Smart Mobility Across Ohio

January 2021

DriveOhio

Ohio's Smart Mobility Ecosystem

DriveOhio

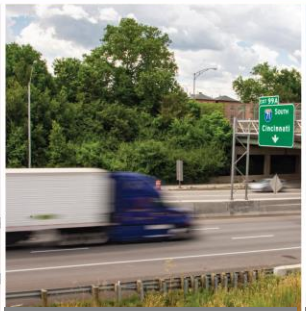
flyOhio

Rural Mobility

FlyOhio

2020 DriveOhio ANNUAL REPORT

Electrification



Smart Logistics

City Solutions

Source: 2020 DriveOhio Annual Report

City of Columbus awarded $50m for Smart Columbus

2016

Union County awarded $5.9m ATCMTD grant for US33

Ohio Research Project with Unmanned Aircraft

1st Smart Mobility Summit

2017

DriveOhio RFP for AV/CV Plan Framework

SMARTCenter Partnership Announced

Governor Kasich Signs Executive Order for AV Testing

Procurement for Self-Driving Shuttles

2018

SMARTCenter Testing Facility Groundbreaking

DriveOhio sponsors INNOVATE-O-thon

A UAS Strategic Plan is announced

RFP's go out for a "Connected Marysville"

SkyVision is Launched

Ohio wins $7.5m USDOT ADS Grant

2019

Governor DeWine Signs Executive Order

#STEMDrivesOhio Design Challenge

Smart Belt Coalition Issues RFI for Truck Automation

Nexar's CityStream Pilot Project

EV Charging Study Announced

USDOT announces DriveOhio as first participants on Automated Vehicle Initiative

Ohio wins $4.4m USDOT Grant for I-70 Ohio-Indiana Truck Automation Corridor

2020

DriveOhio

Electrification

DriveOhio
The Future of Smart Mobility

odot
transportation.ohio.gov

Electric Vehicle Charging Study

June 2020

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DriveOhio
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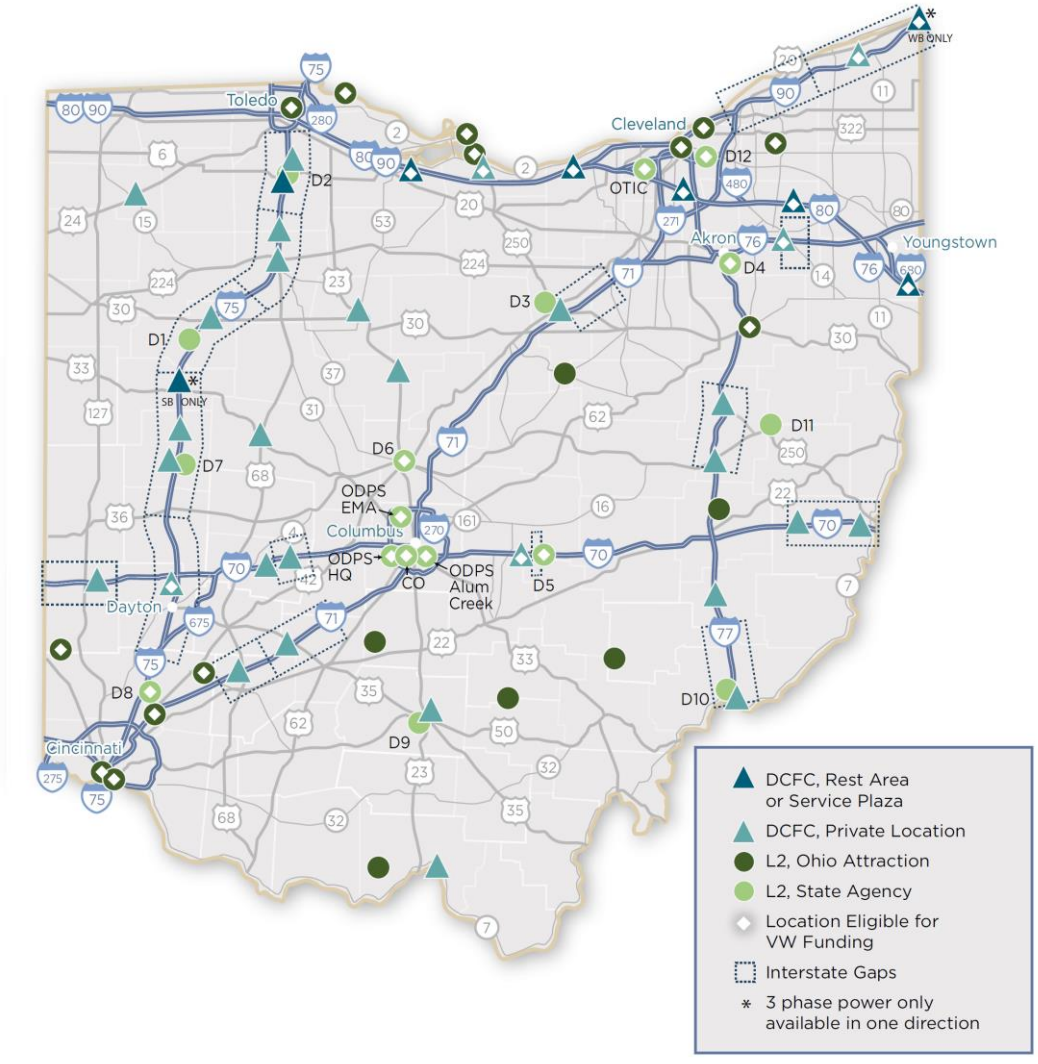

