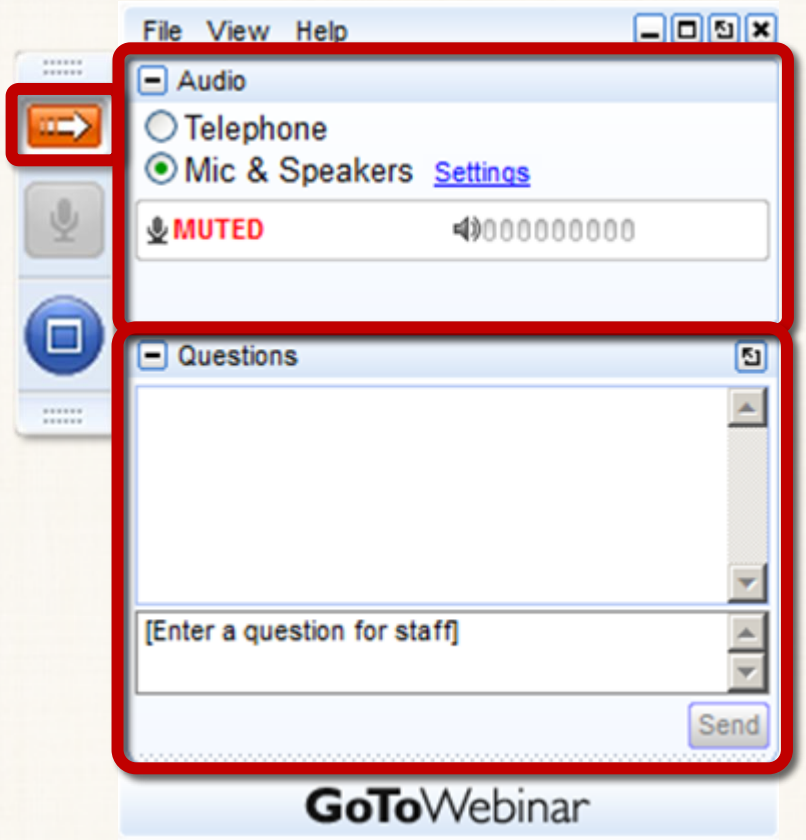
Electric Vehicles and Equity

June 6, 2023



WEBINAR LOGISTICS



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FEATURED REPORT

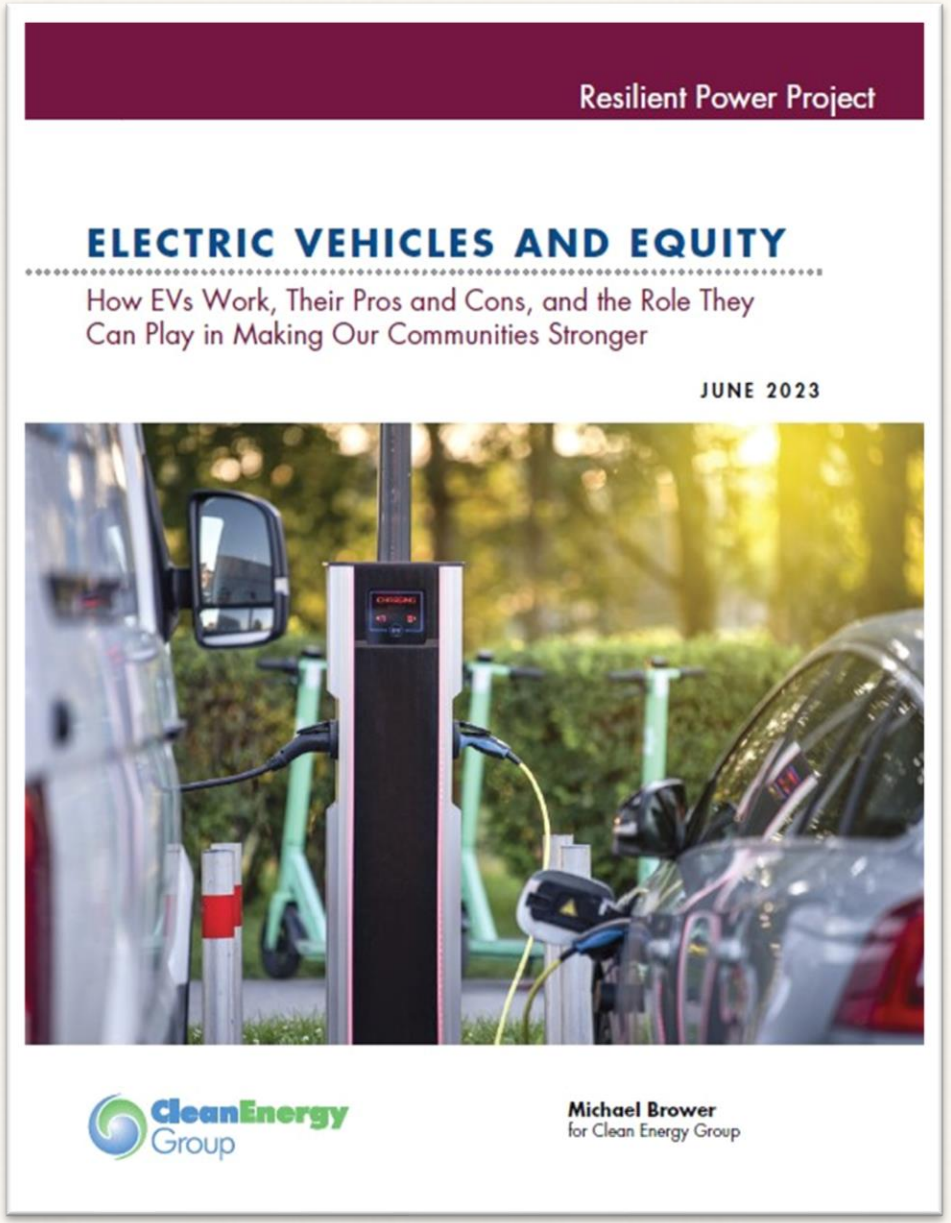
Electric Vehicles and Equity:

