Executive Summary

This report estimates the costs associated with including Plug-in Electric Vehicle (PEV) charging infrastructure during initial construction for multi-family and nonresidential projects compared to retrofitting this infrastructure at a later date. The City and County of San Francisco is currently considering potential local building codes that would require PEV charging infrastructure as part of new construction and certain renovations.

This report finds that installing PEV charging infrastructure during initial construction is very cost-effective. Table ES-1 below shows that the cost for installing complete or nearly complete 240-volt 40-amp electric circuits as a retrofit is several times more expensive than installing this infrastructure during new construction. Installing infrastructure during new construction can avoid retrofit costs including breaking and repairing walls, longer raceways (also referred to as conduit) using more expensive methods and upgrading electric service panels. In addition, the soft costs such as permitting and inspections and project management are much lower for new construction.

Table ES-1. Estimated Cost-Effectiveness of San Francisco Proposal, Two Scenarios

	Per PEV Parking Space with Electrical Circuit		Total Incremental Cost of Building	
	New	Retrofit	New	Retrofit
Scenario A - 10 Parking Space Building, two PEV Parking Spaces	$920	$3,710	$1,840	$7,420
Scenario B - 60 Parking Space Building, 12 PEV Parking Spaces	$860	$2,370	$10,320	$28,440

The cost estimates in this report are based on the scenarios described below and cost factors from industry reference materials. These cost estimates are not intended to represent the costs of any specific installation and the report does not discuss costs outside of building code compliance. These additional costs can include Electric Vehicle Supply Equipment (EVSE) that plugs into the PEV, associated lighting, signage, any required bollards, etc.

MAYOR'S MESSAGE 11

Exhibit 1: Cost of installing charging station infrastructure before and after construction.

Scenario	Cost Per EV Parking Space With 40A Circuit (excl. EVSE)	
	New Build	Retrofit[11]
5-10 EV spaces	$920	$10,273
26+ EV spaces	$860	$3,634

Source: Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco" **and "SCE Charge Ready Advisory Board** *5th Meeting – Slide 11) All costs in $USD.*

Note: These values only represent the customer-side make-ready infrastructure costs, and do not include the cost of EVSE, which range from $400 to over $6500 for a single-port Level 2 unit.[12]

The city of San Mateo, CA also conducted an analysis[13] of the make-ready[14] infrastructure costs associated with the **'EV-Readiness'**[15] of a proposed building with a 10% EV-readiness requirement. Using the cost variables in the study, the estimated cost of EV infrastructure (as a percent of total construction costs) of a 42-unit, 92,000 sq.ft. multi-unit residential building with 100 parking spaces and a 10% EV-readiness requirement, comes to 0.17% (Exhibit 2)

Additionally, for a typical 100,000 sq. ft. commercial office project with 100 parking spaces and a 10% EV-readiness requirement, the estimated cost of make-ready EV infrastructure (as a percent of overall construction cost) came to 0.13% (Exhibit 3)

Exhibit 2: Residential Make-Ready Infrastructure Cost Scenario – San Mateo, CA

Residential - 10% EV Readiness Example Scenario i.e. CalGreen Building Code (3%) + San Mateo Ordinance (+7%) Net Increase	
Total Spaces	100
EV Ready Spaces Required (10% of total)	10
240V/40A conduit	
Wiring	$19,360
Panel Capacity	$11,020
Overcurrent Protection Devices	$4,770
Total Material + Installation costs	$4,950
	$40,100
Estimated construction cost for new commercial construction ($250/sq.ft) for 92,000 sq.ft building with parking	$23,000,000
Estimated 'Residential' Make-Ready infrastructure cost as percentage of Total Construction Cost w/10% EV Readiness Requirement	0.17%

[11] Southern California Edison 'Charge Ready' Program Advisory Meeting #5 (August 2017) – Slide 11
[12] https://www.afdc.energy.gov/uploads/publication/evse_cost_report_2015.pdf
[13] http://www.integrateddesign360.com/projects - Green Building and Energy Policy Development for City of San Mateo
[14] "Make-Ready" - Refers to a parking space that includes the following components; listed raceway (conduit), sufficient electrical panel service capacity, overcurrent protection devices, wire, and suitable termination points such as a junction box with a service loop or directly landed within an EVSE (i.e. Full Circuit)
[15] For example, a one percent (1%) EV readiness requirement means that 1 out of every 100 parking spaces should be able to support EV charging. A 3% requirement refers to 3 out of 100 EV-ready spaces etc.

