U.S. EPA's State and Local Energy and Environment Webinar Series

EPA United States Environmental Protection Agency

An Introduction to Electric Vehicle-Ready Buildings

March 24, 2021
3:00 – 4:00 PM Eastern

Two audio options:
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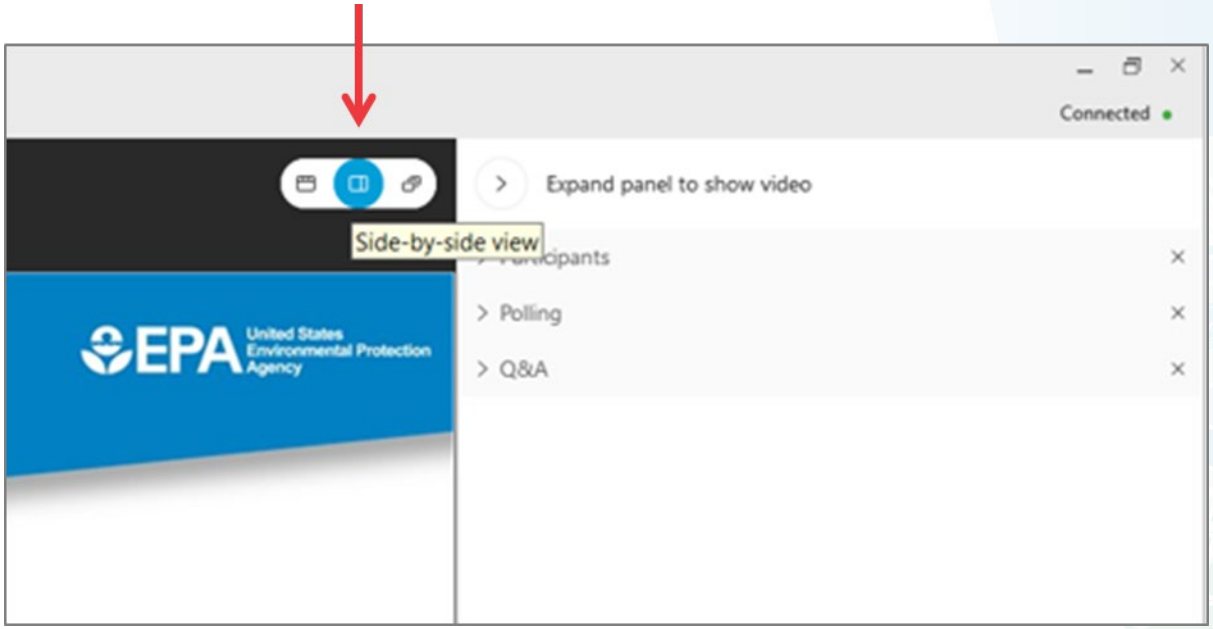
   Event number: 185 520 3131

Screen View

- There are several layout options
- We recommend the side-by-side view



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We'll use three panels

- Participants, Polling, and Question & Answer (Q&A)
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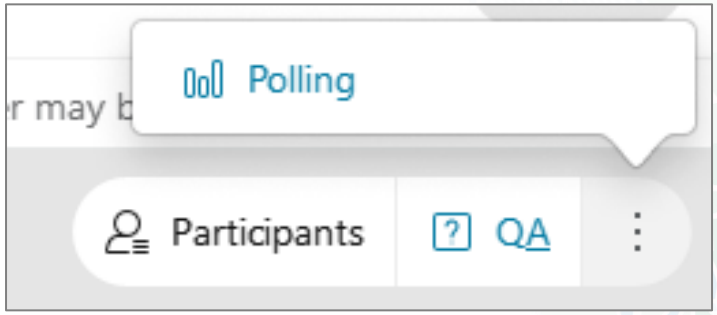

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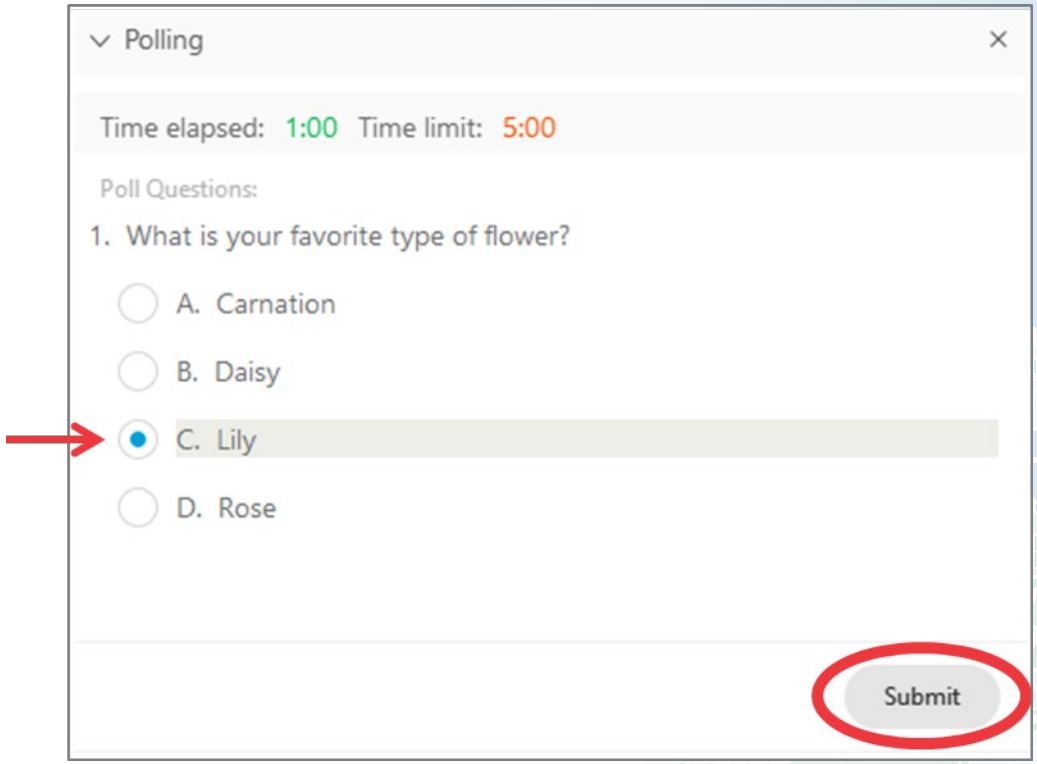