How EVs Work, Their Pros and Cons, and the Role They Can Play in Making Our Communities Stronger

June 2023

by Michael Brower for Clean Energy Group

www.cleanegroup.org/publication/electric-vehicles-and-equity



WEBINAR SPEAKERS

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Electric Vehicles and Equity

How EVs Can Address the Environmental and Economic Goals of Disadvantaged Communities

Michael Brower, Cantus Firmus Consulting LLC
Nathan King, Itselectric Inc
Seth Mullendore, Clean Energy Group

Webinar Speakers

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Electric Vehicles and Equity

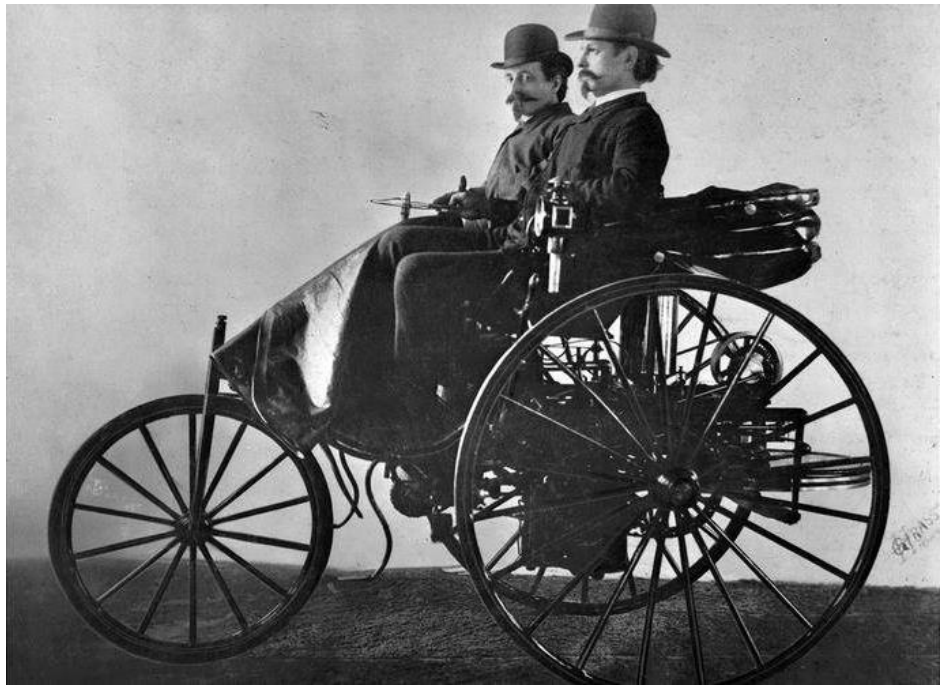
Outline

- The EV Revolution
- Benefits and Challenges of EVs in Communities
- The Case for Resilience
- The Inner-City Charging “Desert” – and How to Solve It
- Overcoming Barriers

EVs have been around for as long as cars powered by internal combustion

But limitations in electric power and range meant gas-powered cars dominated the 20th century

Thomas Parker Electric Car: 1884
(Source: Wikipedia Commons)

