



# Memorandum

**TO:** TRANSPORTATION AND ENVIRONMENT COMMITTEE

**FROM:** Kerrie Romanow

**SUBJECT:** SEE BELOW

**DATE:** November 16, 2022

Approved

Date

11/28/22

**SUBJECT: BUILDING REACH CODE UPDATE ON COST TO INCREASE MULTIFAMILY VEHICLE CHARGING REQUIREMENTS, CARBON MITIGATION STRATEGIES, AND ROOFTOP SOLAR**

## **RECOMMENDATION**

Staff recommends that City Council accept this status update on the marginal cost analysis for increased electric vehicle charging infrastructure in new multifamily housing developments and the research findings on embodied carbon mitigation strategies and the City's roof design standards to allow expanded use for rooftop solar and recommend this item be added on Consent for the December 13, 2022, City Council meeting.

## **OUTCOME**

Provide a status update to City Council on the research, analysis, and stakeholder engagement conducted to analyze the marginal cost analysis of increasing electric vehicle charging infrastructure in new multifamily housing developments, embodied carbon mitigation strategies, and roof space design standards to expand rooftop solar.

## **EXECUTIVE SUMMARY**

To address the growing threat of climate change, the City has set aggressive zero emission vehicle and 100 percent carbon-neutral electricity goals through its approval of Climate Smart San José ("Climate Smart") and the Pathway to Carbon Neutrality by 2030 ("Pathway"). To help incentivize and prepare for electric vehicle (EV) adoption and rooftop solar installations, the City approved a building reach code in 2019 to increase EV charging infrastructure and to require solar-readiness across all new developments.

The City's current EV reach code requires that new multifamily developments allocate 70 percent of parking spaces included in a development as EV capable spaces equipped to be upgraded to a charging station; 20 percent as EV ready spaces that provide an outlet for charging; and, 10 percent as charging stations also referred to as electric vehicle service equipment. Updating these requirements to phase out EV capable spaces and increase EV ready spaces to 95 percent with the remaining 5 percent of spaces having charging stations, is cost comparable to the current EV reach code, comprising 0.4-0.5 percent of total construction costs. This infrastructure will help support both the State of California's landmark ban on the sale of gas-powered vehicles by 2035 as well as the City's greenhouse gas (GHG) reduction efforts. In addition, installing EV charging infrastructure as a retrofit is costlier than installation during new construction.

San José has 270 megawatts of rooftop solar installed – making it fifth in the nation for solar installs per capita<sup>1</sup> - and has a Climate Smart goal to increase local solar installations to 1 gigawatt (GW). The City's existing solar-readiness requirements and online solar permitting, and the federal government's extension of the solar tax credit, will help encourage further rooftop solar installations.

The City's GHG inventories focus on mostly operational GHG emissions, such as fuel used in transportation, energy use by buildings, and waste handling. Embodied carbon refers to the GHG emissions associated with materials through their entire lifecycle, including manufacturing, transportations, installation, maintenance, and disposal. The State adopted legislation addressing embodied carbon in construction including setting a statewide 40 percent GHG emissions reduction target by 2035, providing training for architects, and creating a pathway for net-zero concrete. Regionally, local governments have set standards requiring low-carbon concrete mixes in all new development and the use of alternate materials, such as timber, as the first steps in implementing statewide requirements.

Staff will continue to monitor both rooftop solar and embodied carbon developments for future opportunities to accelerate significant progress on the City's climate action goals.

## **BACKGROUND**

In 2019, the City adopted Climate Smart, the City's climate action plan, which included a GHG emissions reduction goal by 2050 in alignment with the Paris Agreement. Climate Smart strategies include increased EV adoption and local renewable energy installation goals.

The California Energy Commission updates the Building Energy Efficiency Standards (Title 24, Parts 6 and 11) and the California Green Building Standards Code (Part 11, CALGreen), every

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<sup>1</sup> <https://www.sanjoseca.gov/your-government/departments-offices/environmental-services/climate-smart-san-jos/climate-smart-data-dashboard/energy-distributed-generation>

three years. Local jurisdictions may adopt “reach codes” to require development projects to exceed these minimum state standards. The City must readopt its reach codes every three-year code cycle for the requirements to remain in effect, otherwise, the new state laws will repeal them. Current EV charging infrastructure requirements are included in CALGreen.