Webinar Feedback

- A feedback form will pop-up when you exit today's webinar

Q&A

- Participants are muted
- Questions will be moderated at the end
- To ask a question:
  1. Select “All Panelists” from the drop-down menu
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  3. Hit “Send”

- EPA will post final webinar materials on the Webinar Series page: www.epa.gov/statelocalenergy/state-local-and-tribal-webinar-series

Today's Agenda

- **Andrea Denny and Peter Banwell**, Office of Atmospheric Programs, U.S. Environmental Protection Agency (EPA)

  Jessica Daniels, Office of Transportation and Air Quality (OTAQ), EPA
- **Matt Frommer**, Southwest Energy Efficiency Project (SWEEP)
- **Michael Salisbury,** City and County of Denver, Colorado
- Question and Answer Session

The views expressed by speakers on this webinar are solely those of the participants and EPA does not endorse any products or commercial services mentioned in this webinar.

Introduction

Andrea Denny
Lead Environmental Policy Analyst

Peter Banwell
Senior Manager, ENERGY STAR

Jessica Daniels
Environmental Protection Specialist

U.S. Environmental Protection Agency

U.S. EPA's State and Local Energy and Environment Program

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- We offer free tools, data and technical expertise about energy strategies, including energy efficiency, renewable energy and other emerging technologies, to help state, local and tribal governments achieve their environmental, energy and economic objectives

- Access these resources at: www.epa.gov/statelocalenergy

- Electrification Webinar Series
  - Upcoming topics: Equity & Access, Education & Engagement
  - Get notifications by subscribing to our newsletter:
    - www.epa.gov/statelocalenergy/state-and-local-energy-newsletters
  - Past Webinars:
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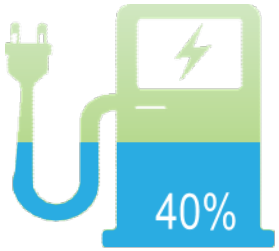
ENERGY STAR Electric Vehicle (EV) Charging Specification

Level 1 (110V) and Level 2 (240V) alternating current (AC) chargers

- Safety certified by recognized third-party entities
- Energy savings of 40% in standby mode



New scope includes direct current (DC) electric vehicle supply equipment (EVSE)/ charging station up to 350 kilowatt (kW)

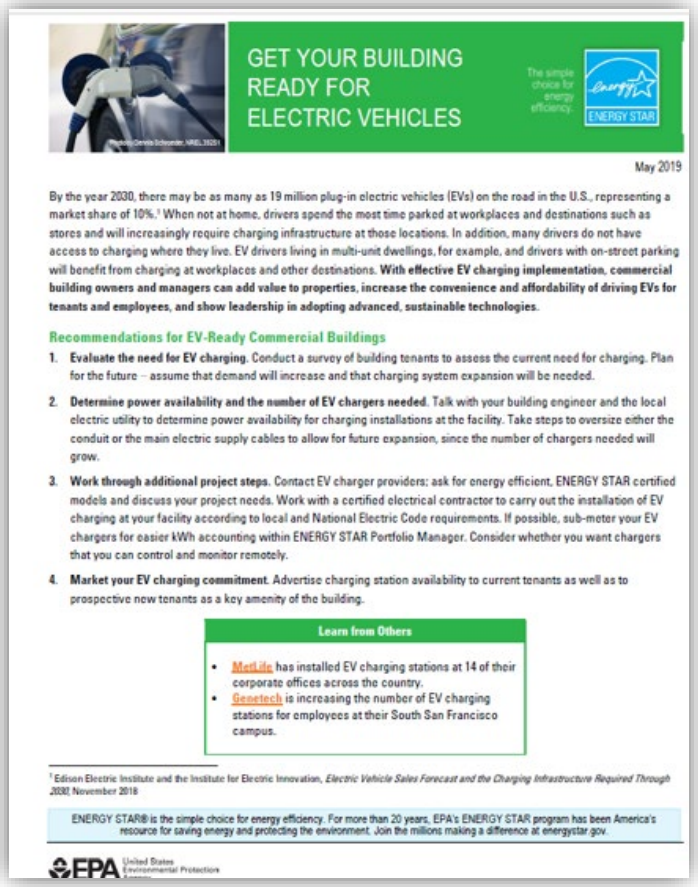
- Approximate savings per charger worth 500-kilowatt hour/year with every 1% increase in efficiency*
- Fleet aggregate savings of megawatt/year
- Requires the capability to enable an **open access** connection, allow demand-response capability *for both AC and DC EVSE*
- Additional saving opportunities with connected, smart chargers exist through Vehicle to Grid Integration (VGI), including Vehicle to Building (V2B).