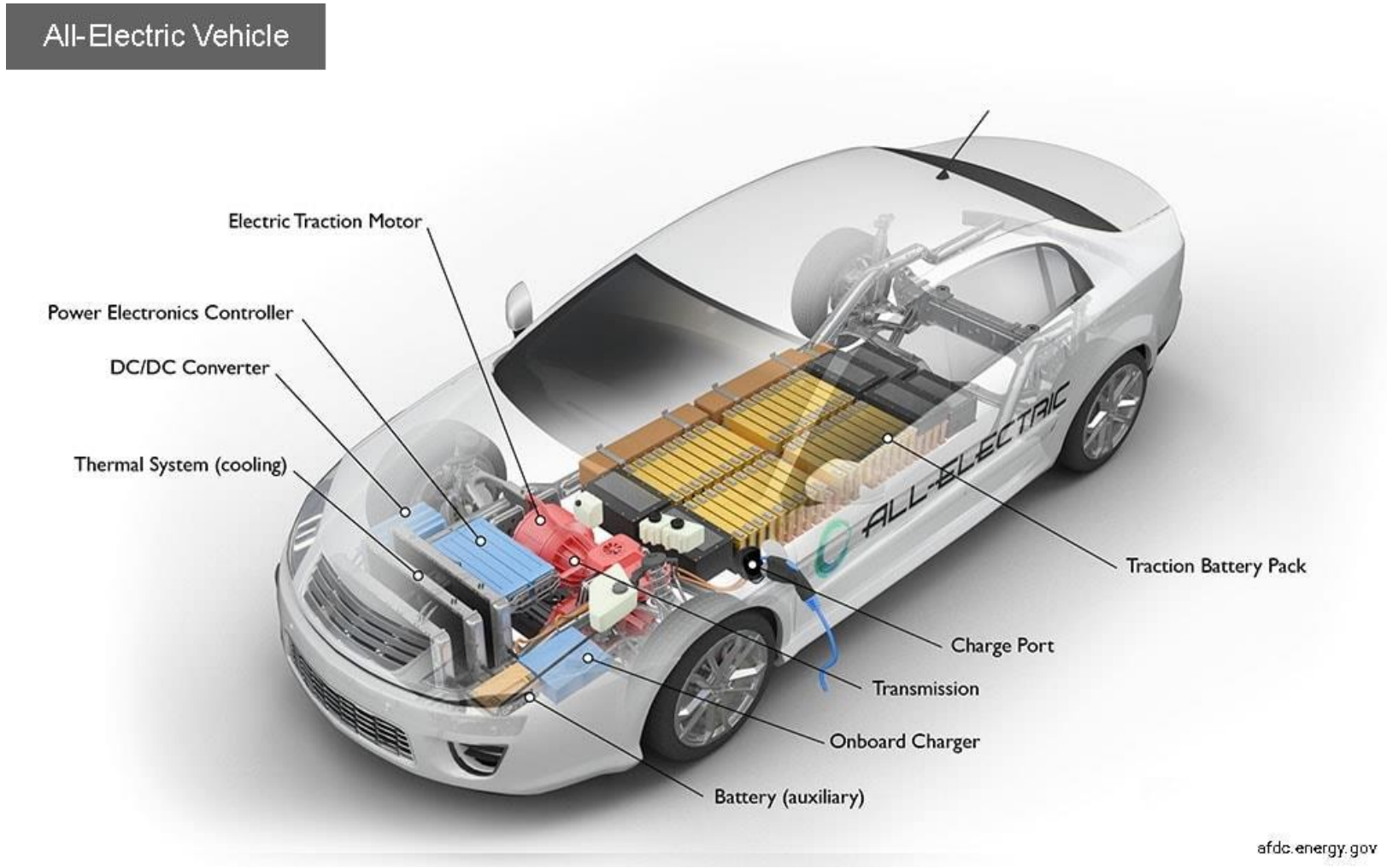


Carl Benz Gas-Powered Car: 1886
(Source: Mercedes-Benz)

Today's EVs are sophisticated machines

Main components:

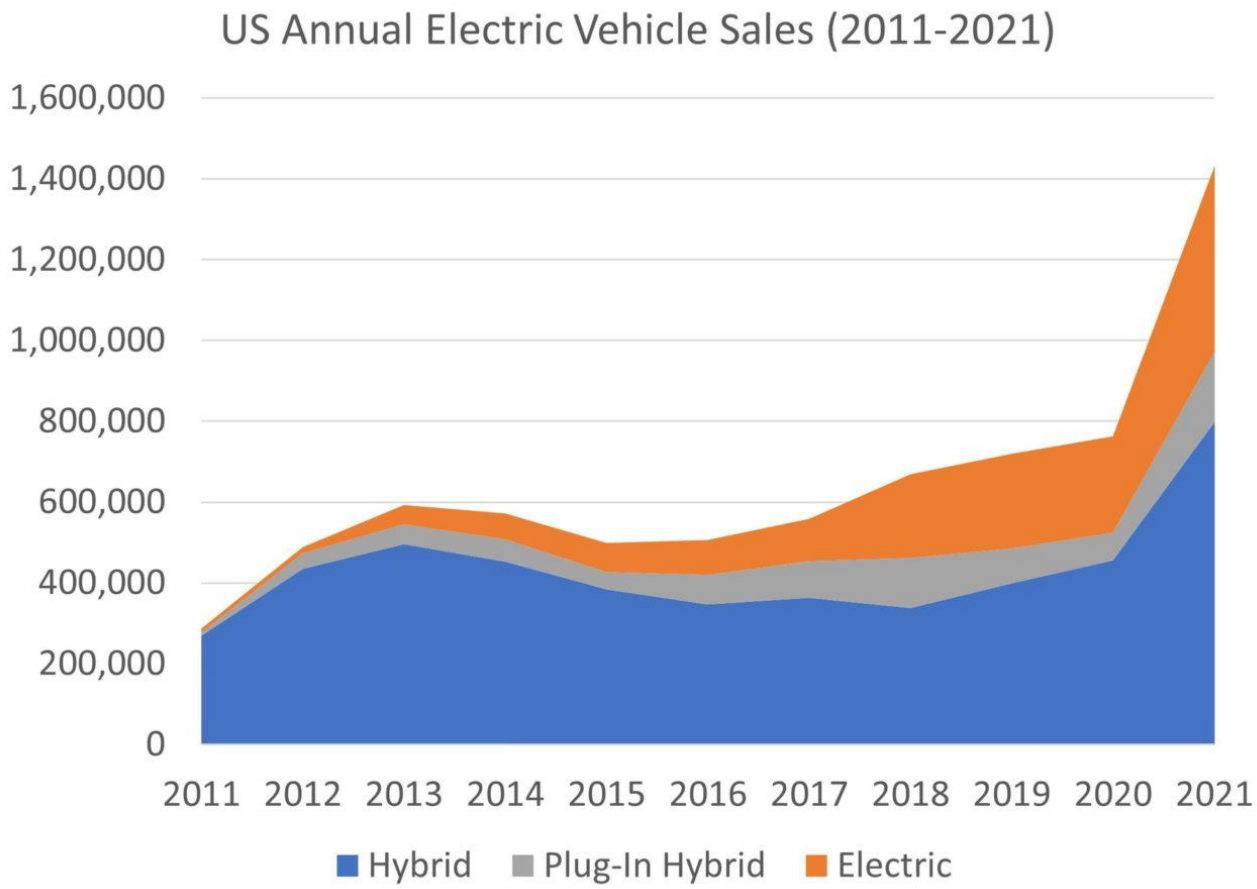
- High-torque electric motors
- High-capacity lithium-ion battery pack
- DC/AC charging system
- Complex software and controls to manage power flows
- Hybrid gas-electric cars also have gas-powered engines for power boost and charging



Typical All-Electric Car Schematic
(Source: US Department of Energy)

EV Sales are taking off

- Decreasing cost, improving performance, environmental values are driving sales
- 10% of total vehicle market today, share forecast to grow to 50% within 10 years
- One-third of electric vehicle sales are all-electric, two-thirds are hybrid



(Source: US Bureau of Transportation Statistics, June 2022)

Why own an EV?