DriveOhio

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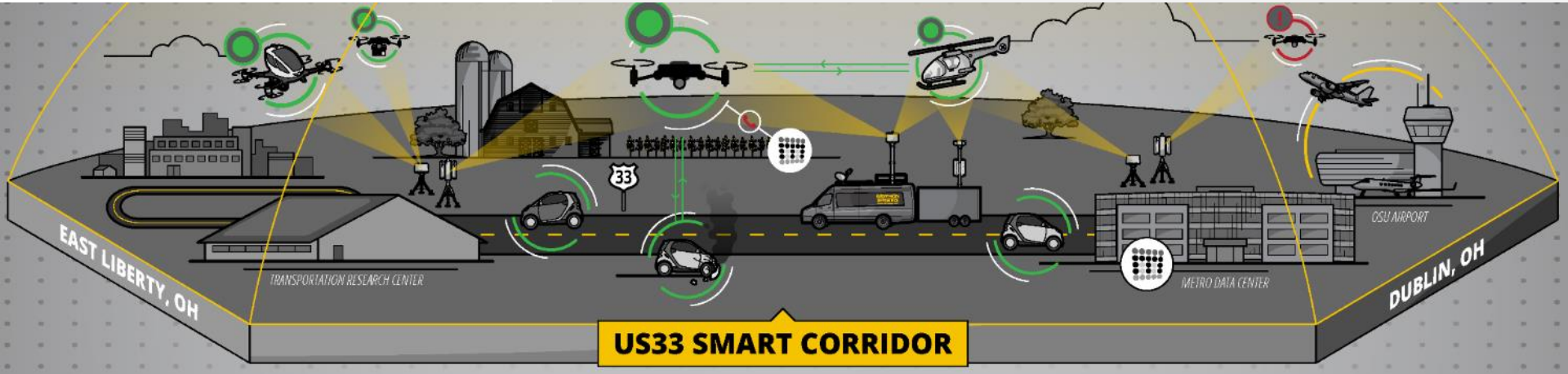
33 SMART MOBILITY CORRIDOR

DriveOhio TRC flyOhio

UNION COUNTY OHIO grow with us. | City of marysville | City of Dublin OHIO, USA

The US 33 Smart Mobility Corridor is one of the world's **largest integrated smart mobility test corridors** – on the ground and in the air.

- 35 miles of **connected + automation-ready** roads
- Low-altitude **air traffic management** testing
- **Industry, academic, and research** collaborations



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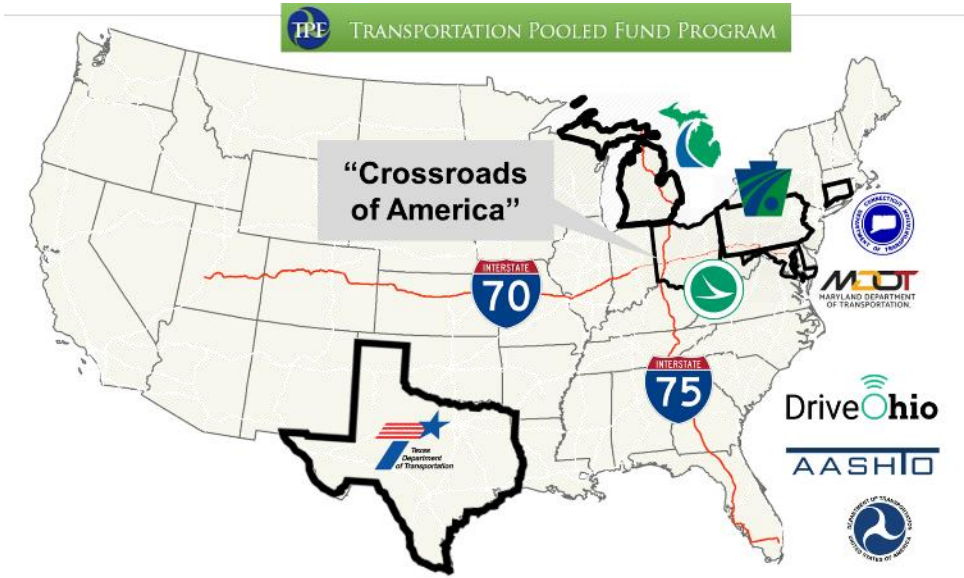
On The Ground