*based on a 50-kW station with 10% utilization

Tools and Resources

ENERGY STAR EV Chargers Website

- Consumer Buying Guidance
- Online Tools:
  - Product Finder and Qualified Products List
  - Incentives List for Electric and Plug-in Hybrid Vehicles
  - Locator Tool for Public EV Charging Stations
- One-pagers for EV-ready Commercial Buildings, Homes, and Charging EVs with Green Power
- Available Research of Electric Models
- Procurement Language for Fleet Managers



GET YOUR BUILDING READY FOR ELECTRIC VEHICLES

May 2019

By the year 2030, there may be as many as 19 million plug-in electric vehicles (EVs) on the road in the U.S., representing a market share of 10%.[1] When not at home, drivers spend the most time parked at workplaces and destinations such as stores and will increasingly require charging infrastructure at those locations. In addition, many drivers do not have access to charging where they live. EV drivers living in multi-unit dwellings, for example, and drivers with on-street parking will benefit from charging at workplaces and other destinations. **With effective EV charging implementation, commercial building owners and managers can add value to properties, increase the convenience and affordability of driving EVs for tenants and employees, and show leadership in adopting advanced, sustainable technologies.**

Recommendations for EV-Ready Commercial Buildings

1. **Evaluate the need for EV charging.** Conduct a survey of building tenants to assess the current need for charging. Plan for the future – assume that demand will increase and that charging system expansion will be needed.
2. **Determine power availability and the number of EV chargers needed.** Talk with your building engineer and the local electric utility to determine power availability for charging installations at the facility. Take steps to oversize either the conduit or the main electric supply cables to allow for future expansion, since the number of chargers needed will grow.
3. **Work through additional project steps.** Contact EV charger providers; ask for energy efficient, ENERGY STAR certified models and discuss your project needs. Work with a certified electrical contractor to carry out the installation of EV charging at your facility according to local and National Electric Code requirements. If possible, sub-meter your EV chargers for easier kWh accounting within ENERGY STAR Portfolio Manager. Consider whether you want chargers that you can control and monitor remotely.
4. **Market your EV charging commitment.** Advertise charging station availability to current tenants as well as to prospective new tenants as a key amenity of the building.

Learn from Others

- MetLife has installed EV charging stations at 14 of their corporate offices across the country.
- Genetech is increasing the number of EV charging stations for employees at their South San Francisco campus.

[1] Edison Electric Institute and the Institute for Electric Innovation, *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030*, November 2018

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U.S. EPA's State, Local, and Tribal Transportation Resources

- EPA's OTAQ protects human health and the environment by reducing air pollution and greenhouse gases from mobile sources and the fuels that power them, advancing clean fuels and technology, and encouraging business practices and travel choices that minimize emissions

- We help state, local, and tribal governments achieve their environmental and other objectives by providing expertise on:
  - State Implementation Plans
  - Transportation Conformity
  - Vehicle Emissions Inspection & Maintenance and state fuel programs
  - Travel Efficiency and Greenhouse Gas (GHG) Planning
  - MOtor Vehicle Emission Simulator (MOVES), Calculators, and Tools

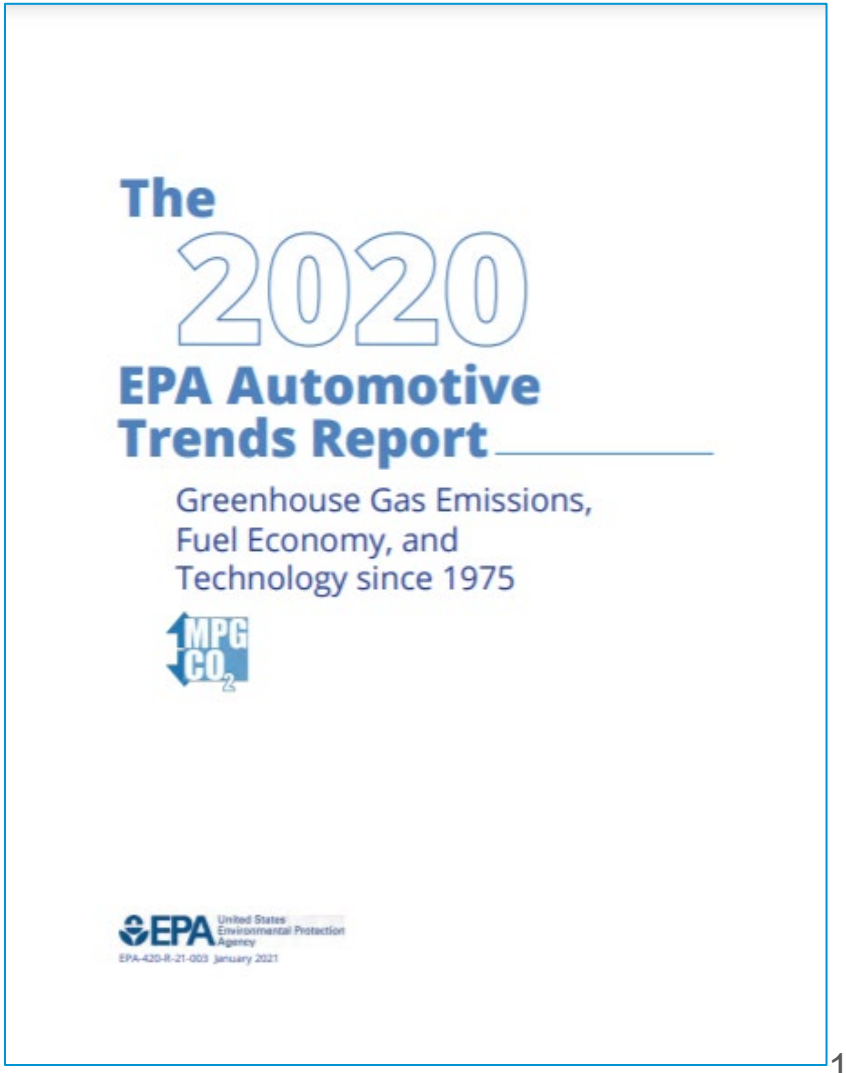
- Access these resources at the State and Local Transportation Resources page: www.epa.gov/state-and-local-transportation

OTAQ's Voluntary Programs and Initiatives

- EPA's OTAQ also has several voluntary programs and initiatives for state, local, and tribal governments as well as other stakeholders
- Clean Diesel Program – To reduce diesel emissions that impact public health
  - Includes grants and rebates under the Diesel Emissions Reduction Act (DERA)
  - www.epa.gov/cleandiesel
- Ports Initiative – To improve environmental performance near ports
  - www.epa.gov/ports-initiative
- SmartWay – To advance sustainable transportation supply chains
  - www.epa.gov/smartway