In 2019, City Council adopted a reach code for new residential and non-residential construction incentivizing building electrification, requiring EV charging infrastructure, and extending solar-readiness requirements across all building types. In October 2022, City Council readopted the City’s reach code continuing EV charging infrastructure for new developments. The reach code requires that new multifamily developments allocate 70 percent of parking spaces included in a development as EV capable spaces equipped to be upgraded to a charging station; 20 percent as EV ready spaces that provide an outlet for charging; and, 10 percent as charging stations also referred to as electric vehicle service equipment. Charging stations can be Level 1 (“L1”), Level 2 (“L2”), or a Fast Charger, with increased charging speeds moving up the levels. Charging stations may also include an automated load management system that allows for power sharing across multiple stations. Low power level 2 (LPL2) charging options are also available which charge at a slower rate than standard L2 chargers but provide cost savings due to reduced electrical infrastructure needs.

In September 2020, Governor Newsom issued Executive Order N-79-20, which requires that 100 percent of all new passenger cars and trucks sold in California be zero-emission vehicles by 2035. In August 2022, the California Air Resources Board adopted Resolution 22-12 which included the regulations to accomplish this statewide goal.

In November 2021, City Council accelerated Climate Smart goals by adopting a goal of carbon neutrality by 2030. In April 2022, City Council directed staff to engage stakeholders and return by December 2022 with an analysis of the marginal cost per unit of expanding EV infrastructure requirements for every new multifamily unit with parking to allocate charging stations for 5 percent of the parking spaces and EV ready charging outlets for 95 percent of the remaining parking spaces. In June 2022, City Council received an update on carbon mitigation strategies and rooftop design for solar and accepted the Pathway to accelerate Climate Smart and achieve a carbon neutrality by 2030 goal. The Pathway identifies four focused strategies, including moving to zero-emission vehicles and powering our community with 100 percent carbon-neutral electricity. At that meeting, Council directed staff to continue evaluating the City’s roof space design standards to expand rooftop solar and embodied carbon mitigation strategies for buildings and return with recommendations by December 2022.

## **ANALYSIS**

This update focuses on three strategies related to the City’s climate goals: 1) increasing EV charging infrastructure in multifamily housing, 2) minimizing embodied carbon in building construction; and 3) supporting rooftop solar.

### **Electric Vehicle Charging Infrastructure Cost Analysis**

Staff worked with TRC Companies, Inc. to evaluate the marginal cost per unit of expanding EV charging infrastructure requirements in new multifamily developments to include three options:

- 1) Option 1A, which allocates 5 percent charging stations and 95 percent EV ready charging outlets for every new multifamily housing unit with parking.
- 2) Option 1B, which allocates 15 percent charging stations and 85 percent low power level 2 EV ready charging outlets in alignment with the 2022 model reach code developed by Silicon Valley Clean Energy, Peninsula Clean Energy, and East Bay Community Energy, representing Santa Clara County (excluding San José), San Mateo County, and Alameda County cities<sup>2</sup>, and
- 3) Option 1C, which allocates 15 percent networked charging stations and 85 percent low power level 2 EV ready charging outlets.

A networked EV infrastructure system is connected remotely to a larger network and is part of an infrastructure system of connected chargers. See Table 1, *Summary of EV Charging Infrastructure Costs and Reach Code Comparisons*, for the cost analysis including a comparison to the City's existing EV charging infrastructure reach code requirement for new multifamily developments. See Attachment A for the EV infrastructure marginal cost analysis completed by TRC Companies, Inc.

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<sup>2</sup> <https://bayareareachcodes.org/#resources>

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**Table 1. Summary of EV Charging Infrastructure Costs and Reach Code Comparisons\***

