council

From:  Christine Daniel, City Manager

Submitted by: Eric Angstadt, Director, Planning and Development

Subject: Update on the Status of Electric Vehicle Infrastructure in Berkeley

SUMMARY

This report is in response to the July 16, 2013, City Council referral requesting information on the status of plug-in electric vehicle (PEV) charging policy and infrastructure in Berkeley. It includes a description of these efforts over the last two years, addresses concerns that Berkeley is lagging behind other cities in the provision of PEV infrastructure, describes potential funding opportunities, and highlights remaining issues tied to the provision of PEV infrastructure, one of which is PEV charging options for homes that lack off-street parking.

Staff from the Planning & Development and Public Works Departments, with guidance from the Energy, Public Works, and Transportation Commissions, have made significant gains in several aspects of PEV charging policy and infrastructure. Specifically, the permitting procedure for off-street residential PEV charging systems is now an inexpensive, over-the-counter process. The City also launched a Non-Residential PEV Charging Station Pilot Program earlier this year, which streamlines permitting and provides assistance to encourage businesses to install charging stations in their existing parking lots. In addition, the City recently added a standard condition of approval for new development projects that requires PEV charging readiness in parking lots. Finally, the City increased its publicly accessible PEV charging offerings; as of July 1, 2013, the Center Street Garage features two Level 2 charging stations for public use. An engineering assessment was also completed in June 2013 to determine the electrical capacity and cost for adding PEV charging stations at other municipal locations.

The City also remains involved in regional PEV discussions and competitive for regional funding opportunities. Near-term grant opportunities focus primarily on providing incentives to lower the cost of PEVs and for PEV charging equipment in multiunit buildings and at workplaces. Grants cannot be expected to fully fund additional public charging stations in Berkeley.

CURRENT SITUATION AND ITS EFFECTS

Staff is working to expand Berkeley's PEV infrastructure by streamlining the permit process, encouraging private investment, and installing publicly accessible charging equipment. Staff is focusing these efforts in the following prioritized order:

1. Home charging, ideally during off-peak hours,
2. Commercial charging, for employees and/or the public, and
3. Public charging on municipal or other public property.

Home Charging

The City produced its first guide for permitting the safe installation of residential charging equipment in September 2011.¹ Since that time, staff's main focus in the residential sector has been to address zoning-related barriers to off-street charging. In May 2013 staff instituted new administrative practices that allow most applicants for off-street residential charging equipment to obtain approval through an over-the-counter electrical permit. The cost of the electrical permit is \$127. As of April 2013, 67 permits for residential charging systems have been approved.

Home charging for individuals that lack off-street parking remains challenging for Berkeley and other cities. In recent months, staff and elected officials received communication from residents interested in installing electrical outlets or charging stations at the curb to allow for charging within the public right-of-way (PROW). These requests are expected to continue.

The minor encroachment permit process could provide for safe installation of curbside charging stations, but many other issues remain, including universal access, enforcement of parking/charging restrictions, requirements for the provision of electricity, and competing uses of the PROW. These issues may make residential curbside charging difficult or infeasible, but staff continues to seek solutions. As of today, residential on-street curbside charging is not allowed.

Commercial Charging

On February 7, 2013, the City launched a Non-Residential PEV Charging Station Pilot Program (Pilot Program) in response to a December 13, 2011, City Council referral for an expedited permit process for PEV charging station installation on private commercial property.² The Pilot Program encourages non-residential properties to install PEV charging stations in their existing parking lots by offering a clear pathway, staff guidance, and streamlined permitting. PEV charging equipment may be authorized through issuance of a Zoning Certificate, rather than the previous requirement of a Use

¹ The Plug-In Electrical Vehicle Residential Charging System Permit Guide is available in the Permit Service Center and on the Office of Energy & Sustainable Development's website at <http://www.cityofberkeley.info/EVresidentialcharging/>.

² Information about the Non-Residential Plug-in Electric Vehicle Charging Station Pilot Program is available in the Permit Service Center and on the website at www.cityofberkeley.info/EVchargingpilot/.

Permit or Administrative Use Permit. Program participants have flexibility in the type and use of charging stations they select while meeting requirements for disabled access, safety, and signage. Reception from the community has been positive and staff is hopeful that the first applications will be submitted soon, most likely from Berkeley businesses installing PEV charging stations for use by their employees.