Transportation Trends

- EPA Automotive Trends Report
  - Public information about new light-duty vehicle greenhouse gas emissions, fuel economy data, technology data, and auto manufacturers' performance in meeting the agency's GHG emissions standards
  - www.epa.gov/automotive-trends
- EPA Green Vehicle Guide
  - Learn more about emerging options in transportation like zero emission vehicles (ZEVs), shared mobility, and self-driving cars
  - www.epa.gov/greenvehicles



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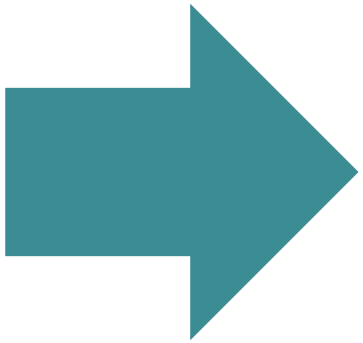
Which best describes your organization's experience with EV building codes or ordinances?

- We have a code or ordinance in place
- We are developing a code or ordinance
- We are considering a code or ordinance in the future
- We have no plans to create a code or ordinance



Poll 1

EV Infrastructure Building Codes

EPA United States Environmental Protection Agency

Matt Frommer

Senior Transportation Associate

Southwest Energy Efficiency Project

EV Infrastructure Building Codes

Matt Frommer
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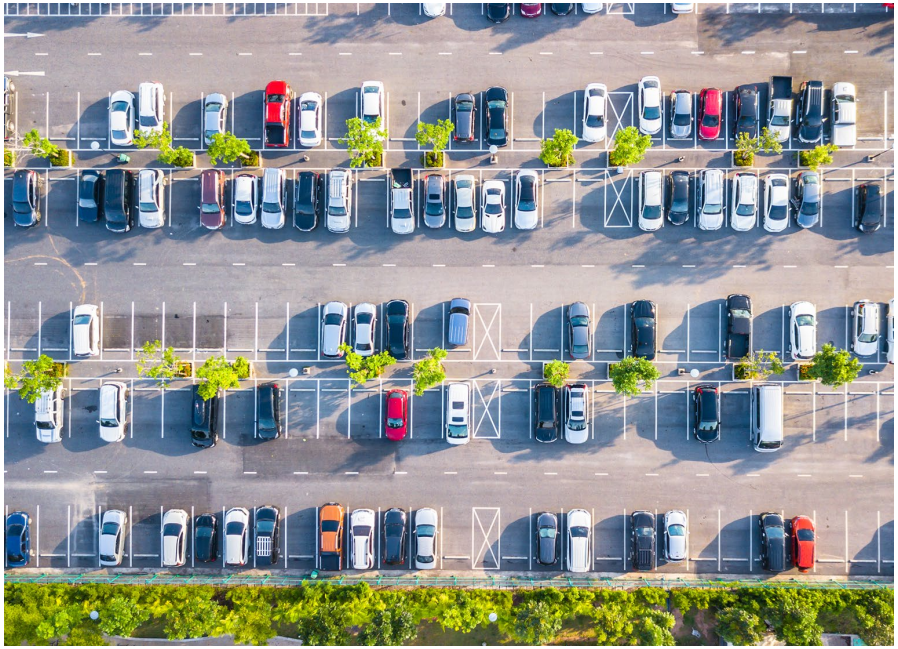
March 24, 2021

Why Adopt EV Infrastructure Building Codes?

SWEEP
SOUTHWEST ENERGY EFFICIENCY PROJECT



The Scale of the EV Infrastructure Challenge

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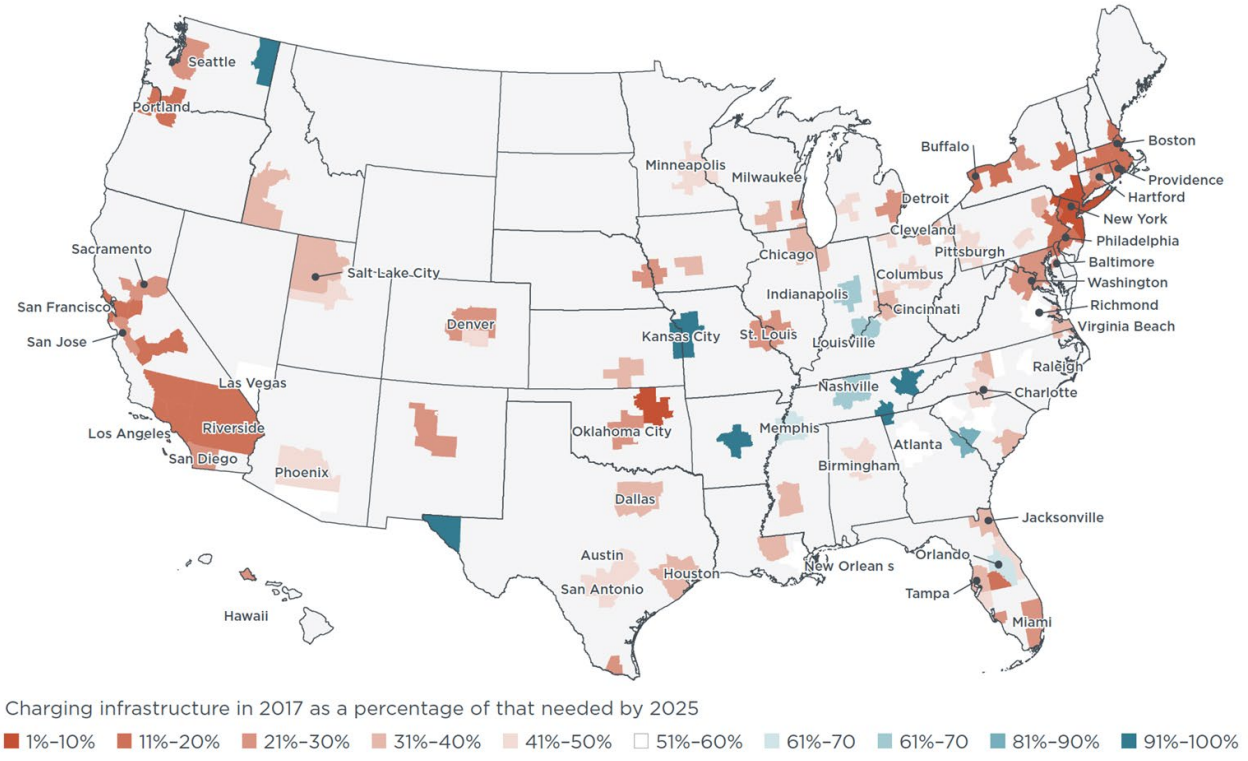
SOUTHWEST ENERGY EFFICIENCY PROJECT