Benefits of EV Readiness & Infrastructure

- EV Readiness for new construction directly supports the City's commitment to transform all ground transportation to renewable fuels by 2035
- Retrofitting for EV conduits costs **4 to 8 times more** than ensuring EV Readiness during new construction
- Average residential buildings have a 50-year lifespan on average. It is critical that charging infrastructure is incorporated in the pre-construction stage to ensure buildings can accommodate future EV-driving residents

Cost of Installing "EV Ready" Infrastructure

Scenario	Cost Per EV Parking Space with 40A Circuit	
	New Build	Retrofit
5-10 EV spaces	$920	$10,273
26+ EV spaces	$860	$3,634

Source: "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco" and "Southern California Edison 'Charge Ready' Program Advisory Board Meeting #5 (August 2017) – Slide 11"

Items in New Construction	Original Bill 25	Elefante CD2	Kobayashi CD2
Solar Hot Water Heating	Require single-family homes use solar, wind or another **renewable energy source for not less than 90% of energy for service water heating**, 4 exceptions.	**Align the requirements with state law** on renewable hot water heating given recent court ruling, clarifying gas exemption should be rarely if ever used and decision up to the homeowner.	**References state law only.**
Solar PV	No requirements.	Add **solar-ready homes provision** to construction documents and install sufficient conduit and electric panel capacity to allow for a **future solar PV system** on roof.	Add **solar-ready homes provision** to construction documents (no conduit or panel capacity required).
EV Readiness (Overall)	**Level 1 required in residential** settings (single-family and multi-family), **Level 2 in commercial.**	• Increase requirement for all EV-readiness from **Level 1 to faster Level 2** • Add **alternative point system pathway** to provide flexibility for projects to comply (more points for EV-ready stalls in common areas, Level 3 capacity or installed chargers). • Allow developers to **aggregate EV-readiness across projects, with a minimum compliance** for any individual project.	• **Lowers to Level 1 required** for all settings. • Includes **alternative point system pathway** but significantly reduces the points required compared with Elefante CD2. • Amends 25% EV-ready threshold to be tied to ***housing units* rather than *parking stalls*** • Allow developers to aggregate EV-readiness across projects, **without any minimum compliance** for any individual project.
EV Readiness (Single family/duplex)	Require dedicated outlet with **Level 1** charge.	Require dedicated outlet with **Level 2** charge.	Require dedicated outlet with **Level 1** charge.
EV Readiness (Commercial)	If at least 12 stalls in new parking lot, 25% or more of parking stalls are EV-ready at Level **2.**	• If at least 12 stalls in new parking lot, 25% or more of parking stalls are EV-ready at Level 2 (**or equivalent points score**). Level 2 baseline for points systems. • **Lowers minimum** compliance for retail by 20%.	• **Unspecified EV-ready requirements** for commercial (**or equivalent points score**). • **Level 1** baseline for points systems.
EV Readiness (Multi-family)	If at least 8 stalls in new parking lot, 25% or more pkg stalls are EV-ready at Level **1.**	If at least 8 stalls in new parking lot, 25% or more of parking stalls are EV-ready at Level **2** (**or equivalent points score**). Level 2 baseline for points systems.	If at least 8 stalls in new parking lot, **25% or more of housing units** have one EV-ready stall (or equivalent points score). **Level 1** baseline.
EV Readiness (Affordable)	Same as multi-family above.	Same as multi-family above, but **lowers minimum** threshold by: 20% for 140% AMI or below; 40% for 60% AMI or below	**Exempts** all affordable housing (140% AMI and below) from EV requirements.
Concrete Masonry Units (CMUs)		**CMUs** included.	**CMUs** excluded.
Jalousie Windows		**Jalousie** window exemptions provided.	**No jalousie** window exemptions.
Sampling		**Ease sampling requirements** for air infiltration/duct for production home builders.	**Eases sampling requirements**, same as Elefante CD2.
Ceiling Fan		Accept ceiling fan **junction box** (in place of fan) for production home building.	Accept ceiling fan **junction box** (in place of fan) for production home building.
Other		Other **minor corrections** for consistency, clarity or formatting.	Other **minor corrections** for clarity/formatting.