Staff reviewed a range of information sources in order to ensure that the Pilot Program is consistent with the Americans with Disabilities Act (ADA). Information sources included best practices from other cities, a general guidance document from the Division of the State Architect titled, "Interim Disabled Access Guidelines for Electric Vehicle Charging Stations," general ADA programmatic standards for new services, and accessibility provisions in the California Building Code Chapters 11B and 11C. Draft guidelines titled, "Plug-In Electric Vehicles: Universal Charging Access Guidelines and Best Practices" were released by the Governor's Office of Planning and Research in April 2013, but following public concern from the disability community, the document was withdrawn for further development and has no planned release date.

As a result, no federal or state guidelines exist specifically for disabled access to PEV charging stations. Based upon the best available information, staff determined that the first charging station space must provide for disabled access either through placing the PEV charging station so that it can be used at an ADA parking space or by creating a charging space with "universal access" features (including an access aisle on the passenger side of at least 5', and ideally 8' in width). Furthermore, accessible charging spaces shall be located such that an accessible path of travel is maintained between the charging space and public right-of-way. In doing so, Berkeley has developed standards for the Pilot Program and for public charging on municipal property that may require more accessibility measures than what other communities are doing, but that may also be closer to compliance when final regulations are issued.

In neighboring communities with more publicly-available charging stations than Berkeley, a majority of the stations have been provided by private businesses. For example, the publicly-available PEV charging stations in Emeryville are located at IKEA, the Four Points by Sheraton, and LBA Realty. Oakland has almost 50 publicly-available charging stations, but only 19 are on public land (installed by Alameda County on County land); the others are in private parking garages, at Alta Bates Summit Medical Center, Nissan of Oakland, and Walgreen's. Berkeley's businesses have not yet provided publicly-available PEV charging stations, but the Pilot Program is designed to encourage this action and may be particularly effective when paired with opportunities for chargers through a \$120 million settlement between the California Utilities Commission and NRG Energy, Inc. Staff from Planning and Economic Development have worked to connect NRG Energy with Berkeley businesses that may be competitive to receive free charging equipment through this settlement.

In December 2012, the Planning and Development Department also added a PEV charging readiness condition of approval for new development projects: at least 10% of parking spaces for new residential parking, or at least 1 parking space if less than 10 residential parking spaces will be provided, shall be pre-wired to allow for future Level 2 PEV charging system installation. For non-residential developments with over 20 parking spaces, at least 3% of the spaces must be pre-wired to allow for future Level 2 PEV charging system installation. This condition of approval is designed to help make home and workplace/public charging more prevalent in new development projects.

Public Charging on Municipal/Public Property

On July 1, 2013, a second Level 2 public charging station, donated to the City by City CarShare, was activated in the Center Street Garage. This station has been well-received based on feedback on PEV-user blogs and its frequent use; in the month of July 2013 the new charging station was used on 30 of 31 days and was typically used for 2-3 charging sessions each day. The new station is networked and so allows for data collection on use and electricity consumption that will be used to evaluate demand and future fee structuring. At the same time that the new station was activated, the parking space serving the first Level 2 PEV charging station (installed in March 2012 by the California Energy Commission) and the legacy small paddle inductive charger in that Garage was redesigned to make it accessible for all users, including those with disabilities.³ In addition to these public PEV charging stations, the Center Street Garage also has two City CarShare PEVs with charging stations.

In order to increase the availability of public charging in Berkeley, the Office of Energy and Sustainable Development (OESD) commissioned an electrical engineering analysis of 9 municipal locations, included as an attachment. The list of locations was developed by staff from OESD and Public Works and included the three municipal parking garages, two municipal surface parking lots, on-street spaces in the vicinity of the Claremont Branch Library and the Permit Service Center, the Dona Spring Animal Shelter, and the Berkeley Marina in the vicinity of the Old Ferry Dock. This assessment, completed in June 2013, provides technical and budgeting information about the potential to add PEV charging stations at each location given the existing electrical service and the extent of upgrades needed if the current capacity will not support the addition.

Data from the analysis show that by far the best existing capacity for PEV charging stations is at the Telegraph/Channing Garage. Other locations that have enough electrical capacity to support at least one Level 2 charging station include the Oxford Street Garage, Claremont Branch Library, Dona Spring Animal Shelter, 1947 Center Street, and the Berkeley Marina near the Old Ferry Dock. However, even at installations of Level 2 charging stations that can utilize the existing electrical service, the cost

³ Information on public charging in Berkeley is available on the website at <http://www.cityofberkeley.info/publicchargingev/>

estimates (including all materials, installation, and engineering & City administrative fees) range from \$22,800-\$41,100 per Level 2 dual-port station and \$14,200-\$37,100 per Level 2 single-port station. When new electrical service would be needed, such as at the Berkeley Way Lot, Elmwood Lot, and for any additional chargers at the Center Street Garage, the total costs to install Level 2 dual-port stations jumps to \$27,300-\$54,000 per station. Please see the attached assessment for additional detail.