PEV Population – Units in Operation

Percentage of Total Population

Scenario	2020	2025	2030
BAU	43,346	249,683	718,787
	0.8%	*4.1%*	*10*
ZEV+	45,701	295,223	838,
	0.8%	*4.8%*	*11*
High	45,701	363,692	1,037,
	0.8%	*5.9%*	*14*

Source: 2020-2030 Colorado Plug-in Electric Vehicl (PEV) sales by policy scenario (Navigant, 2019)



Public & workplace charging as a percentage of chargers needed by 2025 by metro-area.

Source: International Council for Clean Transportation: Quantifying EV charging Gap (2019)

BAU: Business as usual

Why Adopt EV Infrastructure Building Codes?

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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.

HOA: Homeowner association

Colorado Needs More EV Charging Stations to Accelerate the EV Market

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- Lack of EV charging is one of the biggest barriers to purchasing an EV
- "6 in 10 Americans are unlikely to buy an EV because there are not enough places to charge (58%) or they are concerned they will run out of charge while driving (57%)" – AAA survey (2019)
- Colorado needs 15 times as many charging stations in the next 10 years to support our EV targets
- In the U.S, only 6% of homes were built in the last 10 years

30,000 EVs → 450,000 EVs

EVSE type	2020	2025	2030
Home L2	13,399	74,638	199,314
Public L2	648	3,619	9,638
Workplace L2	923	5,154	13,727
DCFC	132	650	2,250
Total	**15,101**	**84,061**	**224,929**

Source: Colorado's Xcel Energy Transportation Electrification Plan EV charging projections (2020)

AAA: American Automobile Association
L2: Level 2
DCFC: Direct current fast charging

Global Automaker Commitments

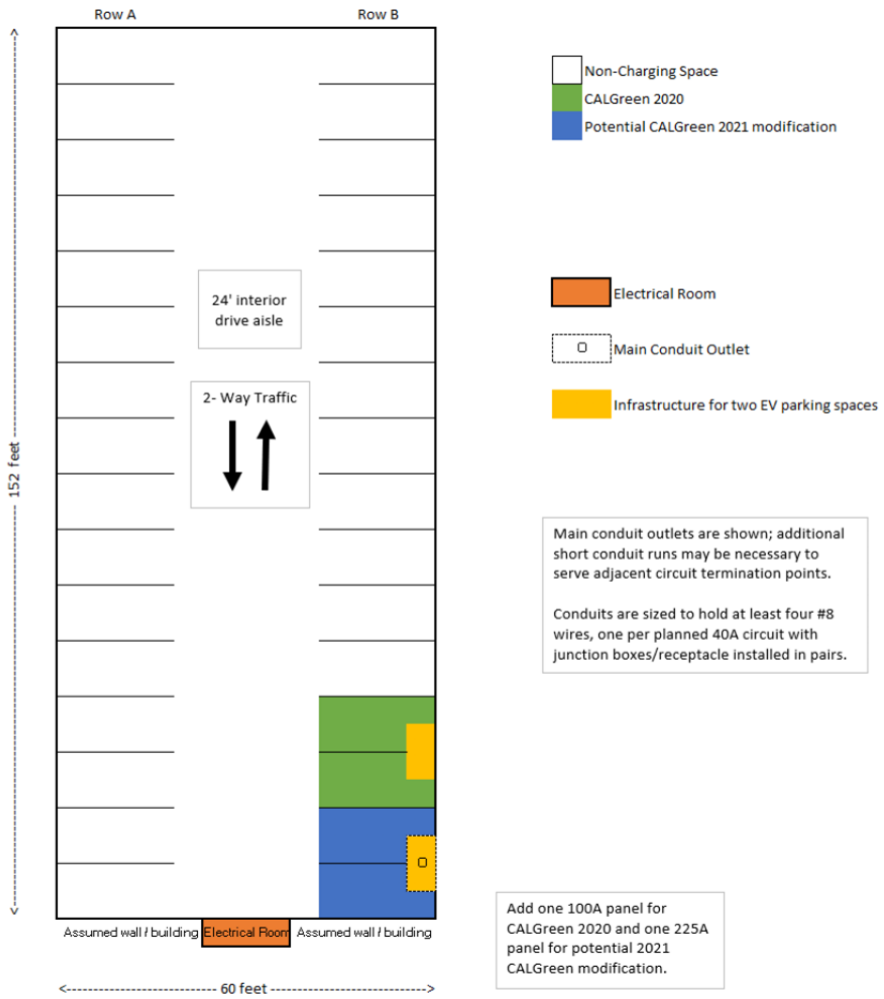
Automaker	Electrification Commitment
Audi	20 new EV models by 2025
BMW	12 EVs by 2025
Volvo	50% of sales are electric by 2025 [5 new battery electric vehicles (BEVs) by 2021]
General Motors (GM)	100% EV sales by 2035
Jeep	10 plug-in hybrid electric vehicles (PHEVs) and 4 BEVs by 2022
Renault-Nissan-Mitsubishi	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

Multi-Family EV Charging Challenges

- Home-charging: 92% of chargers, 77% of electricity delivered to EVs. Rest split between workplace, public Level 2, and DC Fast-chargers