Pros

- Zero tailpipe emissions, much lower greenhouse gas emissions
- Lower fuel and maintenance costs
- Simple operation, good performance, high reliability
- Less risk of fire

Cons

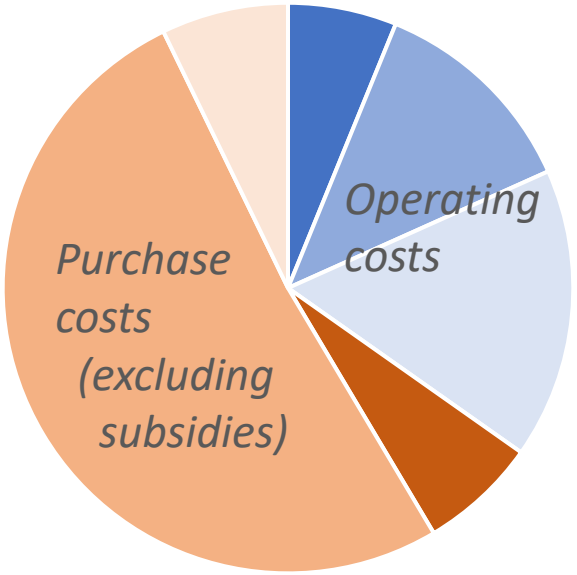
- More limited range
- Limited access to charging points in some areas
- Higher purchase price (may be offset by tax credits & rebates)
- Concerns about environmental impacts of batteries

Total Cost of Ownership

It usually comes out about the same for EVs as for comparable conventional cars

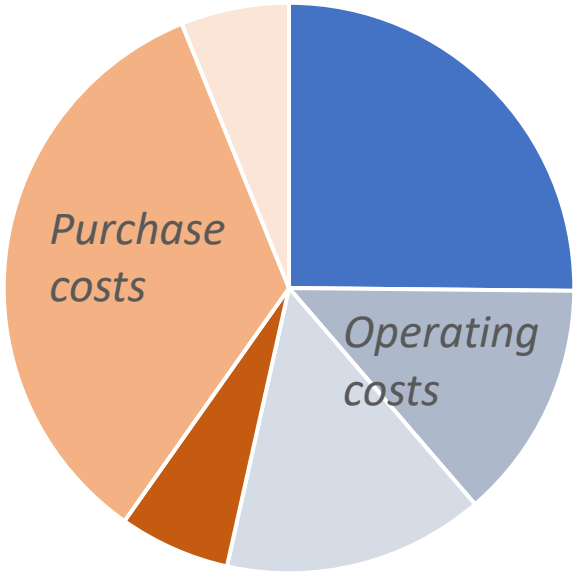
Electric Vehicles

$9824/yr



All Cars – Weighted Average

$10,728/yr



Source: American Automobile Association: Your Driving Costs (2022). Assumes cars are driven 15,000 miles/year. Excludes EV tax credits and other EV subsidies.

What about incentives for EVs?

Federal tax credits

$7500 for new EVs

$4000 for used EVs (one-time)

Useful only to households with sufficient taxable income

Complicated rules concerning battery size, domestic content, other

State incentives

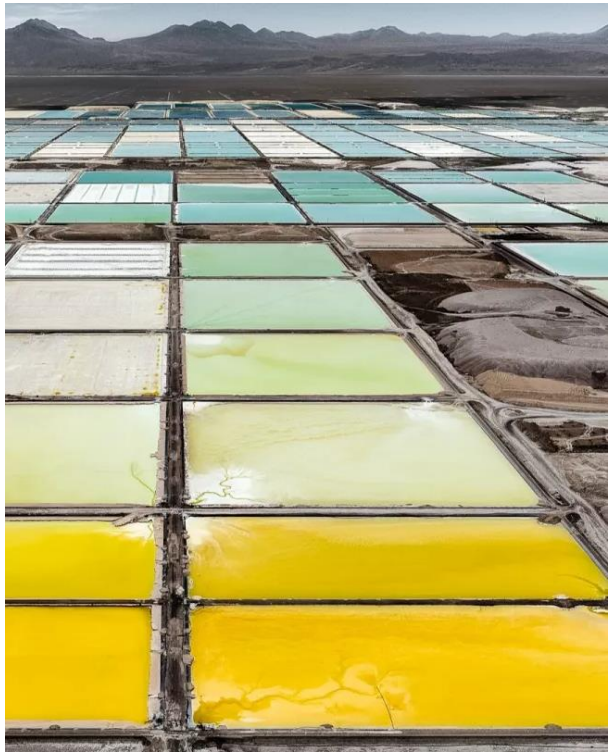
31 states and DC offer various rebates and tax credits

Are EVs good for the environment?

Overall, yes, but sustainable alternatives to lithium-ion batteries are needed

100% reduction in tailpipe pollution

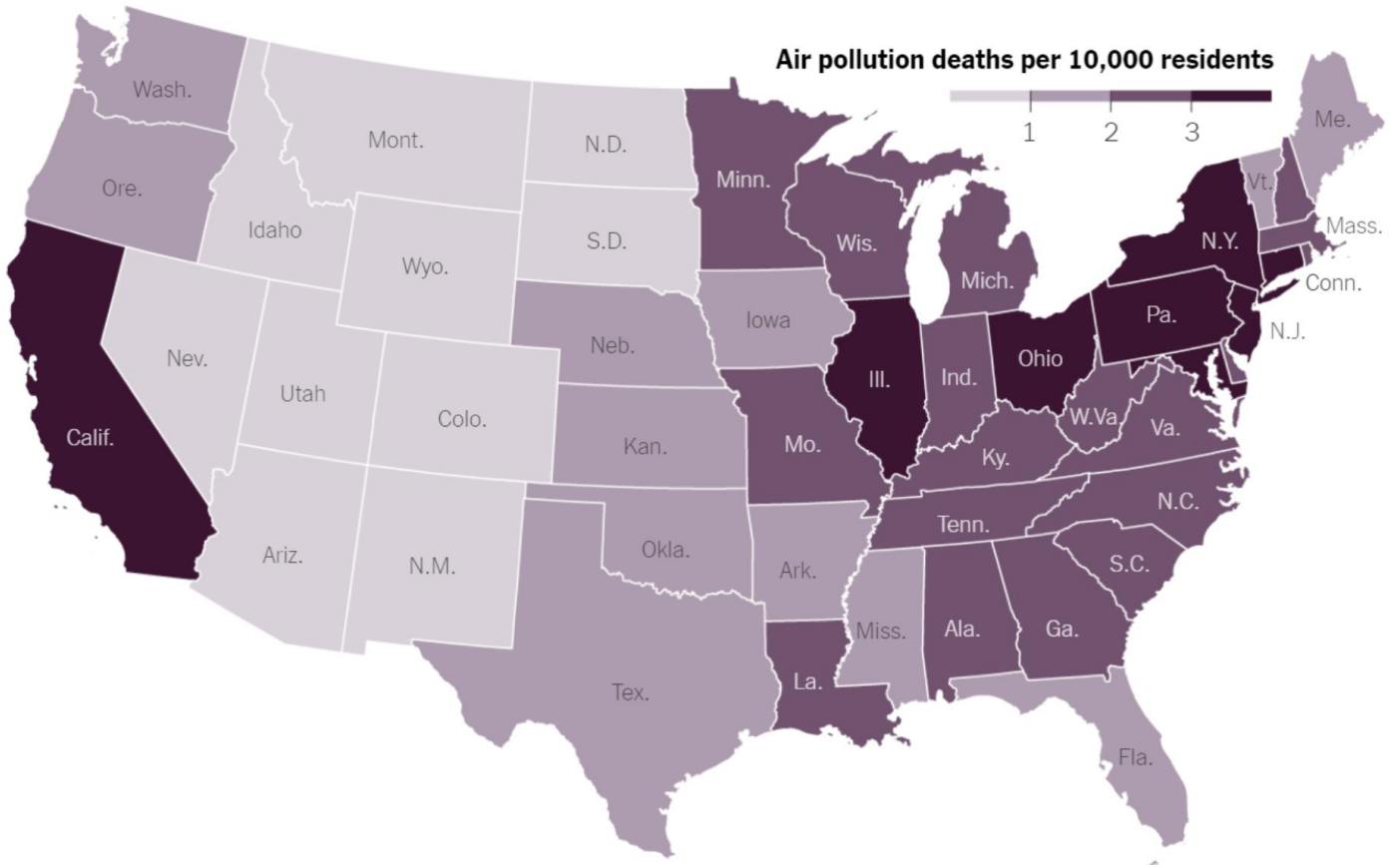
50%-75% reduction in greenhouse gas emissions (including power plants)