Funding Opportunities

Adding new municipal public charging stations in Berkeley will require significant financial resources. Staff continues to monitor funding opportunities for PEV charging infrastructure and is currently pursuing a limited opportunity through the EV Project, a U.S. Department of Energy program administered by Ecotality. The EV Project can provide DC fast charging stations and up to \$14,000 in installation costs and can add up to twelve free Level 2 charging stations with \$1,000 towards installation on each. Ecotality met with OESD staff for an assessment of the Telegraph/Channing Garage, the only municipal location found to have the electrical capacity needed to support DC fast charging. The resulting bids estimated installation costs of \$40,000-46,000 for the DC fast charger at this location, a cost that far exceeded any previous installation done as part of the EV Project.

Through regular participation in the Bay Area EV Strategic Council, Berkeley staff has early information about upcoming Bay Area Air Quality Management District (Air District) PEV investment plans. On June 5, 2013, the Air District Board approved \$6.25 million to promote PEVs. These funds will primarily be used as incentives for the purchase/lease of PEVs. Funds will be dedicated to providing public agencies \$1,000-\$2,000 rebates on the purchase or lease of PEVs. Air District investments will also go toward PEV charging equipment at workplaces and multifamily dwellings. Berkeley may be competitive for a municipal DC charger through this project, but would have to supply matching funds to participate. Full details about this opportunity should be released this fall.

Staff also continues to monitor the \$120 million in PEV purchase incentives and the \$80 million for a regional PEV charger network that the Metropolitan Transportation Commission (MTC) has proposed through Plan Bay Area. If approved, MTC's regional PEV charging network program is expected to begin in 2015 and the vehicle buy-back and PEV purchase incentive in 2020.

In the short-term, the only potential grant opportunities for new municipal public charging stations are for DC fast charging (through either the EV Project or the Air District); both grants would also require significant investment by the City. Similarly, based on the recent electrical assessment of municipal properties, the addition of new Level 2 charging stations will typically require at least \$25,000 for station purchase and complete installation.

BACKGROUND

The City of Berkeley has an interest in promoting the adoption of PEVs as documented in the Climate Action Plan (CAP) and General Plan. PEVs include plug-in hybrid electric vehicles, like the Chevy Volt and Toyota Prius Plug-in, and full battery electric vehicles, like the Nissan Leaf and Tesla Model S, that utilize electricity, rather than gasoline, for some or all of their fuel. The use of electricity for transportation, particularly in combination with state efforts to lower the carbon content of the electrical supply, is a fundamental component to achieving Berkeley's CAP goals of reducing community-wide global warming emissions 33% by 2020 from year 2000 levels.

Demand for PEVs in California is strong; for example, the 2013 Fiat 500e hit the market in California in April and sold out for the year in June. California leads the nation for PEV sales and as of April 2013, 36% of the state's PEV sales were in the Bay Area. PEV adoption in Berkeley is expected to be high due to the community's greater than average adoption of hybrid vehicles, like the Toyota Prius, and has been evidenced by PEVs on the streets and calls from the public to elected officials and staff for more charging opportunities.

Staff efforts on PEVs over the last two years have been framed by September 20, 2011, guidance provided by the Energy, Public Works, and Transportation Commissions, and by City Council's direction to monitor regional efforts to promote PEV adoption, to monitor local and regional funding opportunities related to PEV policy and infrastructure, to develop print and web-based information that provides guidance to residents on the safe and legal installation of home PEV charging systems, to report on these and other relevant efforts to City Council as part of the annual Climate Action Plan update, and to continue to ensure that parking spaces in the public right-of-way (PROW) are not dedicated to an individual's exclusive use, including for the purpose of charging a PEV. Staff from within multiple divisions of the Planning & Development and Public Works Departments have worked together, as needed, in taking action to address these issues.

POSSIBLE FUTURE ACTION

City staff, with input from the Energy, Public Works, and Transportation Commissions, has taken significant action toward providing PEV infrastructure and encouraging the adoption of PEVs. Complexities, including the financial realities of providing public charging opportunities, remain.

Possible future actions include:

- Home charging: Residents lacking off-street parking currently face the biggest barriers to PEV adoption. Staff is currently concentrating on creating public and workplace alternatives for charging. Staff has avoided use of the PROW for residential charging due to concerns such as accessibility, enforcement, and competing uses of the PROW. However, because these requests are expected to

continue, a reevaluation of residential PROW charging and a proposed scenario under which PEV charging in PROW could be considered may be appropriate.