EV Charging Infrastructure Type	Cost/Port	San José Reach Code		Option 1A – Council Direction		Option 1B – Regional Model		Option 1C – Networked Model	
		% of spaces	Cost	% of spaces	Cost	% of spaces	Cost	% of spaces	Cost
L2 EV Capable	\$2,362.25	70%	\$165,358	-	-	-	-	-	-
L2 EV Ready Charging Outlet – low power level 2	\$2,351.80	-	-	85%	\$199,903	85%	\$199,903	85%	\$199,903
L2 EV Ready Charging Outlet	\$2,805.55	20%	\$56,111	10%	\$28,056	-	-	-	-
L2 Charging Station – “dumb” automated load management system, dual port**	\$3,113.55	10%	\$31,136	-	-	15%	\$46,703	-	-
L2 Charging Station – networked automated load management system, dual port***	\$4,935.15	-	-	5%	\$24,676	-	-	15%	\$74,027
<b>Total</b>		<b>100%</b>	<b>\$252,604</b>	<b>100%</b>	<b>\$252,634</b>	<b>100%</b>	<b>\$246,606</b>	<b>100%</b>	<b>\$273,930</b>
<b>% of charging spaces</b>		<b>30%</b>		<b>100%</b>		<b>100%</b>		<b>100%</b>	
<b>% of construction cost</b>			<b>0.4%</b>		<b>0.4%</b>		<b>0.4%</b>		<b>0.5%</b>

\*The analysis assumes multifamily housing development with 100 dwellings and an EV charger for each parking space.

\*\*Dumb automated load management system refers to a non-networked charger that reduces charging rates without any external communications, only depending on the number of chargers connected.

\*\*\* Networked automated load management system refers to a charger that exchanges data with other chargers, vehicles, or control system

As Table 1 demonstrates, Option 1A and 1B are cost comparable, at 0.4 percent of construction cost, to the City’s current EV charging infrastructure requirements for new multifamily developments, while Option 1C is slightly higher at 0.5 percent. The percent of construction cost is calculated by dividing the total cost of EV infrastructure for each option by \$58 million, which is the construction cost estimate for a 150,000-square-foot development with 100 parking spaces in the Bay Area. Options 1A, 1B, and 1C provide significantly more EV ready charging infrastructure and phase out EV capable spaces, which are more expensive due to the junction box and conduit required to prepare a space for future charging infrastructure.

Options 1A and 1B also include an automated load management system, which can help to maximize the number of EV outlets at a site, while minimizing the electrical infrastructure upgrade costs<sup>3</sup>. These options are also both dual port, which means that two vehicles can charge simultaneously on one station. The main difference between Option 1A and Option 1B is that Option 1A provides the minimum amount (5 percent) of a networked automatic load management system while 1B provides more charging stations but they are non-networked for cost savings.

Since the City already has a reach code allocating 10 percent charging stations for new multifamily housing developments with parking and the regional model code increases this percentage to 15 percent, Option 1C includes a networked version of the regional model code for comparison. While more expensive than a non-networked option, a networked option can provide many benefits, including allowing:

- building owners to monitor electricity usage and incentivize charging during low-peak hours
- building owner/operator to reboot the system for routine maintenance reducing the cost and time the charger is down for repairs
- connection to a larger network of charging stations
- customers to qualify for additional incentives, such as the California Energy Commission's California Electric Vehicle Infrastructure Program (CALeVIP)

It is also important to note that, regardless of any future option that the City may pursue, implementing updated EV charging infrastructure requirements at the time of new multifamily construction will also be significantly less costly than implementing them as a retrofit. For example, Pacific Gas & Electric Company (PG&E) reported an average retrofit cost per port of \$18,000 with a range between \$10,000 to \$31,000 for retrofits completed through their EV Charge Ready program.<sup>4</sup>

### **Embodied Carbon**

Embodied carbon quantifies the total GHG emissions associated with materials and construction processes throughout the entire lifecycle of a building, including extraction, manufacturing, installation, maintenance, and disposal<sup>5</sup>. Embodied carbon emissions are not quantified in the City's communitywide GHG emissions inventories, as the inventories use a production-based inventory standard. This standard is focused on emissions directly produced within the city, rather than a consumption-based approach, focused on emissions associated with goods and services consumed within the city. A 2015 study of consumption-based GHG emissions for the

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<sup>3</sup> [https://www.peninsulacleanenergy.com/wp-content/uploads/2021/05/PCE\\_ALMS-Contractors-Toolkit-1.pptx#:~:text=Automated percent20Load percent20Management percent20Systems percent20\(ALMS,EV percent20charging percent20at percent20a percent20site](https://www.peninsulacleanenergy.com/wp-content/uploads/2021/05/PCE_ALMS-Contractors-Toolkit-1.pptx#:~:text=Automated%20Load%20Management%20Systems%20(ALMS,EV%20charging%20at%20a%20site)

