

EV-Ready Building Codes

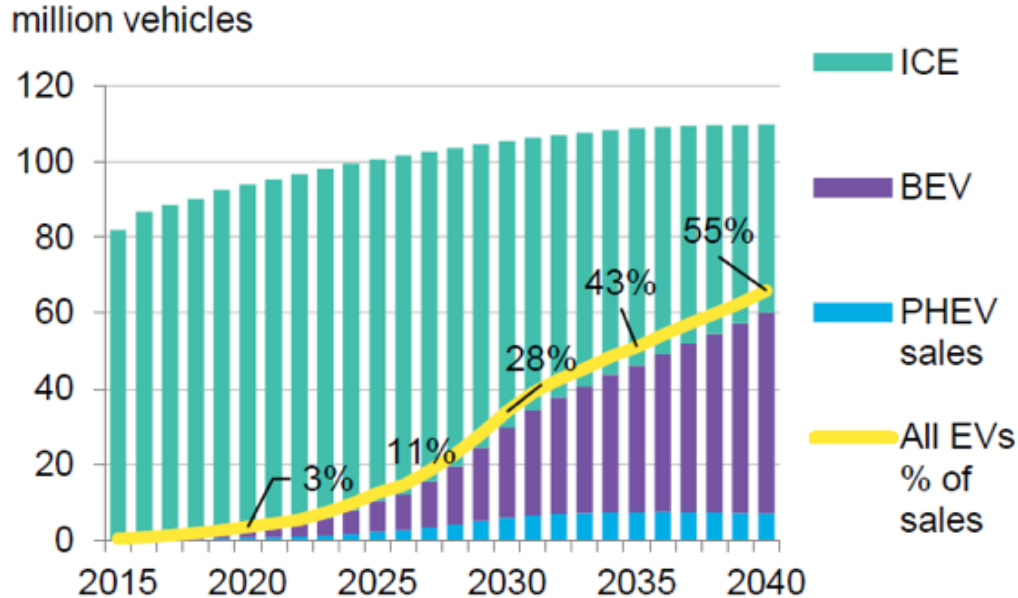


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Electric Vehicle Market Projections

There are currently 1.3 million EVs in the US, with a 2.2% nationwide EV market share



Electric Vehicle Benefits

- **Economic Savings:**

- Equivalent of paying \$1.08 per gallon in Nebraska
- Only 20 moving parts in an EV compared to 2,000+ in an ICE vehicle – 35% lower costs

- **Environmental Savings:**

- Zero tailpipe emissions
- 66% fewer GHG emissions – gets cleaner each year the grid transitions toward Renewables

- **Efficiency Savings:**

- ICE vehicles are 17-21% efficient vs an electric motor, which is 90-95% energy efficient
- Level 2 chargers are 6% more efficient than Level 1

