

Attachment – EV Marginal Cost Analysis

Methodology

Analysis Objective:

Determine project costs for various EV charging installation scenarios:	ALMS:
A. Circuit sharing (2) Level 2 EV Capable (240V, 40A each when circuit eventually	Capable of 20A each w ALMS
B. Conduit sharing (2) Level 1 EV Ready outlets (120V, 20A each).	None
C. Conduit sharing (2) Level 2 Low Power EV Ready outlets (240V, 20A each).	None
D. Conduit sharing (2) Level 2 EV Ready outlets (240V, 40A each). Excludes panel	None
E. Circuit sharing (2) Level 2 EV Charging Stations (240V, 40A each)	20A when two vehicles charging
F. Conduit sharing (2) Networked Level 2 EV Charging Station (240V, 40A each)	Capable via networking
F. (1) Networked Level 2 EV Charging Station (240V, 80A each)	Capable via networking

Notes:

- (1) This is a bottom-up theoretical model, not using actual construction cost data.
- (2) Electrical capacity, including panel size, transformers, and electrical service are not included. These are real, potentially large, costs but can vary widely depending on the size and function of the building. Higher capacity systems (e.g., dedicated L2) will require more service upgrades on a per-port basis leading to higher per-port costs as deployment scale increases. Costs for electrical service and transformers should be mitigated to the developer as of April 2022 via PG&E Rule 29. For more information see PG&E advice letters 6423-E and 6424-E.
- (3) The analysis uses outdoor-rated outlets intended to conform to NEC and local permitting requirements.
- (4) The analysis assumes that the EVSE installations are located close to a panel (150'), and EVSEs are mounted to a wall. Stations installed for adjacent parking stalls will be mounted in the middle of the two stalls.
- (5) The analysis uses Clipper Creek HCS D40 Dual Charging Stations and Enel X JuiceBox as the proxies for L2 circuit sharing configuration. The cost listed in the 'Assumptions' table on Tab 'Cost Analysis' can be changed to reflect the preferred EVSE. The HCS D40 unit reflects the 'floor' cost for EVSE, but project costs can be \$2500-\$4000 more per port depending on EVSE vendor and ALMS strategy.
- (6) 2022 CALGreen requirements are a percentage of parking spaces provided, not a percentage of dwelling units. Conversely, the reach code requirements are a percentage of dwelling units - with a goal to ensure EV charging access to 100% of dwellings. Because San Jose has no parking minimum requirements, this analysis assumes 100 dwellings are provided with 1 parking space each. If a developer provides greater than 1 parking space per dwelling, the costs associated with 2022 CALGreen will increase while the others will remain the same.
- (7) The analysis does not include CALeVIP incentive amounts, due to varying project costs, locations, and applications. Incentive amounts are located here: <https://calevip.org/faq/what-are-incentive-amounts-charger-9>

Definitions:

- ALMS** = Automatic Load Management System, which reduces charging rates when more vehicles are plugged in any external communications, only depending on the number of chargers connected.
- "Networked" ALMS** = charger that exchanges data with other chargers, vehicles, or control system
- EV Capable** = panel capacity, conduit
- EV Ready** = panel capacity, conduit, wiring, breaker, receptacle
- EV Charging Station** = panel capacity, conduit, wiring, breaker, charger

Total Parking Spaces 100
 Cost of Construction \$/ft2 \$392
 ft2 per dwelling, including common areas 1500
 Building size ft2 150,000
Construction cost \$58,800,000

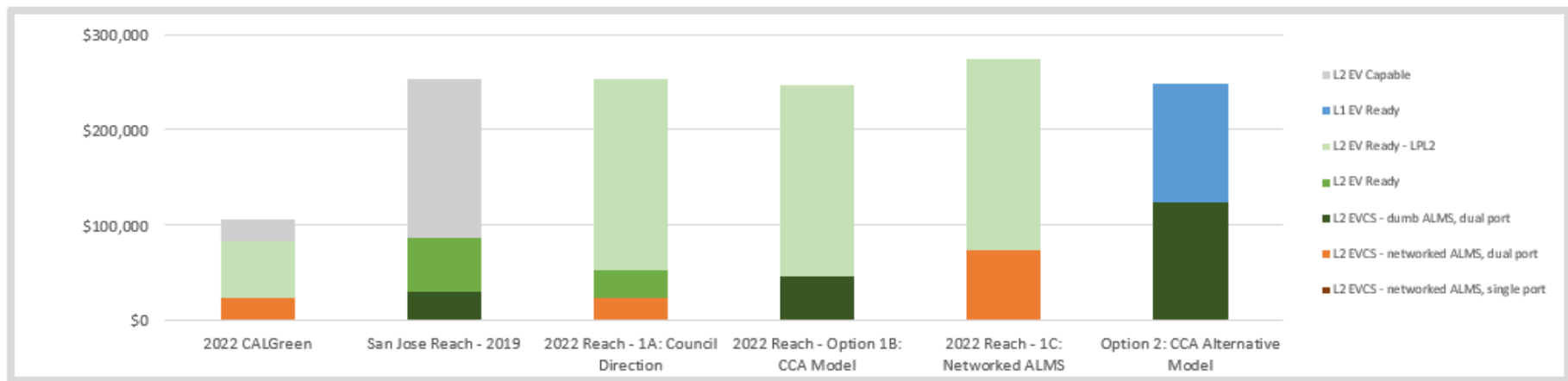
This assumes a 100-unit multifamily building with exactly 1 space per dwelling.
[source](#)