- Commercial charging: Berkeley businesses have not yet provided public (or workplace) charging stations. Historic barriers to this private sector provision of PEV infrastructure have been addressed through the Pilot Program launched this year. An evaluation of additional actions, such as financial or regulatory incentives, that the City of Berkeley could incorporate may be effective in speeding private investment in this sector.
- Municipal charging: Even when utilizing grant funding and pilot program opportunities, the installation of new municipal public charging stations will require additional funding. Staff has taken initial action to identify and prioritize PEV charging stations on municipal property based on electrical assessments, parking availability, and location.

FISCAL IMPACTS OF POSSIBLE FUTURE ACTION

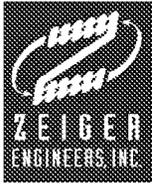
Varies depending on action taken.

CONTACT PERSON

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Attachments:

- 1: PEV Charging Equipment Assessment (Zeiger Engineers, Inc., June 11, 2013)



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June 11, 2013

City of Berkeley

PEV CHARGING EQUIPMENT ASSESSMENT

This report, and its corresponding appendix, describes the electrical assessment of nine municipal locations within Berkeley for opportunities to install plug-in electric (PEV) charging stations. As directed by City of Berkeley staff, the nine sites investigated include the three municipal parking garages, two surface parking lots, on-street spaces in the vicinity of the Claremont Branch Library and the Permit Service Center, the Dona Spring Animal Shelter, and the Berkeley Marina in the vicinity of the Old Ferry Dock. The details of each assessment are provided below.

PEV Charging Equipment: For the basis of this assessment, the type of charger used was a Level 2 PEV, having a maximum current of 32.0amps at 240 volts single phase, or 27.7amps at 208 volts single phase. Chargers selected were "Charge Point" CT2100 family, as manufactured by Coulomb Technologies, Campbell, CA. The chargers are available as a single and dual charge stations; wall or bollard mounted.

Appendix: To aid in understanding what specific work is needed at each of the city sites that are being assessed, wiring diagrams (single line diagrams) and site plans have been prepared and are included in the appendix of this

SITE DESCRIPTIONS

1. **Center Street Garage:** Garage has a service rated 600amps 120/208 volt three phase, located in a closet at the ground level office. The equipment is antiquated. There are five (5) single PEV chargers installed in the garage; three on Level 1b and two on Level 4a. There is no available capacity to install additional chargers. Therefore, it would be necessary to upgrade the service or to provide a second service dedicated to the PEV charger use.

If an additional six (6) Dual Level 2 PEV chargers would be desired, a new separate 400amps 120/208 volt three phase service would be required; cost for this new service would be approximately \$25,000. Alternatively, the existing service could be modernized and upgraded in rating to 1000amps 120/208 volt three phase at a cost of approximately \$50,000.

2. **Telegraph/Channing Garage:** The ground level of the garage has a separate 1200 amp 120/208 volt commercial multi-meter switchboard for ground level tenants. The garage itself has a 1200 amps 120/208 volt three phase meter switchboard which is underutilized. There is available one spare 100amp and one 400amp fused disconnect switches, located in a sub-metered 600amp section, that can be used to feed a new panel dedicated for PEV chargers. A maximum of twelve (12) Dual Level 2 PEV chargers or one (1) DC (120kw) Fast Station charger and three (3) Dual Level 2 PEV chargers can be accommodated by this underutilized submetered section. Exposed

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conduit would be run from electrical room across ground level ceiling, and through floor slab up to second floor parking level for about 220 feet total length of run.

Scheme A: One (1) Dual Level 2 PEV charger station: In sub-metered section, use spare 100amp fused switch and new 100 amp fuses, to feed a new 100amp 208 volt three phase subpanel equipped with two 40amp 2 pole circuit breakers, to be located on 2nd floor at south east corner. Additional work needed to complete installation includes: signage, wheel stops, bollards, X-raying and core drilling floor slab, and floor striping.

Scheme B: Three (3) Dual Level 2 PEV charger stations: In sub-metered section, use spare 400amp fused switch and new 200amp fuses, to feed a new 200 amp 208 volt three phase panel equipped with six 40amp 2 pole circuit breakers, to be located on 2nd floor at the south east corner. Additional work needed to complete installation includes: Additional work needed to complete installation includes: signage, wheel stops, bollards, X-raying and core drilling floor slab, and floor striping.