POPULAR EVs AND THEIR RANGE

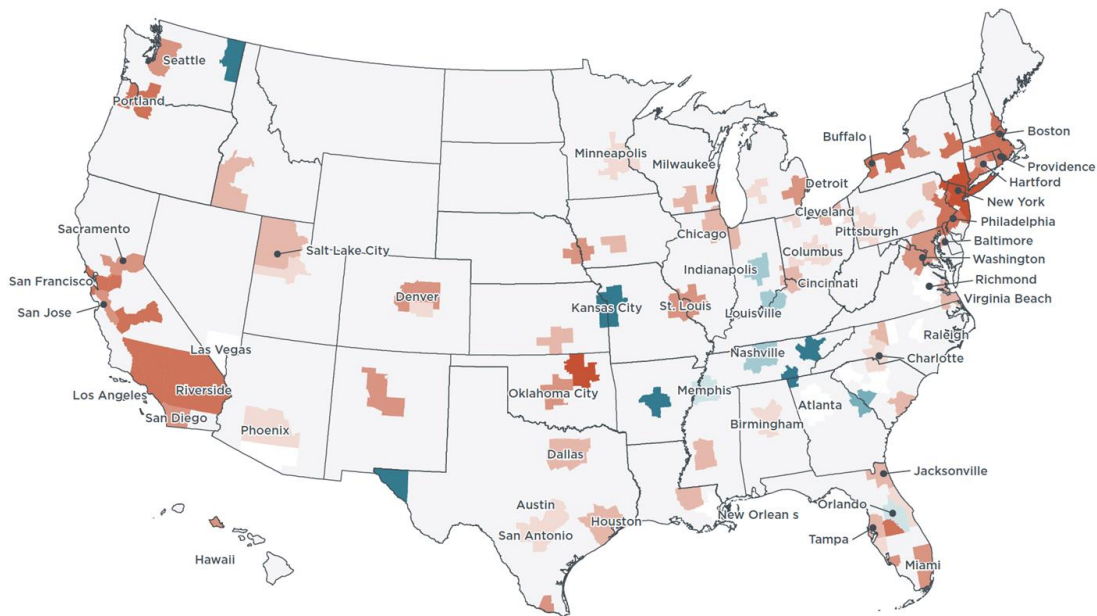
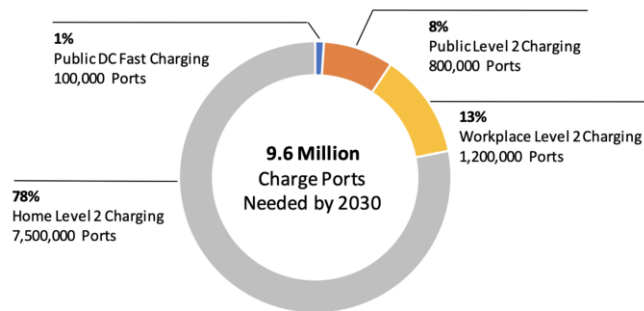
VEHICLE MAKE/ MODEL	EPA-RATED DRIVING RANGE ON SINGLE CHARGE (MILES)
Tesla Model 3	240-310
Hyundai Kona EV	258
Kia Niro EV	239
Chevrolet Bolt	238
Nissan Leaf Plus	226
Audi E-Tron	204
Volkswagen eGolf	125
Hyundai Ioniq PHEV	32 electric (520 total)
Chrysler Pacifica Hybrid	29 electric (630 total)
Toyota Prius Prime	25 electric (640 total)

Source: Plug-in America

Automaker	Electrification Commitment
Audi	20 new EV models by 2025
BMW	12 EVs by 2025
Volvo	50% of sales are electric by 2025 (5 new BEVs by 2021)
GM	20 electric cars by 2023
Jeep	10 PHEVs and 4 BEVs by 2022
Renault-Nissan-Mitsubishi	Sell 1 million EVs per year by 2022 (12 new BEVs)
Ford	40 EV models by 2022: 16 BEVs, 24 PHEVs
Honda	2/3 of all sales to be electric by 2030
Hyundai-Kia	8 new EVs by 2022
Jaguar - Land Rover	Pledge to manufacturer only EVs and hybrids after 2020
Toyota	10 BEVs by early 2020s

The Scale of the EV Infrastructure Challenge

EV Charging Infrastructure by Location (2030)



Charging infrastructure in 2017 as a percentage of that needed by 2025

1%-10% 11%-20% 21%-30% 31%-40% 41%-50% 51%-60% 61%-70% 61%-70% 81%-90% 91%-100%

Figure ES-1. Public and workplace charging infrastructure in place in 2017 as a percentage of infrastructure needed by 2025 by metropolitan area

EV Charging 101

LEVEL 1 STANDARD OUTLET

- Connector provided with every EV
- Plug into a standard **120V wall outlet**
- Great for overnight or workplace charging
- Ideal for daily **commutes under 40 miles**



4
miles
per hour



LEVEL 2 240 VOLT OUTLET

- Available for both home and stations
- Provides a full charge for most EVs in:



100% Electric

4-8 hours
to full charge



Electric & Gas

1-2 hours
to full charge



25
miles
per hour



DC FAST CHARGE

- Faster charging rates at commercial locations.
- 3 different connectors depending on vehicle:



200
miles
in 1-2 hours



Why Adopt EV Infrastructure Building Codes?

1-Help overcome a critical barrier to EV adoption by facilitating EV charging infrastructure

2-Avoid EV charging infrastructure retrofit costs including:



Electrical system retrofits



Breakage and repair of hardscapes



Soft Costs: permitting, inspection, HOA or landlord approvals, etc.