Region construction cost performance

International building costs per m ² of internal area, in 2021	Chicago	Houston	Los Angeles	Mexico City	New York City	San Francisco	Toronto	Vancouver	US\$
Commercial									
CBD Offices – high-rise prestige	5,576.0	3,764.0	5,793.0	1,581.2	6,752.0	7,070.0	3,473.2	3,418.3	
CBD Offices – up to 20 floors medium (A-Grade)	4,359.0	2,769.0	4,965.0	1,206.9	5,833.0	5,840.0	2,814.1	2,571.1	
Office fit-out (30,000sq ft) low specification	1,461.7	1,058.9	1,367.6	919.1	1,617.2	1,588.3	1,319.6	1,192.4	
Office fit-out (30,000sq ft) medium specification	2,195.2	1,590.2	2,053.9	1,134.9	2,428.8	2,385.4	2,019.2	1,907.9	
Office fit-out (30,000sq ft) high specification	3,280.5	2,376.4	3,069.3	1,914.4	3,629.6	3,564.6	3,239.5	3,179.8	
Hotels									
3-Star travellers	3,123.0	1,824.0	3,200.0	1,020.2	3,234.0	3,590.0	1,987.4	2,543.9	
5-Star luxury	6,212.0	4,034.0	6,217.0	1,961.3	5,977.0	6,830.0	3,696.6	3,974.8	
Resort style	3,913.0	2,473.0	3,972.0	2,357.7	4,096.0	4,280.0	2,782.4	3,974.8	
Industrial									
High-tech factory/laboratory	6,117.0	5,125.0	5,407.0	2,897.8	5,955.0	6,020.0	4,769.8	4,598.9	
Large warehouse distribution centre	2,109.0	1,184.0	1,600.0	716.1	1,880.0	1,840.0	1,325.9	1,482.0	
Retail									
Large shopping centre including mall	3,512.0	2,959.0	3,862.0	1,202.3	4,083.0	4,330.0	2,804.6	2,420.1	
Neighbourhood incl supermarket	1,806.1	1,318.7	3,098.0	848.0	2,207.0	2,200.0	2,173.7	1,655.5	
Prestige car showroom	3,244.0	3,222.0	3,350.0	1,433.4	3,659.0	3,670.0	2,543.9	2,305.4	
Residential									
Apartments high-rise	2,780.0	2,055.0	3,641.0	947.4	3,993.0	4,220.0	2,265.6	3,020.9	
Townhouses medium standard	1,760.0	1,106.0	2,317.0	685.8	2,248.0	2,870.0	1,723.4	1,994.8	

EVCI Cost Analysis	Cost per Port	2022 CALGreen		San Jose Reach -		2022 Reach - 1A:		2022 Reach - Option		2022 Reach - 1C:		Option 2: CCA	
		% of	cost	% of	cost	% of spaces	cost	% of spaces	cost	% of spaces	cost	% of spaces	cost
L2 EV Capable	\$2,362,250	10%	\$23,623	70%	\$165,358		\$0		\$0		\$0		\$0
L1 EV Ready	\$2,061,400		\$0		\$0		\$0		\$0		\$0	60%	\$123,684
L2 EV Ready - LPL2	\$2,351,800	25%	\$58,795		\$0	85%	\$199,903	85%	\$199,903	85%	\$199,903		\$0
L2 EV Ready	\$2,805,550		\$0	20%	\$56,111	10%	\$28,056		\$0		\$0		\$0
L2 EVCS - dumb ALMS, dual port	\$3,113,550		\$0	10%	\$31,136		\$0	15%	\$46,703		\$0	40%	\$124,542
L2 EVCS - networked ALMS, dual port	\$4,935,150	5%	\$24,676		\$0	5%	\$24,676		\$0	15%	\$74,027		\$0
L2 EVCS - networked ALMS, single	\$7,134,600		\$0		\$0		\$0		\$0	0%	\$0		\$0
Total		40%	\$107,093	100%	\$252,604	100%	\$252,634	100%	\$246,606	100%	\$273,930	100%	\$248,226
% of construction cost			0.2%		0.4%		0.4%		0.4%		0.5%		0.4%