Telegraph Channing Garage

Scheme A: Installation of one Dual PEV charger station	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station Level 2 station, wall mounted	1	ls	\$8,100	\$8,100
Power connection to existing panel including conduit, wire, drilling	1	ls	\$7,500	\$7,500
New subpanel and twin circuit connections to PEV	1	ls	\$2,000	\$2,000
Access signage, stripping, and protective bollards	1	ls	\$1,500	\$1,500
Engineering and City Administrative Costs	1	ls	\$10,000	\$10,000
				\$29,100
Scheme B: Installation of three Dual PEV charger stations				
Dual PEV charger station Level 2 station, wall mounted	3	ea	\$7,500	\$22,500
Power connection to existing panel including conduit, wire, drilling	1	ls	\$9,500	\$9,500
New subpanel and twin circuit connections to PEV	1	ls	\$6,500	\$6,500
Access signage, stripping, and protective bollards	1	ls	\$3,000	\$3,000
Engineering and City Administrative Costs	1	ls	\$12,000	\$12,000
			Total	\$52,500

- Oxford Garage:** The underground garage portion of this multi-story mixed-use building has a commercial six-meter service switchboard, rated 1200amps, 120/208 volts three phase. There is a spare 200amp three phase meter socket available that can be used for PEV chargers. A maximum of five (5) Dual Level 2 PEV chargers can be accommodated by this meter. Exposed conduit would be run from electrical room across garage ceiling to new panel, about 200 feet total length of run.

Scheme A: One (1) Dual Level 2 PEV charger station: Activate existing spare 200amp meter socket with new service and PG&E meter, and install 100amp circuit breaker, to feed a new 100amp 208 volt three phase panel equipped with two 40amp 2 pole circuit breakers, to be located in the garage near Stall 73. Use new panel to feed pedestal mounted Dual Level 2 charger station. Additional work needed to complete installation includes: signage, wheel stops, bollards, saw cutting of floor and hand trenching, concrete floor repairs, concrete base for pedestal.

Attachment 1 - PEV Charging Assessment

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Scheme B: Three (3) Dual Level 2 PEV charger station: Activate existing spare 200amp meter socket with new service and PG&E meter, and install one 200amp three pole circuit breaker, to feed a new 200amp 208 volt three phase panel equipped with six 40amp 2 pole circuit breakers, to be located in the garage near Stall 73. Use panel to feed one pedestal mounted Dual Level 2 PEV charger station, and two (2) wall mounted Dual Level 2 PEV charger stations. Additional work needed to complete installation includes: signage, wheel stops, bollards, saw cutting of floor and hand trenching, concrete floor repairs, and concrete base for one pedestal.

Oxford Street Garage

Scheme A: Installation of one Dual PEV charger station	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station pedestal mounted, concrete cutting	1	ls	\$9,700	\$9,700
Power connection to existing meter including conduit, wire, drilling	1	ls	\$5,500	\$5,500
New subpanel and twin circuit connections to PEV	1	ls	\$2,000	\$2,000
Access signage, stripping, and protective bollards	1	ls	\$1,500	\$1,500
Engineering and City Administrative Costs	1	ls	\$15,000	\$15,000
			Total	\$33,700
Scheme B: Installation for a total of 3 Dual PEV charger stations				
Dual PEV charger station pedestal mounted, concrete cutting	1	ls	\$9,700	\$9,700
Dual PEV charger station wall mounted	2	ea	\$7,500	\$15,000
Power connection to existing meter including conduit, wire, drilling	1	ls	\$7,800	\$7,800
New subpanel and twin circuit connections to PEV's	1	ls	\$13,500	\$13,500
Access signage, stripping, and protective bollards	1	ls	\$2,500	\$2,500
Engineering and City Administrative Costs	1	ls	\$20,000	\$20,000
			Total	\$68,500

4. **Berkeley Way Parking Lot:** There are no available meter services located in the parking lot. PG&E has overhead utilities along Berkeley Way that could supply a new meter service pedestal located in parking lot. For installation of one (1) Dual Level 2 charger station, the new meter pedestal would be rated 100amps, 120/240 volts single phase. For up to three (3) Dual Level 2 chargers, the new meter pedestal would be rated 300amps, 120/240 volts single phase. Space is available in the parking lot to locate new service equipment. The existing Pay Station in the center of the parking lot would need to be relocated adjacent to the accessible parking stall. Restriping is required to restore old pay station to a parking stall. Distance between the new pedestal and the existing utility pole requires a trench length of about 40 feet long through planter and sidewalk. A new access ramp will be needed to be constructed through the planter adjacent to the sidewalk of Berkeley Way.