<sup>4</sup> [https://www.peninsulacleanenergy.com/wp-content/uploads/2020/08/PCE\\_SCVE-EV-Infrastructure-Cost-Analysis-Report-2019.11.05.pdf](https://www.peninsulacleanenergy.com/wp-content/uploads/2020/08/PCE_SCVE-EV-Infrastructure-Cost-Analysis-Report-2019.11.05.pdf)

<sup>5</sup> <https://www.carboncure.com/concrete-corner/what-is-embodied-carbon/>

Bay Area by a UC Berkeley research group estimated that GHG emissions from construction made up 2.7 percent of all consumption-based emissions in San José<sup>6</sup>. Worldwide, embodied carbon emissions from building materials and construction make up about 8 percent of all GHG emissions<sup>7</sup>.

The primary sources of embodied carbon in construction are concrete, steel, and aluminum. Concrete is currently used on a large scale in construction projects, with this trajectory estimated to increase in the future<sup>9</sup>, so it is a key emission source and focus for embodied carbon mitigation strategies globally.

California has adopted legislation to address embodied carbon including: Senate Bill (SB) 596 which requires the state's cement sector to achieve net zero greenhouse gas emissions by 2045<sup>8</sup>; Assembly Bill (AB) 1010 which requires licensed architects to complete five hours of continuing education training on zero net carbon design as a condition of their license renewal<sup>9</sup>; AB 2446, which sets an ambitious statewide goal of 20 percent embodied carbon emissions reductions by 2030 and 40 percent reductions by 2035.<sup>10</sup> The Climate Action Reserve, which provides a GHG offset registry for global carbon markets and helped to inform the development of the State of California's cap-and-trade program, is currently working on a concrete protocol, expected to be presented in March 2023, that seeks to increase the use of supplementary cementitious materials in place of cement in the development of concrete.<sup>11</sup> CALGreen currently offers voluntary measures, which call for low-carbon concrete mixes that are cost-competitive, meet performance requirements, and are building code approved, that cities may adopt to address embodied carbon emissions.

In addition to statewide actions, two Bay Area cities have adopted policies which address embodied carbon in construction. In 2019, Marin County adopted a California Low Carbon Concrete Code that sets limits on the composition of concrete in order to set a cap on embodied carbon emissions.<sup>12</sup> In 2022, Emeryville adopted its Mass Timber Bonus Points measure to encourage developers to use timber in their projects over steel and concrete, by allotting points for taller and denser developments per floor area ratio of timber incorporated into a development.<sup>13</sup> StopWaste established a regional Bay Area Embodied Carbon Regional Working Group in 2017. The group is currently working to design a roadmap of policy action to support regional economic development opportunities in local supply chains focused on reuse and bio-

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<sup>6</sup> <https://escholarship.org/uc/item/2sn7m83z>

<sup>7</sup> 11 percent of global energy-related GHG emissions are from building materials and construction: <https://worldgbc.org/advancing-net-zero/embodied-carbon/> and energy-related GHG emissions make up about 75 percent of total global emissions: <https://www.epa.gov/climate-indicators/climate-change-indicators-global-greenhouse-gas-emissions>

<sup>8</sup> <https://legiscan.com/CA/text/SB596/2021>

<sup>9</sup> <https://openstates.org/ca/bills/20212022/AB1010/>

<sup>10</sup> [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=202120220AB2446](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB2446)

<sup>11</sup> <https://www.climateactionreserve.org/how/protocols/low-carbon-cement/dev/>

<sup>12</sup> <https://www.marincounty.org/depts/cd/divisions/sustainability/low-carbon-concrete>

<sup>13</sup> <https://www.ci.emeryville.ca.us/DocumentCenter/View/14143/Item-93---Mass-Timber-Bonus-Points>

based materials; incentivize scalable building material practices, such as responsible mass timber; and alignment with CALGreen to target the largest emitters and projects utilizing concrete and steel.<sup>14</sup> Together, these developing statewide and regional initiatives will help to inform future City endeavors associated with embodied carbon in construction.