- 50% of Americans do not have access to a dedicated off-street parking space at their residence

- Logistical barriers of installation:
  - Homeowner association rules
  - Shared or non-deeded parking spaces
  - Split incentive for renters



Avoid EV Charging Infrastructure Retrofit Costs

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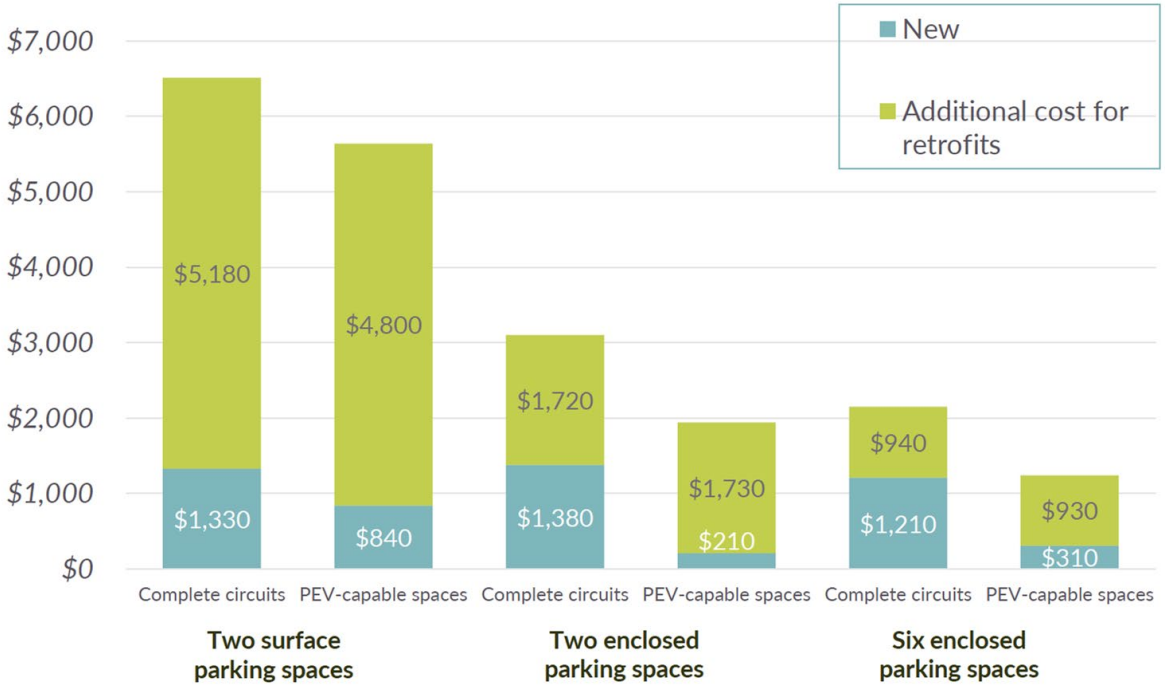
"Installing EV capable parking spaces in stand-alone retrofits is typically 4 to 6 times more expensive compared to installing EV capable parking spaces during new construction. **If EV capable parking spaces are installed during new construction, $2,040 - $4,635 per parking space is saved over the retrofit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

- Energy Solutions (2019)



Costs modeled for the City of Oakland

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Multi-Unit Residential/Commercial - EV Infrastructure Summary Table

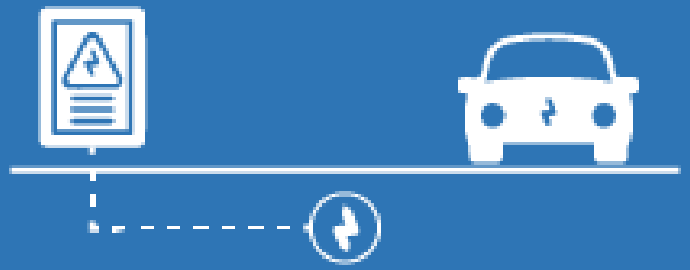
	CORE	PROGRESSIVE
ELECTRICAL CAPACITY	208/240V capacity, 40A breaker per port	208/240V capacity, minimum of 40A breaker per port
PANELS	Space to accommodate one 40A breaker, per port, for 20% of spaces	Space to accommodate one 40A breaker at least, per port, for 50% of spaces
PARKING SPACES & EV CAPABILITY (DEEDED)	EV-ready Infrastructure for 20% of total spaces. Subpanels within 100ft of each EV stall	EV-ready Infrastructure for 50% of total spaces. Subpanels within 100ft of each EV stall
PARKING SPACES & EV CAPABILITY (NON-DEEDED)	EV-ready Infrastructure for 20% of total spaces	EV-ready Infrastructure for 50% of total spaces
AUTOMATIC LOAD MANAGEMENT	No difference	No difference
ESTIMATED COST AS A PERCENTAGE OF TOTAL CONSTRUCTION COST (RESIDENTIAL/COMMERCIAL)	0.27 % - 0.35 %	0.67 % - 0.87 %

EV Infrastructure Code Specifications

1. "EV-Capable"

Electrical panel capacity + branch circuit + raceway

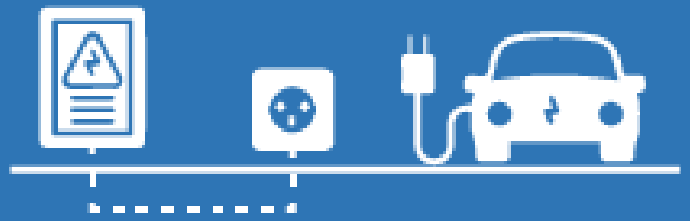
Atlanta, GA: 20% is EV-Capable (Ordinance)



2. "EV-Ready"