Scheme A: One (1) Dual Level 2 PEV charger station: Install new meter pedestal rated 100amps, 120/240 volts single phase and underground service conduit to PG&E point of connection at utility pole location on Berkeley Way. Pedestal shall be equipped with two (2) 40amp 2 pole circuit breakers for charger station, and one (1) 20amp 1 pole circuit breaker for connection of pay station. Additional work needed to complete installation includes: signage, striping, wheel stops, bollards, ramp, trenching, AC pavement and landscape repairs, removal and reinstallation of pay station, concrete bases for pay station and pedestal base.

Attachment 1 - PEV Charging Assessment

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Scheme B: Three (3) Dual Level 2 PEV charger station: Install new meter pedestal rated 300amps, 120/240 volts single phase and underground service conduit to PG&E point of connection at utility pole location on Berkeley Way. Pedestal would be equipped with six (6) 40amp 2 pole circuit breakers for charger station, and one (1) 20amp 1 pole circuit breaker for connection of pay station. Additional work needed to complete installation includes: signage, striping, wheel stops, bollards, ramp, trenching, AC pavement and landscape repairs, removal and reinstallation of pay station, concrete bases for pay station and pedestal base.

Berkeley Way Parking Lot

Scheme A: Installation of one PEV charger station	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station pedestal mounted	1	ls	\$9,100	\$9,100
Service connection to PGE, underground conduit, conductors, includes PGE charges	1	ls	\$10,500	\$10,500
Service meter pedestal and circuit connection to PEV	1	ls	\$5,000	\$5,000
Access signage, stripping, protective bollards, relocate pay station, ramp	1	ls	\$7,500	\$7,500
Engineering and City Administrative Costs	1	ls	\$14,000	\$14,000
			Total	\$46,100

Scheme B: Installation for a total of three Dual PEV charger stations

Dual PEV charger station pedestal mounted, concrete base	3	ea	\$9,100	\$27,300
Service connection to PGE, underground conduit, conductors, includes PGE charges	1	ls	\$12,500	\$12,500
Service meter pedestal and circuit connections to PEVs	1	ls	\$13,500	\$13,500
Access signage, stripping, protective bollards, wheel stop, relocate pay station, ramp	1	ls	\$7,500	\$7,500
Engineering and City Administrative Costs	1	ls	\$21,000	\$21,000
			Total	\$81,800

5. **Elmwood Parking Lot:** There is an existing 600amps 120/240 volt single phase multi-meter service at the rear of the commercial buildings. It is unlikely that the ownership of that metering equipment would allow City to use their service due to its limited capacity. New service can be made by running underground to the corner of Russell Street and College Avenue. It may be possible to coordinate the request for new service with that of a planned new traffic signal light project. Distance between the new pedestal and the existing utility point of connection requires a trench about 300 feet long through planter, pavement and sidewalk. Extra cost may be necessary for the construction of the underground work because of existing underground utilities, and potential use of directional boring of conduit to avoid open trenching in this busy street and sidewalk area.

To meet the criteria of one (1) Dual Level 2 PEV charger, plus two additional similar chargers, a new service(s) would be required. PG&E has underground utilities along Russell Street and College Avenue, which could be extended to a new service pedestal. For one (1) Dual Level 2 charger, the pedestal would be rated 100amps, 120/240 volts single phase. For up to three (3) Dual Level 2 PEV chargers, the pedestal would be rated 300amps, 120/240 volts single phase, subject to PG&E approval. Space is available to locate new service equipment in the parking lot.

Scheme A: One (1) Dual Level 2 PEV charger station: Install new meter pedestal rated 100amps, 120/240 volts single phase and underground service conduit to PG&E point of connection at College Avenue and Russell Street. Pedestal would need to be equipped with two (2) 40amp 2

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pole circuit breakers for charger station. Additional work needed to complete installation includes: signage, striping, wheel stops, bollards, trenching, AC and sidewalk pavement repairs, landscape repair, and concrete bases for charger station and service pedestals.

Scheme B: Three (3) Dual Level 2 PEV charger stations: Install new meter pedestal rated 300amps, 120/240 volts single phase and underground service conduit to PG&E point of connection at corner of College Avenue and Russell Street. Pedestal would need to be equipped with six (6) 40amp 2 pole circuit breakers for charger station. Additional work needed to complete installation includes: signage, striping, wheel stops, bollards, trenching, AC and sidewalk pavement repairs, landscape repair, and concrete bases for charger station and service pedestals.