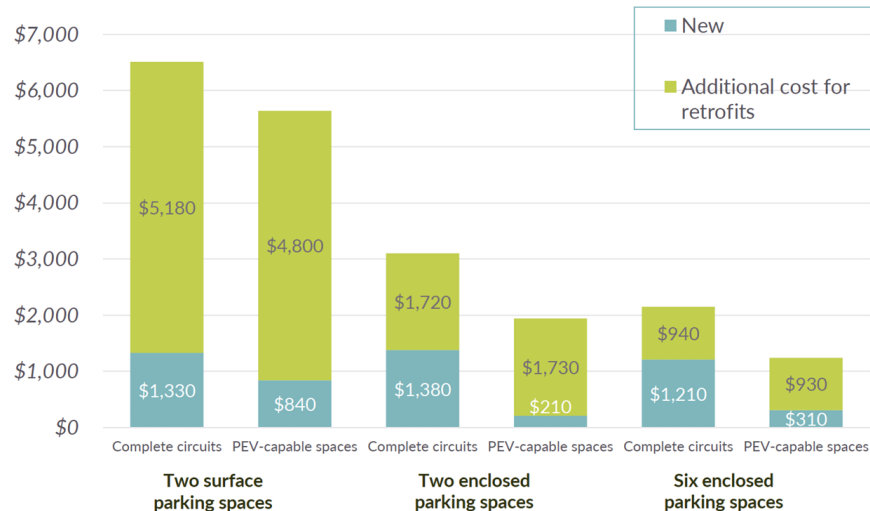
Why do we need EV charging requirements in our building codes?

“Installing EV capable parking spaces in stand-alone retrofits is typically 4 to 6 times more expensive compared to installing EV capable parking spaces during new construction. If EV capable parking spaces are installed during new construction, \$2,040 - \$4,635 per parking space is saved over the retrofit scenario.”

- Energy Solutions (2019)

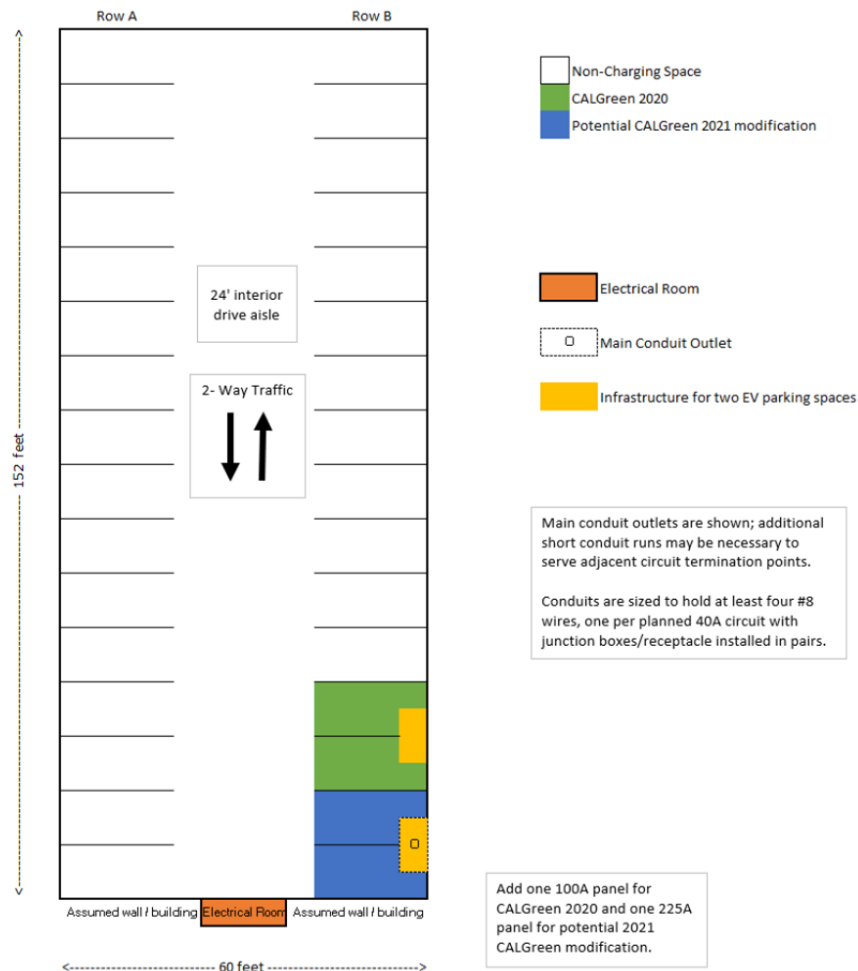
Why Adopt EV Infrastructure Building Codes?