Mining and disposal impacts of batteries compared to petroleum

Source: Euronews

EVs and Air Pollution



Source: *Nature* and *The New York Times*

- Over 100 million Americans (30%) live in counties where air quality is below EPA standards
- Fine particulates (PM2.5) and ozone cause 100,000-200,000 premature deaths annually
- Millions of asthma attacks
- Links to delayed cognitive development
- One quarter of impacts are due to cars and trucks

But the air pollution burden is not equitably shared

- Historical PoC settlement patterns put them closer to sources of industrial and urban air pollution
- PoC are exposed to 25% more harmful air pollutants than Whites
- Blacks are exposed to 34% more than Whites
- PoC are 3 times more likely to be exposed to the highest pollutant concentrations

Source: *Science Advances (2021)*, by Center for Air, Climate, and Energy Solutions

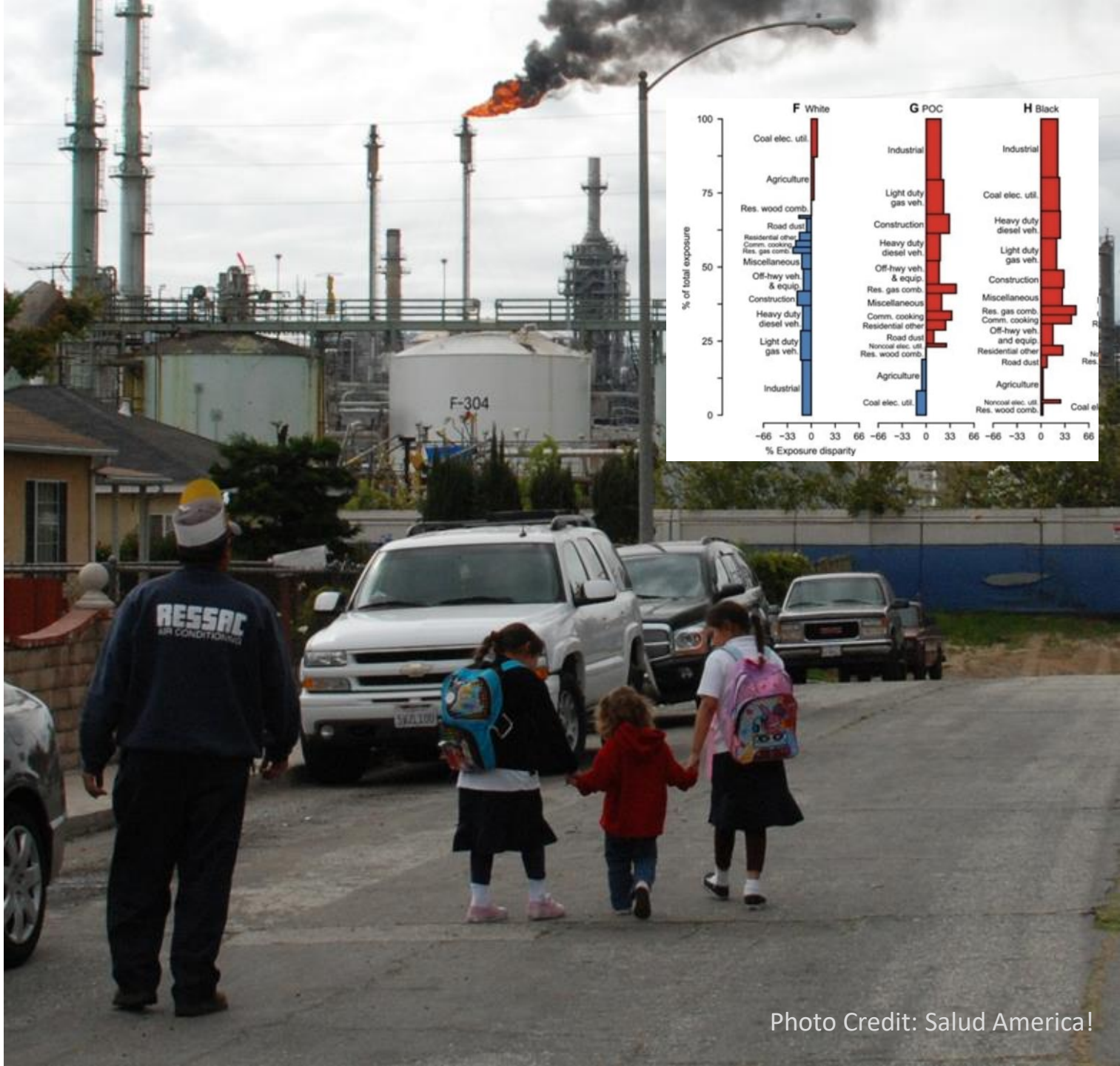


Photo Credit: Salud America!