Elmwood Parking Lot

Scheme A: Installation of one Dual PEV charger station	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station pedestal mounted	1	ls	\$9,100	\$9,100.00
Service connection to PGE, underground conduit, conductors, including PGE charges	1	ls	\$19,000	\$19,000
Service meter pedestal and circuit connection to Dual PEV	1	ls	\$6,000	\$6,000
Access signage, striping, and protective bollards	1	ls	\$2,000	\$2,000
Engineering and City Administrative Costs	1	ls	\$18,000	\$18,000
			Total	\$54,100
Scheme B: Installation for a total of three Dual PEV charger stations				
Dual PEV charger station pedestal mounted, concrete base	3	ea	\$9,100	\$27,300
Service connection to PGE, underground conduits, conductors, including PGE charges	1	ls	\$25,500	\$25,500
Service meter pedestal and circuit connections to PEVs	1	ls	\$13,500	\$13,500
Access signage, striping, and protective bollards	1	ls	\$6,500	\$6,500
Engineering and City Administrative Costs	1	ls	\$20,000	\$20,000
			Total	\$92,800

6. **Claremont Branch Library:** The service to the library building does appear to have capacity for just one charger. In order to confirm its capacity, City's library electrician will need to investigate and confirm capacity, and also City will need to resolve if the library is willing to have a charge station connection to their meter. The service is fed from a subsurface PG&E transformer located curbside on west side of Benvenue Street. A new 200amp 120/240 volt single phase service would be required for an additional three chargers, for a total of four chargers, along Benvenue Street. It does not appear likely that chargers would be wanted along Ashby Avenue because it is posted for tow-away hours. PG&E does have underground utilities that can be extended for a new service pedestal.

Scheme A: One (1) Level 2 PEV charger station: Curbside charger can be installed on west side of Benvenue Street in front of library at the parking space to the north of an accessible ramp. Work includes installation of one (1) 40amp 2 pole circuit breaker in existing building service switchboard, trenching and sidewalk pavement replacement for conduit to curb side locations, Additional work needed to complete installation includes: signage, landscape repair, and charger station pedestal concrete base. A new conduit run underground would be about 60 feet long from charger to existing service switchboard.

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Scheme B: Four (4) Level 2 PEV charger stations: In lieu of using the existing library service, as it does not have available capacity, a new service will be constructed, rated 200amps 120/240 volt single phase, using a service meter pedestal in planter strip near to the existing PG&E subsurface transformer vault, with underground service conduit to PG&E vault. The four curbside chargers can be installed on west side of Benvenue Street in front of library, with two stations located at parking spaces to the south of the accessible parking space, and two at parking spaces to the north. Four (4) 40amp 2 pole circuit breakers would be provided in service pedestal for the chargers, together with underground feeders, pull boxes, trenching and sidewalk pavement replacement. Additional work needed to complete installation includes: signage and sidewalk pavement replacement, together with landscape repair, and charger station pedestal concrete bases.

Claremont Branch Library

Scheme A: Installation of one PEV charger station	Qty	Unit	Unit Cost	Total Cost
PEV charger station pedestal mounted, concrete base	1	ls	\$7,100	\$7,100
Power connection to library, underground conduit, conductors	1	ls	\$5,000	\$5,000
Access signage and protective bollards	1	ls	\$1,200	\$1,200
Engineering and City Administrative Costs	1	ls	\$18,000	\$18,000
			Total	\$31,300

Scheme B: Installation for a total of four PEV charger stations

Dual PEV charger station pedestal mounted, concrete base	3	ea	\$7,100	\$21,300
Service connection to PGE, underground conduit, conductors, including PGE charges	1	ls	\$4,000	\$4,000
Service meter pedestal and circuit connections to PEV's	1	ls	\$14,000	\$14,000
Access signage and protective bollards	1	ls	\$3,000	\$3,000
Engineering and City Administrative Costs	1	ls	\$25,000	\$25,000
			Total	\$67,300

7. **Dona Spring Animal Shelter:** The animal shelter building has an 800amps 120/208 volt three phase service. Provisions were made for a future connection of PEV charger stations from Panel "A" (rated 200amps 120/208 volts three phase, four wire) by installation of an empty 2" conduit into the east side of the parking lot. There is only capacity for one (1) Dual Level 2 PEV charger. In order to connect an additional two (2) Dual Level 2 PEV chargers, for a total of three (3) Dual Level 2 PEV chargers, a new 200amps 120/208 volt three phase four wire service meter pedestal would be required.

Scheme A: One (1) Dual Level 2 PEV charger station: Install two (2) 40amp 2 pole circuit breakers in Panel A and extending new wiring out to existing pull box in parking lot, and from pull box install new underground conduit to pedestal mounted Dual Level 2 PEV charger station located adjacent to existing accessible parking stall in the center of parking area. Additional work needed to complete installation includes: signage, protective steel bollards and wheel stops, charger station concrete base, trenching and pavement repairs.