EV-Capable + 240-volt outlet

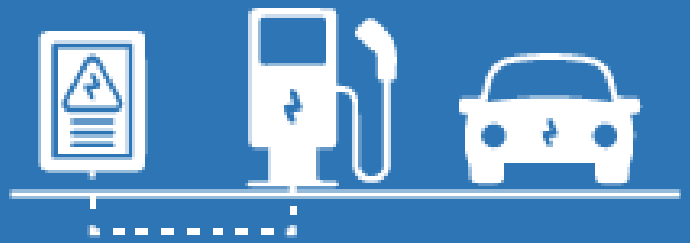
Denver, Boulder: (1) EV-Ready Space per dwelling for single family units



3. "EV-Installed"

Install a minimum number of Level 2 charging stations

Denver: 5% EV-Installed for multifamily units & Commercial



2019-21 Progress

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Municipality	State	Year	Location	Single-family	Multi-family	Commercial
Denver	CO	2019	International Building Code (IBC) / International Revenue Code (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
Boulder	CO	2019	IBC / IRC	1 EV-Ready space per dwelling unit	5% EV-Installed, 10% EV-Ready, 40% EV-Capable (25+ spaces)	5% EV-Installed, 10% EV-Ready, 10% EV-Capable (25+ spaces)
Avon	CO	2021	Ordinance	1 EV-Ready space per dwelling unit	5% EV-Installed, 10% EV-Ready, 15% EV-Capable (7+ spaces)	5% EV-Installed, 10% EV-Ready, 15% EV-Capable (10+ spaces)
Fort Collins	CO	2019	IBC / IRC	1 EV-Capable space per dwelling unit	10% EV-Capable	
Madison	WI	2021	Ordinance	1 EV-Ready space per dwelling unit	2% EV-Installed, 10% EV-Ready (increases by 10% every 5 years)	1% EV-Installed (increases by 1% every 5 years), 10% EV-Ready (increases by 10% every 5 years)
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
St Louis	MO	2021	Ordinance	1 EV-Ready space per dwelling unit	2% EV-Installed, 5% EV-Ready (increases to 10% in 2025)	2% EV-Installed, 5% EV-Ready
2024 IBC (proposed)	International	2021	IBC / IRC	-	2% EV-Installed, 18% EV-Ready	2% EV-Installed, 8% EV-Capable

Questions?

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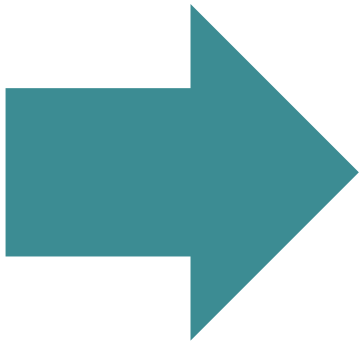
What are the largest barriers to implementing an EV-capable/ready building code or ordinance? (select all that apply)

- Uncertainty of demand for EV infrastructure
- Concerns from building developers/property owners
- Need for coordination between government departments
- Grid/infrastructure concerns
- Other (answer in Q&A box)



Poll 2

EV Ready Building Codes in the City and County of Denver

Michael Salisbury

Transportation Energy Lead

City and County of Denver, Colorado

EV Ready Building Codes in the City and County of Denver

Mike Salisbury
Transportation Energy Lead
Office of Climate Action, Sustainability and Resiliency

An Introduction to Electric Vehicle Ready Buildings

3/24/2021

Denver Climate and EV Goals

Economy Wide:

2025: 30% reduction

2030: 45% reduction

2050: 80% reduction

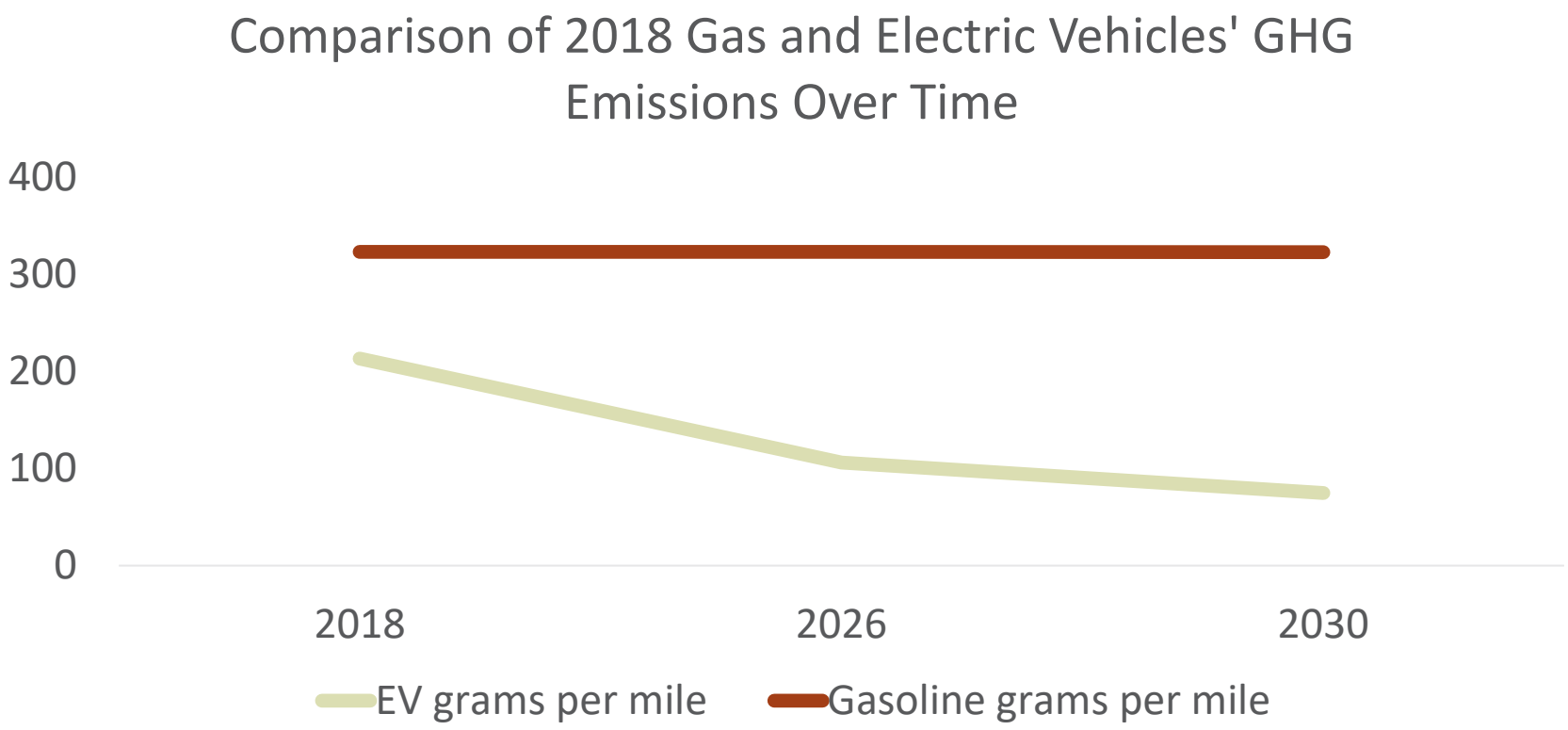
Electric Vehicles:

2025: 15% of vehicles are EVs

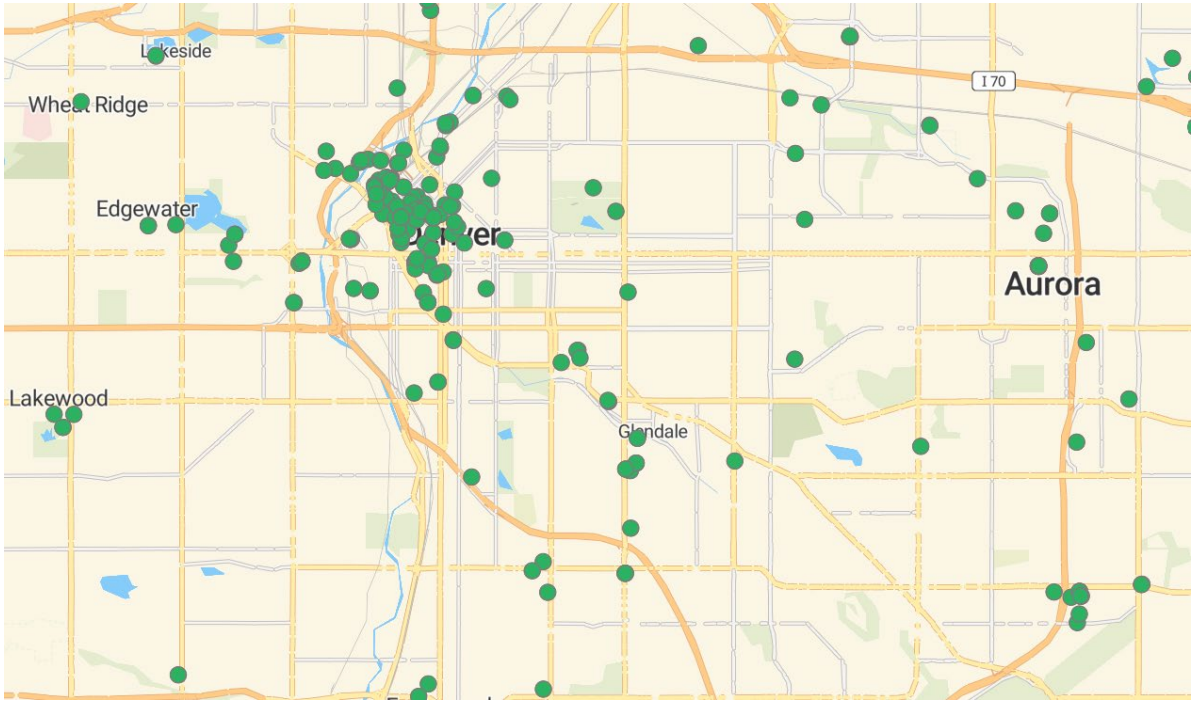
2030: 30% of vehicles are EVs

2050: 100% of vehicles are EVs

Greenhouse Gas Emissions Benefits of Electric Vehicles



Public Charging Today



- 600 Level 2 ports
- 28 DC fast charging ports

By 2030 we need:

- 8,000 Level 2
- 700 DC fast charging

Denver EV Ready Code Requirements

One and Two Family

- One EV Ready Space

Multi-Family

- 5% EVSE Installed
- 15% EV Ready
- 80% EV Capable

Commercial

- 5% EVSE Installed
- 10% EV Ready
- 10% EV Capable

Why EV Ready Building Codes?

- Trenching, punching through walls
- Panel upgrades
- Soft costs: permitting, plans, inspections

"the International Code Committee discovered that around 85-percent of the cost of refits for EV support could be avoided, had EV-Capable infrastructure been included at the start."

www.slashgear.com/new-ev-ready-building-codes-could-be-tipping-point-for-electric-cars-in-us-10606522/

Costs: Example 450 Unit Multi-Family Building

	EV Capable	EV Ready	EVSE Installed	$/Space
Denver	$300	$1,300	$4,000	$722
Developer 1	$280	$800	$12,000	$664
Developer 2	$850	$1,200	$6,500	$1,224

Cost of Structured Parking per Space: $18,000-$25,000

Costs Context: Example 450 Unit Multi-Family Building
Total Parking Structure Cost: $11 million
Total Building Cost: ~$100 million

	Total EV Ready Cost	% of Parking Cost	% of Total Building Cost
Denver	$324,900	2.9%	0.3%
Developer 1	$298,920	2.7%	0.3%
Developer 2	$550,980	4.9%	0.5%

Denver 2022 Code Process

No plans for major advances

Hoping to:

- Clarify language
- Provide flexibility
- Lower Costs

while meeting spirit of providing ubiquitous EV charging infrastructure

Question and Answer Session

Connect with the State and Local Energy and Environment Program

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State and Local Energy and Environment Program

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