Cost Savings Modeled for the City of Oakland



Multi-family challenges

- 50% of Americans do not have access to a dedicated off-street parking space at their residence
- Logistical barriers of installation:
 - HOA rules
 - Shared or non-deeded parking spaces
 - Split incentive for renters

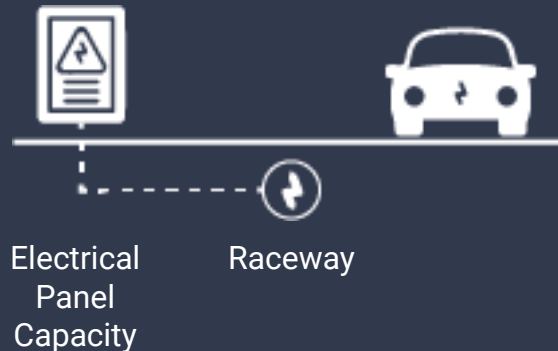


Residential: EV Infrastructure Options

1. EV-Capable

Install electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to the future EV parking spot.

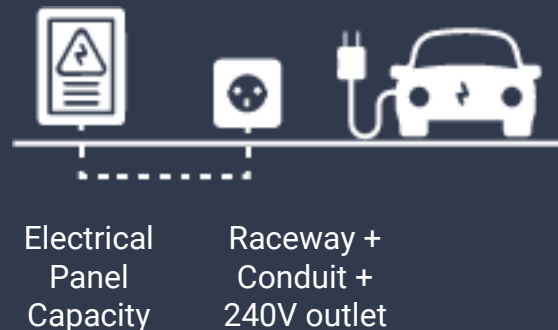
[Sample Code: Denver, CO](#)



2. EV-Ready Outlet

Install electrical panel capacity and raceway with conduit to terminate in a junction box or 240-volt charging outlet.

[Sample Code: Boulder, CO](#)



Commercial: EV Infrastructure Options

1. EV-Capable

Electrical panel capacity + branch circuit + raceway

[Aspen, CO: 3% of parking is EV-Capable \(IBC\)](#)

[Atlanta, GA: 20% is EV-Capable \(Ordinance\)](#)



2. EV-Ready

EV-Capable + 240-volt outlet

[Boulder, CO: 10% of parking is EV-Ready Outlet](#)



3. EV-Installed

Install a minimum number of Level 2 charging stations

[Palo Alto, CA: 5-10% of parking is EV-Installed](#)



2019 Progress on EV building codes

Municipality	State	Year	Location	Single-family	Multi-family	Commercial
Denver (pending)	CO	2019	IBC / IRC	1 EV-Ready Space per dwelling Unit	5% EV-Installed, 15% EV-Ready, 80% EV-Capable	5% EV-Installed, 10% EV-Ready, 10% EV-Capable
Salt Lake City	UT	2019	IBC / IRC + Zoning Ordinance		1 EV-Installed Space for every 25 parking spaces	
Seattle	WA	2019	Ordinance	1 EV-Ready Space per dwelling Unit	100% EV-Ready up to 6 space, 20% EV-Capable for 7+ spaces	10% EV-Ready
Sedona	AZ	2019	Appendix	1 EV-Capable Space per dwelling Unit		5% EV-Capable
Golden	CO	2019	Ordinance		1 EV-Installed Space per 15 parking space, 15% EV-Capable	
San Jose	CA	2019	Ordinance	1 EV-Ready Space per dwelling Unit	10% EV-Installed, 20% EV-Ready, 70% EV-Capable	10% EV-Installed, 40% EV-Capable
Fort Collins	CO	2019	IBC / IRC	1 EV-Capable Space per dwelling Unit	10% EV-Capable	
Vancouver	BC	2019	IBC / IRC	1 EV-Ready Space per dwelling Unit	100% EV-Ready	10% EV-Ready

EV Building Code Resources

www.swenergy.org

Residential Building Code:

[EV Building Codes: Residential IRC 1-pager](#)

[Sample Residential Code Amendment](#)

Commercial Building Code:

[EV Building Codes: Commercial IBC 1-pager](#)

[IBC Sample Building Code Amendment](#)

[EV Infrastructure Cost-Effectiveness](#)

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Ford Electric Crossover (coming Nov. 17)

* Alaska not to scale

Who is Adopting EV Infrastructure Building Codes?