Scheme B: Three (3) Dual Level 2 PEV charger stations: Power source will not use power from existing Panel "A" but instead shall require the installation of a new electrical service consisting of a new 200amps 120/208 volt three phase service meter pedestal in parking lot near to the existing pad mounted PG&E transformer. New service would be taken from the existing transformer. Pedestal to have six (6) 40amp 2 pole circuit breakers to feed three (3) dual Level 2 PEV charger station; one located adjacent to accessible parking in the center of the parking area,

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and two wall mounted chargers located at east side of parking lot near to new service pedestal. Additional work needed to complete installation includes: signage, protective steel bollards and wheel stops, charger station concrete bases, trenching and pavement repairs.

**Dona Spring Animal Shelter Parking Lot
Scheme A: Installation of one Dual PEV charger station**

	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station pedestal mounted	1	Is	\$9,100	\$9,100
Connection to existing panel, underground conduit, conductors, trenching, repairs	1	Is	\$18,000	\$18,000
Access signage, stripping, and protective bollards/wheel stops	1	Is	\$2,000	\$2,000
Engineering and City Administrative Costs	1	Is	\$12,000	\$12,000
			Total	\$41,100

Scheme B: Installation for a total of three Dual PEV charger stations

Dual PEV charger station pedestal mounted, concrete base	1	ea	\$9,100	\$9,100
Dual PEV charger station wall mounted	2	ea	\$7,500	\$15,000
Service connection to PGE, underground conduit, conductors, including PGE charges	1	Is	\$15,500	\$15,500
Service meter pedestal and circuit connections to PEV's	1	Is	\$13,500	\$13,500
Access signage, stripping, and protective bollards	1	Is	\$6,500	\$6,500
Engineering and City Administrative Costs	1	Is	\$20,000	\$20,000
			Total	\$79,600

8. **Center Street at Milvia Street:** Curbside chargers can be installed on north side of Center Street, west of Milvia Street. The City-owned building at 1947 Center Street has capacity to serve two (2) Level 2 PEV chargers. Work includes installation of two (2) 40amp 2 pole circuit breakers in existing building service switchboard, trenching and sidewalk pavement replacement for conduits to curb side charger pedestal locations, together with sidewalk pavement repairs, and charger station concrete bases. Additional work needed to complete installation includes: signage. A new conduit run under sidewalk from charger to existing service switchboard would be about 60 feet long.

Center Street near Milvia at Curbside

Installation of two PEV charger stations

	Qty	Unit	Unit Cost	Total Cost
PEV charger station pedestal mounted, concrete base	2	Is	\$7,100	\$14,200
Power connection to 1947 Center panel, underground conduit, conductors	1	Is	\$5,000	\$5,000
Access signage and protective bollards	1	Is	\$1,200	\$1,200
Engineering and City Administrative Costs	1	Is	\$8,000	\$8,000
			Total	\$28,400

9. **Berkeley Marina Old Ferry Dock:** There is now a meter pedestal rated 100amp 120/240 volt single phase located at the south east corner of the site. This pedestal was installed for the power needs of a farmer's market, or other such public activity. In addition, there is a pad-mounted PG&E transformer located at the south west end of the dock in the parking lot. It supplies power to the marina and parking lot lights. As the dock has its access restricted, the proposed chargers would need to be located in the parking lot to have public access. The new

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charger station would be approximately 460 linear feet away from existing meter pedestal. It has capacity to supply power to only one (1) Dual Level 2 PEV charger station. There is an existing accessible parking space in the lot near to the ramp to the docks. Trenching, AC pavement repairs, and landscape repair, will be required as part of the installation of the underground feeder conduit. Two (2) 40amp 2 pole circuit breakers will need to be installed in the existing service pedestal. Additional work needed to complete installation includes: signage, restriping to create a universal parking stall, protective steel bollards and wheel stops.

Berkeley Marina Parking Lot at Berths J - K

Installation of one Dual PEV charger station

	Qty	Unit	Unit Cost	Total Cost
Dual PEV charger station pedestal mounted	1	Is	\$9,100	\$9,100
Connect. to existing service pedestal, underground conduit, conductors, trenching, repairs	1	Is	\$14,000	\$14,000
Access signage, stripping, and protective bollards/wheel stops	1	Is	\$2,000	\$2,000
Engineering and City Administrative Costs	1	Is	\$12,000	\$12,000
			Total	\$37,100

End of Report