### **Rooftop Solar**

As of September 2022, San José has 270 megawatts of solar installed – making it fifth in the nation for solar installs per capita.<sup>15</sup> The City is on the path to meet its Climate Smart goal of reaching 1GW of solar installs communitywide by 2040.

With the 2019 building code cycle, California’s building code began requiring that all new residential homes have solar photovoltaic (PV) systems installed and that new commercial buildings include roof space for solar panels.<sup>16</sup> In 2019, the City’s building reach code extended solar-readiness requirements to non-residential developments. In addition, the federal Inflation Reduction Act, approved in August 2022, increased the rooftop solar installation tax credit to 30 percent and extended it through 2032, further incentivizing rooftop solar. The City currently offers streamlined, online permitting for rooftop solar installations. The San Jose Citywide Design Standards and Guidelines,<sup>17</sup> adopted in 2021, outline general roof design standards. Currently, buildings 5 stories and greater are required to provide flat roofs for 90 percent of the roof area, allowing for more opportunities for rooftop solar installation in larger buildings. The Single-Family Design Guidelines,<sup>18</sup> adopted in 1999, have standard roof design requirements for single-family buildings. Together, these City, statewide, and federal efforts allow for an incentivized rooftop design that accommodates solar installations across new developments. An additional funding that may impact rooftop solar adoption citywide is the California Public Utilities Commission (CPUC) proposed new Net Energy Metering rules (NEM), known as NEM 3.0. Proposed in December 2021, these NEM rules outline how investor-owned utilities must compensate rooftop solar customers for the energy their panels produce and how much they should pay to access the grid. The proposed rates would result in rooftop solar customers receiving 70-80 percent less for the energy they supply to the grid and an increased monthly charge in range of \$40-\$60. Together, these changes could lengthen the expected investment payback periods from 16 to 18 years. These proposed requirements include a monthly residential Grid Participation Charge of \$8 per kilowatt of installed solar for residential adopters to maintain the grid and fund public programs, a monthly Market Transition Credit of up to \$5.25 per kilowatt for residential solar plus storage and solar-only systems, the establishment of an Equity Fund, and additional requirements.<sup>14</sup>

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<sup>14</sup> [https://docs.google.com/presentation/d/1XtSafivR-CgqAI-kHRzhxb-\\_gFv5sgrvq0J0NWFHr-Q/edit#slide=id.g17acfc8a1df\\_0\\_841](https://docs.google.com/presentation/d/1XtSafivR-CgqAI-kHRzhxb-_gFv5sgrvq0J0NWFHr-Q/edit#slide=id.g17acfc8a1df_0_841)

<sup>15</sup> <https://www.sanjoseca.gov/your-government/departments-offices/environmental-services/climate-smart-san-jos/climate-smart-data-dashboard/energy-distributed-generation>

<sup>16</sup> <https://www.energytoolbase.com/newsroom/blog/california-energy-commissions-new-commercial-solar-storage-mandate-what-you-need-to-know>

<sup>17</sup> <https://www.sanjoseca.gov/home/showpublisheddocument/69148/637520903552430000>

<sup>18</sup> <https://www.sanjoseca.gov/home/showpublisheddocument/15435/636681263974270000>

The solar industry and most environmental advocates have expressed concerns that the CPUC's proposal would set California back in achieving its climate goals and introduce economic barriers to adoption for low- and moderate-income families.<sup>19</sup> A recent study from Lawrence Berkeley National Lab found that 40 percent of solar adopters in California in 2021 had annual household incomes under \$100,000. In February 2022, the CPUC postponed its vote on NEM 3.0 and directed staff to draft a revised proposal. On November 10, 2022, the CPUC withdrew its December 2021 Proposed Decision.<sup>20</sup> On the same day the CPUC released a new Proposed Decision on NEM 3.0 that City staff are still evaluating.<sup>21</sup>

### Stakeholder Input

In early November 2022, City staff hosted five public webinars to present findings and receive feedback. Staff extended invitations to contractors, developers, labor organizations, community-based organizations, the affordable housing community, and residents. In summary, stakeholders expressed strong support for expanding EV infrastructure in multifamily housing and phasing out EV capable spaces with actual charging opportunities through EV ready charging outlets and charging stations. There is also general support for the City to pursue voluntary measures to increase low-carbon concrete use in construction. Stakeholders provided feedback primarily around the following three themes:

- **EV Ownership Data:** Stakeholders strongly support the expansion of EV access in multifamily housing and some stakeholders suggested that the City complete additional analysis on EV ownership in multifamily housing to further support the need for infrastructure.
- **Equity:** Stakeholders framed EV charging access in multifamily buildings as an equity concern, due to:
  - ⊖ a greater percentage of renters in multifamily buildings have low incomes or are people of color compared to owners of single-family homes, and
  - ⊖ connecting EV charging infrastructure to a unit's electrical service panel, as is already included in 2022 CALGreen optional code, can allow the resident to monitor and manage their energy usage and therefore cost.
- **Managing Cost Increases:** Stakeholders expressed the importance of making the cost of EV charging infrastructure financially feasible, especially for affordable housing developers. The City could do this by allowing L1 charger requirements and requiring that every household have access to a charging station instead of requiring that every parking space has EV charging infrastructure.

### Next Steps

Given City and statewide zero-emission vehicle and GHG reduction goals, the City should continue to take reasonable strides to make owning and charging an EV both accessible and

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<sup>19</sup> <https://www.ewg.org/news-insights/news-release/2021/10/clean-energy-groups-urge-california-reject-plan-increases-cost>

<sup>20</sup> <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M498/K526/498526461.PDF>

<sup>21</sup> <https://efile.cpuc.ca.gov/FPSS/0000187056/1.pdf>

convenient to all residents in San José, while also taking into consideration the City's interest in not creating substantial increases in building development costs.

Based on the current developing nature of both embodied carbon mitigation strategies and rooftop solar, staff recommends continuing to monitor embodied carbon and rooftop solar developments to inform whether further City action should be taken.

## **CONCLUSION**

Updating the City's existing EV charging infrastructure reach code requirements for new multifamily development to allocate a minimum of 5 percent charging stations and the remainder EV ready charging outlets to cover 100 percent of parking spaces is cost comparable to the City's current reach code standards – comprising 0.4-0.5 percent of total construction costs. Doing so will serve to increase EV Ready infrastructure fourfold and encourage EV adoption.

Staff's research findings on embodied carbon uncovered local policies and regional policy development to require or encourage the use of more carbon-friendly materials, such as timber and low-carbon concrete. The City's current reach code requires solar readiness for all new development. Both this requirement, California building code, and the recently approved federal Inflation Reduction Act serves to incentivize rooftop solar installations. The outcome of the CPUC's final CPUC 3.0 rules could significantly influence solar financials and how the City moves forward with efforts to expand solar in new development. Considering that if the rule is approved, the payback period for solar and storage adoption may become a significant barrier. Both embodied carbon and rooftop solar have significant developments in process which staff will continue to monitor.

## **EVALUATION AND FOLLOW-UP**

Staff will provide progress updates to the Transportation and Environment Committee and City Council on Climate Smart San José activities, including the reach code, on a semi-annual basis.

## **CLIMATE SMART SAN JOSE**

The recommendation in this memorandum aligns with one or more Climate Smart San José energy, water, and mobility goals.

## **PUBLIC OUTREACH**

City staff hosted a total of five public webinars in November 2022 and extended an invitation to contractors, developers, labor organizations, community-based organizations, the affordable housing community, and residents. Staff also posted information and webinar noticing on the

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City's reach code webpage. This memorandum will be posted on the City's website for the December 5, 2022, Transportation and Environment Committee Agenda as well as on the December 13, 2022, City Council's Agenda.

**COORDINATION**

This memorandum has been coordinated with the City Attorney's Office, City Manager's Budget Office, and the Community Energy, Planning, Building, and Code Enforcement, Transportation, Housing, and Economic Development and Cultural Affairs Departments.

**COMMISSION RECOMMENDATION/INPUT**

No commission recommendation or input is associated with this action.

**CEQA**

Not a Project, File No. PP17-009, Staff Reports, Assessments, Annual Reports, and Informational Memos that involve no approvals of any City action.

/s/  
KERRIE ROMANOW  
Director, Environmental Services

For questions, please contact Julie Benabente, Deputy Director, at [julie.benabente@sanjoseca.gov](mailto:julie.benabente@sanjoseca.gov)

Attachment – EV Infrastructure Marginal Cost Analysis