EVs can be part of an equitable solution

- A rapid transition to EVs from 2020 to 2050 would avoid:
  - 110,000 premature deaths
  - 2.7 million asthma attacks
  - $1.2 trillion in economic damage
- Communities of color stand to benefit significantly since they experience the highest air pollution exposure
- But inequities in access to EVs must be addressed
  - In California, PoC account for 53% of gas car purchases, only 33% of EV purchases
  - Many EVs are unaffordable for lower income households, which benefit less from tax credits
  - Homeowners are 3.5 times more likely to own EVs than renters
  - Inner cities are a “charging desert”

Photo Source: *Architectural Digest*

Many EVs are aimed at the luxury market
(Shown: Lucid Air)

Sources: American Lung Association (health benefits of EV transition), UC Berkeley, UC Davis (demographics of EV ownership)

Electric School Buses: A big opportunity

Photo Credit: Business Wire

Electric School Buses in Stockton, California

- Children riding diesel school buses every day are exposed to nearly 50 times the EPA threshold of “significant risk” in air pollution (Source: NRDC)
- Asthma rates among Black children are double those of White children (CDC), in part because of PM2.5 exposure in buses
- Over 400 school districts (~2%) are responding by deploying electric buses, with federal and state support (WRI)
- Challenges remain: higher up-front cost, charging infrastructure, need for multi-stakeholder collaboration

EVs and Resilience

Photo Credit: New York Daily News

Communities such as Red Hook (Brooklyn) with >75% PoC, went weeks without power after Hurricane Sandy (2012)

- Natural disasters tend to strike low-income and PoC neighborhoods the hardest, most often because of power outages
- Without power, food rots, medicines degrade, heat and air conditioning fail, businesses and jobs close, and communications become difficult
- Community EVs – buses, vans, other vehicles – equipped with two-way chargers can provide backup power to keep shelters and emergency services operating for weeks
- Making EVs work for resilience requires planning and investment in 2-way charging infrastructure

Advantages of EVs for Resilience

Photo Credit: San Diego Gas & Electric

Electric school buses are part of several pilot initiatives, including this V2G (vehicle-to-grid) demonstration project in San Diego.

- Built-in mobility, can be driven to recharging stations
- Reliable, low impact: no need for on-site fuel deliveries or loud generators
- Scalable from homes to churches to emergency services and medical facilities
- 2-way charging is available in several EV models; “smart-grid” equipment needed on receiving end
- Offers peak-shaving to increase grid reliability, reduce peak need

The Charging Challenge

Its Electric, Inc.

Overcoming the Barriers

Clean Energy Group

The Charging Challenge

Presented by:
Nathan King, AIA, LEED AP
Co-Founder/CEO It's Electric

it's electric

itselectric is founded on the belief that cities are an essential tool to **reverse anthropocentric climate change**.[1]

Scope

89%

United States population will live in cities by 2050[2]

Magnitude

3.35M

metric tons of CO2 emitted by US cities in 2019[3,4]

Potential

60%

Potential reduction of global GHG emissions by Net-Zero Cities[5,6]

1. Cities: a 'cause of and solution to' climate change. United Nations News. September 2019.
2. U.S. Cities Factsheet. University of Michigan. September 2021.
3. US cities responsible for 75% of CO2 emissions. U.S. Cities Are Underestimating Carbon Emissions, New Research Shows. Smithsonian Magazine. February 2021.
4. US CO2 emissions 2020. Statista. Data accessed February 2022.
5. This is what cities need to do by 2050 to meet climate goals. National Geographic. September 2019.
6. New York City's Net-Zero Carbon Target for 2050 Is Achievable, Study Finds. NYC Mayor's Office of Environmental Sustainability. April-2021.

Problem

Cities want EV's on the road as quickly as possible. Yet there is no scalable solution to provide EV charging **to the millions who park on the street.**

Climate

36%

CO2 emissions from gas burning vehicles in NY State[1]

Pollution

~58,000

premature deaths each year from roadway pollution in the NE US[2]

Access

40,000,000

drivers rely on street parking[3]

1. New York State Greenhouse Gas Inventory: 1990–2016. NYSERDA. July-2019.
2. Mortality-based damages per ton due to the on-road mobile sector in the Northeastern and Mid-Atlantic U.S. by region, vehicle class and precursor. By Calvin Arter et al, Environment Research Letters, June 2021.
3. Estimate by *itselectric*.

Context

WHEELS

'Charger Desert' in Big Cities Keeps Electric Cars From Mainstream

For city dwellers who would love an E.V., the biggest hurdle might be keeping it juiced up without a garage or other convenient charging stations.

Brooklyn and other urban environments present a challenge to electric-car owners.
Emily Gilbert for The New York Times

Equity

Communities that are underserved by mass-transit options are:

1. More reliant on personal vehicles to commute,
2. Disproportionately negatively affected by roadway pollution,
3. More likely to be displaced by climate change.

Barriers to EV Transition in Cities

Street Parking

~40,000,000 US drivers rely on street parking, and lack convenient and affordable charging.

Time

Installing EV chargers requires extensive siting studies, engineering, and permitting.

Cost

Connecting EV chargers to utility mains requires high capital cost and disruptive street work.

Equity

Many low income and minority communities are miles away from any public EV charger.

Design

Current EV charging equipment has a large footprint and issues with cord management.