Analysis
Council provided direction for a min 5% EVCS and 95% EV Ready.
- 2022 CALGreen 4.106.4.2 allows L2 EV Capable requirements to be replaced with a minimum of L2 EVCS. It also allows all EVCS to be subject to ALMS when providing EVCS in excess of 5%.
- Option 1A: Follow's council direction exactly, and assumes that L2 EV Ready may be sufficient to be more stringent than CALGreen, but it may not be, given the above.
- Option 1B: Replaces L2 EV Ready from Option 1A with non-networked EVCS, including "dumb" ALMS. Note that this is the assumed compliance pathway for the reach codes promoted by PCE, SVCE, and EBCE.
- Option 1C: Replaces all "dumb" ALMS with dual port networked ALMS, since building owners may benefit from the data and CALeVIP incentives.
- Option 2: Alternative model that has lower electrical service to the building. It provides 100% access albeit at lower charging speeds, and lower overall cost.
Option 1B appears to provide the lowest costs to the developer downstream of the breaker. Costs at the panel and upstream, including transformers, are likely to be similar to Option 1A/C, but will likely be higher than Option 2.



Assumptions

Electrical Materials & EVSE

Level 1

Breaker (15A) ¹	1	\$	6.50
Wire (12 AWG) ²	ft	\$	1.50
3/4" Conduit ³	ft	\$	20.00
Outlet ⁴	1	\$	20.00
Cover ⁵	1	\$	35.00

Level 2

Breaker (40A) ⁶	1	\$	16.00
Breaker (80A) ⁷	1	\$	43.00
Wire (8 AWG) ⁸	ft	\$	2.30
Wire (3 AWG) ⁹	ft	\$	5.20
1-1/4" Conduit ¹⁰	ft	\$	27.00
1-1/2" Conduit ¹¹	ft	\$	30.00
Outlet ¹²	1	\$	42.00
Dual Port, Dumb EVSE ¹³	1	\$	1,500.00
Single Port, Networked, EVSE	1	\$	1,400.00
Dual Port, Networked, EVSE ¹⁵	1	\$	5,600.00
Junction Box ¹²	1	\$	35.00

Low Power Level 2

Breaker (20A) ¹⁷	1	\$	16.00
Wire (10 AWG) ¹⁸	ft	\$	1.75
1" Conduit ¹⁹	ft	\$	23.00
Outlet ²⁰	1	\$	12.00

Labor, Permitting, & Other Soft Costs

Labor ²¹	hours	\$	175.00
Permit ²²	1	\$	-
Networking ²³	month/unit	\$	500.00
Contractor Fee ²⁴	%		10%
CALeVIP Incentive ²⁵	1	?	

Building BOM from RSMeans, HomeDepot, Clipper Creek, Enel X, and estimates

2x Level 2 EV Capable - Conduit for 240V/40A, Load Managed

Electrical Materials & EVSE

Component	# of Units	Cost
		\$ -
		\$ -
Conduit	150	\$ 4,050.00
Junction Box	2	\$ 70.00
-		
Subtotal		\$ 4,120.00

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - J-Box	1	\$ 175.00
		\$ -
		\$ -
Subtotal		\$ 175.00
Materials & Labor Total		\$ 4,295.00
Contractor Fee		\$ 429.50
Total		\$ 4,724.50
<i>cost per port</i>		<i>\$ 2,362</i>

2x Level 1 EV Ready - Wire is 120V/20A, Conduit handles 2 circuits

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	2	\$ 13.00
Wire	300	\$ 450.00
Conduit	150	\$ 3,000.00
Outlet	2	\$ 40.00
Cover	2	\$ 70.00
Subtotal		\$ 3,573.00

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Breaker, outlet	1	\$ 175.00
		\$ -
		\$ -
Subtotal		\$ 175.00
Materials & Labor Total		\$ 3,748.00
Contractor Fee		\$ 374.80
Total		\$ 4,122.80
<i>cost per port</i>		<i>\$ 2,061</i>

2x Level 2 Low Power EV Ready - Wire is 240V/20A, Conduit handles 2 circuits | 2x Level 2 EV Ready - Wire is 240V/40A, Conduit handles 2 circuits

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	2	\$ 32.00
Wire	300	\$ 525.00
Conduit	150	\$ 3,450.00
Outlet	2	\$ 24.00
Cover	2	\$ 70.00
Subtotal		\$ 4,101.00

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Breaker, outlet	1	\$ 175.00
		\$ -
		\$ -
Subtotal		\$ 175.00
Materials & Labor Total		\$ 4,276.00
Contractor Fee		\$ 427.60
Total		\$ 4,703.60
<i>cost per port</i>		<i>\$ 2,352</i>