Grid Limitations

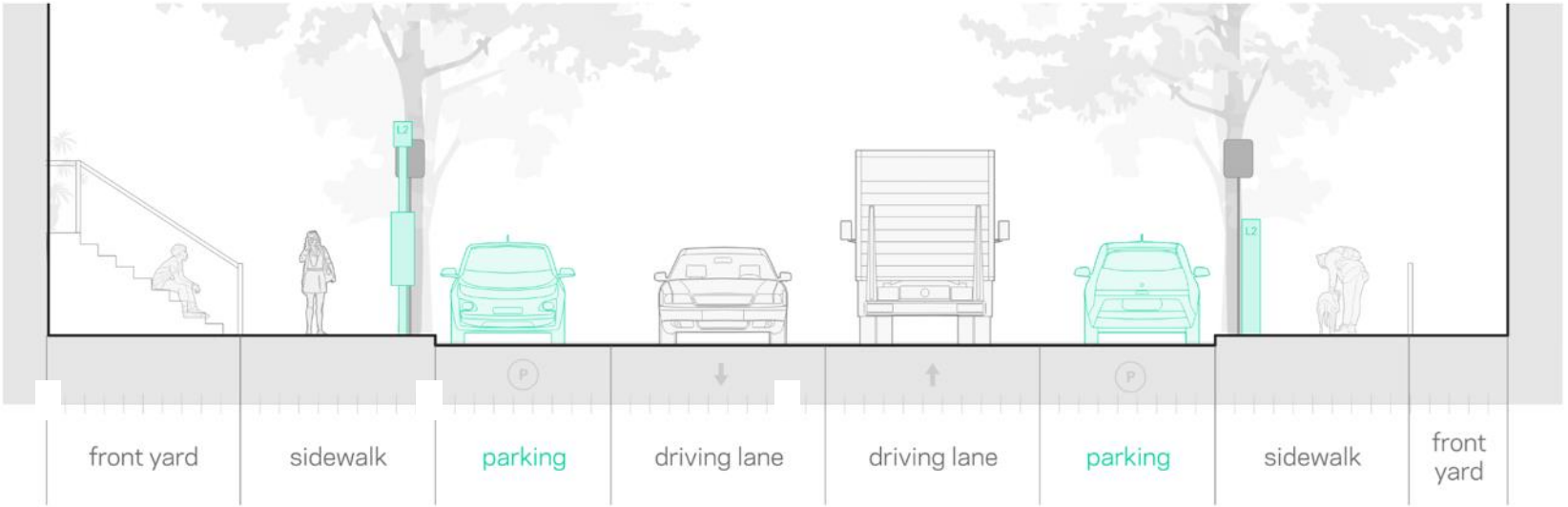
EV charging equipment locations are limited by the availability of utility service capacity.

Distributed Network

In order to fully transition ICE vehicles to electric, a distributed network of lower-voltage (or Level-2) chargers needs to be deployed across all city neighborhoods.

City drivers tend to park within ¼ mile away from where they live.

EV Charging and Urban Design



Source: Curb Enthusiasm -Deployment Guide for On-Street Electrical Vehicle Charging. By WXY and Barretto Bay Strategies. Produced for NYSERDA, NY State Department of Transportation, and New York City Department of Transportation. November-2018.