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	2	\$ 32.00
Wire	300	\$ 690.00
Conduit	150	\$ 4,050.00
Outlet	2	\$ 84.00
Cover	2	\$ 70.00
Subtotal		\$ 4,926.00

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Breaker, c	1	\$ 175.00
		\$ -
		\$ -
Subtotal		\$ 175.00
Materials & Labor Total		\$ 5,101.00
Contractor Fee		\$ 510.10
Total		\$ 5,611.10
<i>cost per port</i>		<i>\$ 2,806</i>

2x Level 2 EVCS - Wire is 240V/40A, Conduit handles 1 circuits. Du 2x Level 2 EVCS - Wire is 240V/80A, Conduit handles 1 circuit. Ne 1x Level 2 EVCS - Wire is 240V/40A, Conduit handle 1 circuit. Networked EVCS

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	1	\$ 16.00
Wire	150	\$ 345.00
Conduit	150	\$ 3,450.00
EVSE	1	\$ 1,500.00
		\$ -
Subtotal		\$ 5,311.00

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	1	\$ 43.00
Wire	150	\$ 780.00
Conduit	150	\$ 4,500.00
EVSE	2	\$ 2,800.00
		\$ -
Subtotal		\$ 8,123.00

Electrical Materials & EVSE

Component	# of Units	Cost
Breaker	1	\$ 16.00
Wire	150	\$ 345.00
Conduit	150	\$ 4,050.00
EVSE	1	\$ 1,400.00
		\$ -
Subtotal		\$ 5,811.00

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Brea	2	\$ 350.00
		\$ -
		\$ -
Subtotal		\$ 350.00
Materials & Labor Total		\$ 5,661.00
Contractor Fee		\$ 566.10
Total		\$ 6,227.10
cost per port		\$ 3,114

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Brea	2	\$ 350.00
Networking (2-yr)		\$ 500.00
		\$ -
Subtotal		\$ 850.00
Materials & Labor Total		\$ 8,973.00
Contractor Fee		\$ 897.30
Total		\$ 9,870.30
cost per port		\$ 4,935

Labor, Permitting, & Other Soft Costs

Component	# of Units	Cost
Labor - Brea	1	\$ 175.00
Networking (2-yr)		\$ 500.00
		\$ -
Subtotal		\$ 675.00
Materials & Labor Total		\$ 6,486.00
Contractor Fee		\$ 648.60
Total		\$ 7,134.60
cost per port		\$ 7,135

Level 1 References

- 1 <https://www.komcdspost.com/p/Square-D/>
- 2 RSMMeans Online, San Jose CA, THNV #12.
- 3 RSMMeans Online, San Jose CA, SIM EMT.
- 4 <https://www.komcdspost.com/p/Square-D/>
- 5 <https://www.komcdspost.com/p/T4VM4G>

Level 2 References

- 6 <https://www.komcdspost.com/p/Square-D-3/>
- 7 <https://www.komcdspost.com/p/SIomaz-8X>
- 8 RSMMeans Online, San Jose CA, THNV #8 ST
- 9 RSMMeans Online, San Jose CA, THNV #3 ST
- 10 RSMMeans Online, San Jose CA, 1-1/4" EMT, Aluminum, Standard Union, \$27/linear foot, 62 2022.
- 11 RSMMeans Online, San Jose CA, 1-1/2" EMT, Aluminum, Standard Union, \$29.55/linear foot, 62 2022. Includes installation, overhead, and profit
- 12 <https://www.komcdspost.com/p/Whisper-Electric-Freedom-50-Amp-Temporary-RV-Power-Outlet-L054P/100153619>
- 13 <https://store.elepartsrock.com/detail/sv-charging-station?search=ev>
- 14 <https://evcharging.co.uk/states/commercial/ev-charging-pre-22-commercial/>
- 15 <https://www.kulbs.com/product/SCTP-FULLP>
- 16 <https://www.komcdspost.com/p/E-in-s-E-in-s-4-in- Junction-Box-PE153712/202043419>

Low Power Level 2 References

- 17 <https://www.komcdspost.com/p/2/>
- 18 RSMMeans Online, San Jose CA, T.
- 19 RSMMeans Online, San Jose CA, I'
- 20 <https://www.komcdspost.com/p/2/>

Labor, Permitting Soft Cost References

- 21 Estimate, can be refined
- 22 Estimated permit cost; set at \$0 because it assumes a permit needed at NIC anyway
- 23 Networking fees to account for variances across site types, data and networking packages, etc. Not necessary for 'dumb' load managing charger selected.
- 24 Contractor estimated based on prior experience
- 25 <https://calvia.org/faq/what-are-incentive-amounts-charger-9>