Comparing Curbside Charging Initiatives

London

Chargers Installed[1]
6,189

2030 Curbside Goal[2]
60,000 - 90,000

Los Angeles

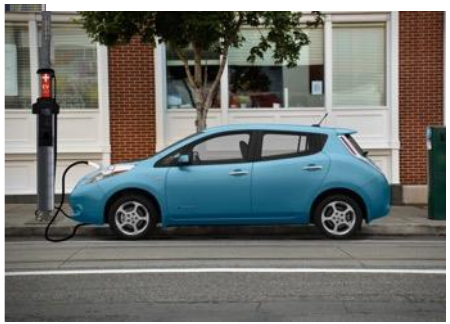
Chargers Installed[3]
477

2030 Curbside Goal
TBD - Expansion anticipated.

New York City

Chargers Installed[4]
100

2030 Curbside Goal[5]
10,000



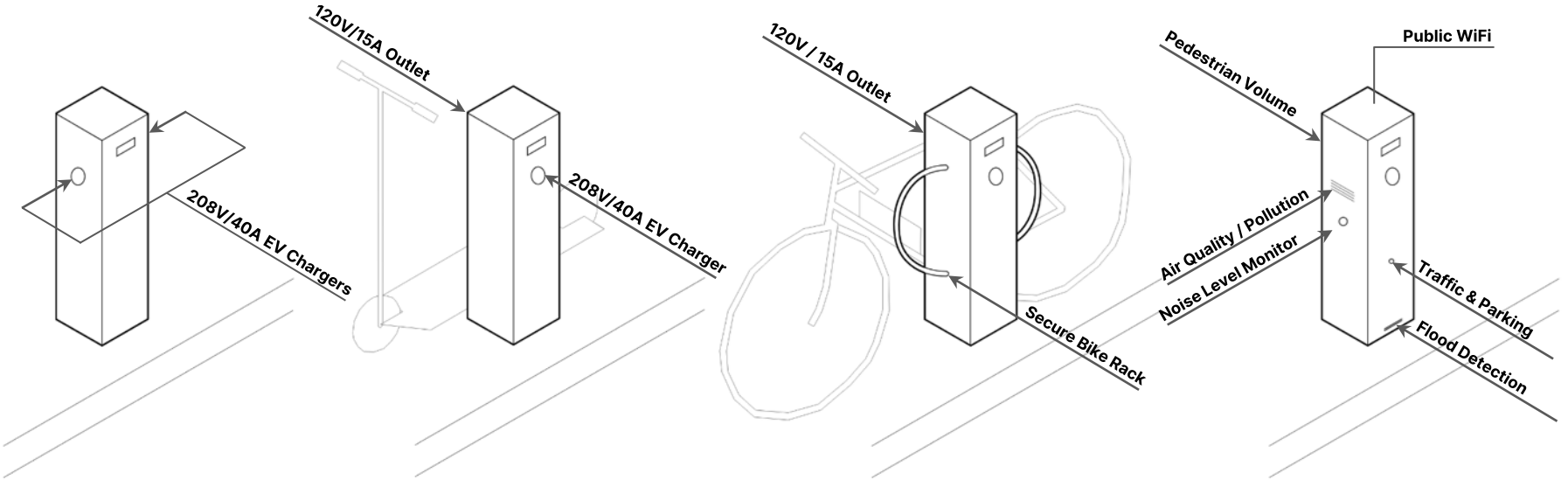
Kansas City

Chargers Installed[6]
30

2030 Curbside Goal[7]
TBD - Expansion authorized.

1. Find and use data on public electric vehicle chargepoints. UK Department for Transport. Data accessed January 2023.
2. London's 2030 electric vehicle infrastructure strategy. UK Department for Transport. December 2020.
3. Alternative Fuels Data Center. US Department of Energy. Data accessed January 2023.
4. Curbside Charging: Reliable, Convenient and Attracting Drivers. ConEdison website. August 2022.
5. Electrifying New York - An Electric Vehicle Vision Plan for New York City. NYC Department of Transportation. September 2021.
6. Streetlight Charging in the Kansas City Right-of-Way. Kansas City Metro Energy website. Accessed January 2023.
7. PSC Issues Decision in Evergy Transportation Electrification Pilot Program Request. Missouri Public Service Commission website. Accessed January 2023.

Adaptability



Double EV Charger Ports

Lower Voltage Outlet

Secure Bike Rack

Civic Multifunctionality

*Industrial design in progress

itselectric

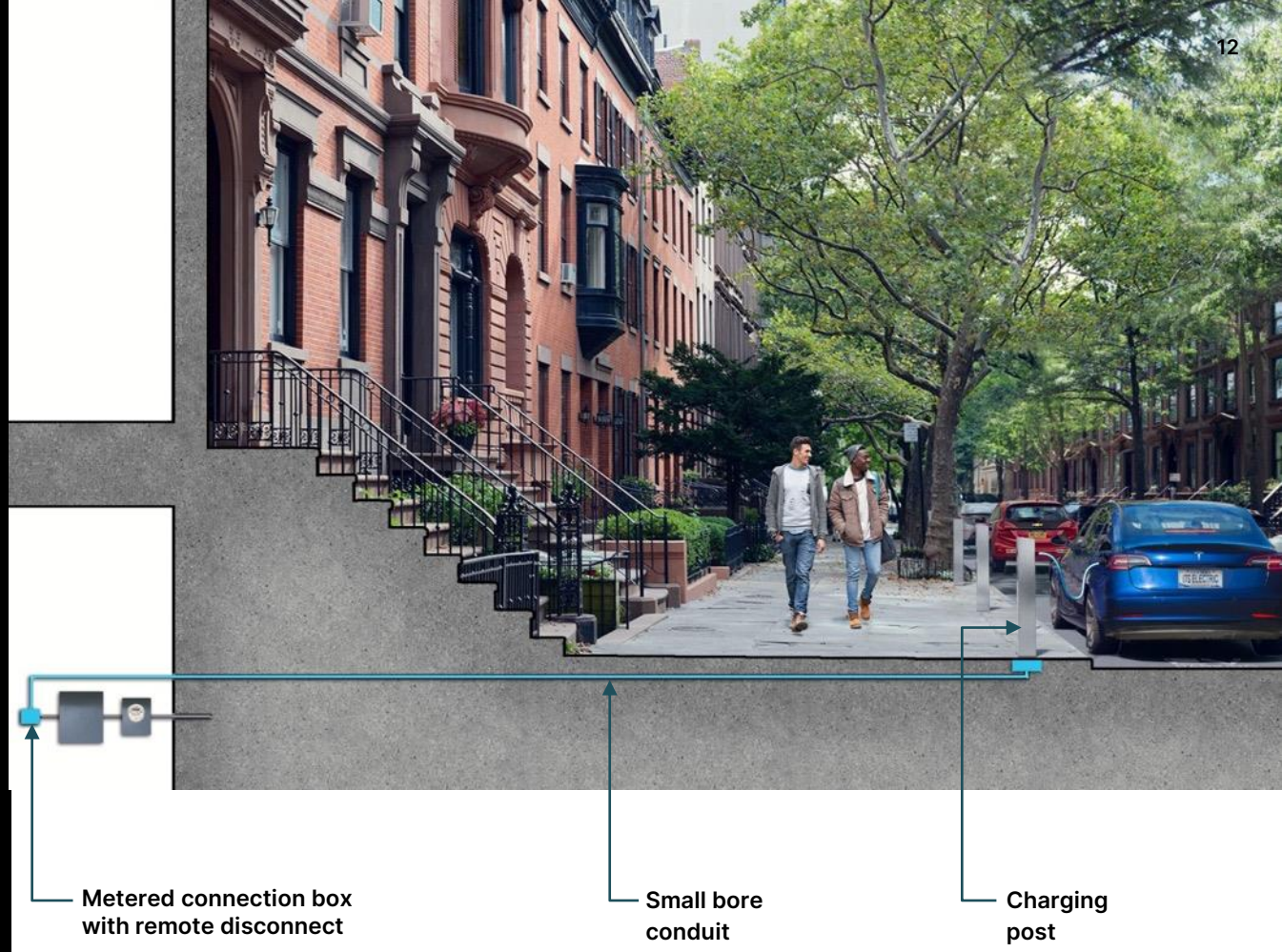
itselectric's is dedicated to reducing the friction around deploying public EV charging in cities.

Rapid Scaling

itselectric can rapidly scale utilizing **existing** residential and commercial electric **infrastructure**.

In return, we **share revenue** with our partner properties.

This **"behind the meter"** installation avoids the costly and time consuming process of connecting to the utility under the roadway.



Designing a dream city is easy; rebuilding a living one takes imagination.

Jane Jacobs


Thank You!

Overcoming Barriers

Transparent and Inclusive Processes

- Engage impacted communities early and often
- Make planning documents and processes easily accessible
- Hold listening sessions and design materials to address community needs and concerns

Comprehensive and Flexible Plans

- Expand focus beyond single-family cars – public transportation, heavy vehicles
- Target public charging and elimination of charging deserts
- Evaluate impacts and outcomes and adjust accordingly

Center Equity from the Start

- Establish equity-based goals and how they will be tracked
- Design incentives and financing to be accessible to all, with an emphasis on overcoming income barriers
- Establish goals and accountability mechanisms in partnership with communities