I-70 Truck Automation Corridor



Automated Vehicle (AV) Pooled Fund

DriveOhio

City Solutions


ONE LINDEN
Our Community. Our Future
easy MILE
THE CITY OF
COLUMBUS
SMART
SM
RT
COLUMBUS
easy MILE

Electric Vehicle Charging Study
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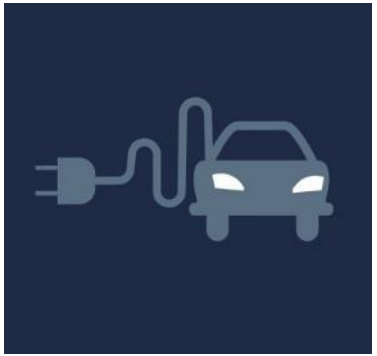
ELECTRIC VEHICLE MARKET STATUS

MANUFACTURER COMMITMENTS



Increase in EV models by 2022

Battery range increasing, prices falling

EV price parity with conventional vehicles

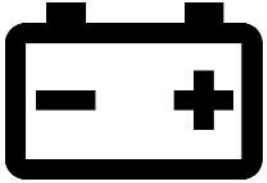
5 models under $30K by 2021

Source: Electric Vehicle Market Status – Update: Manufacturer Commitments to Future Electric Mobility in the U.S. and Worldwide, Lead Authors: Dana Lowell and Alissa, M.J. Bradley & Associates for the Environmental Defense Fund (EDF), www.mjbradley.com/sites/default/files/ElectricVehicleMarketStatusUpdate08142019.pdf

MEDIUM AND LONG TERM GROWTH FACTORS

MANUFACTURER COMMITMENTS

Global market forces have emerged as powerful EV market drivers. To compete in these large markets, U.S. manufacturers must offer attractive EV options.



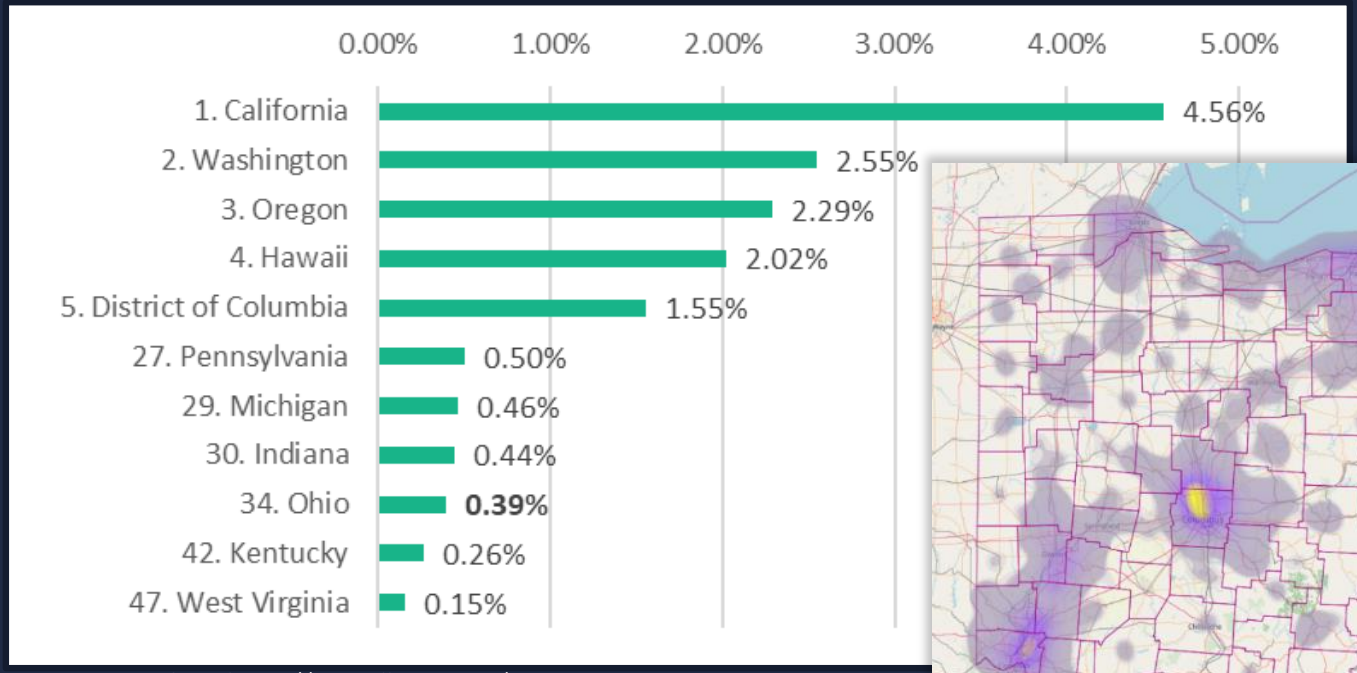
Battery costs will continue to decline due to the normal research and development process

Electrification is a great fit for new and legacy shared mobility services

Options for mid- and heavy-duty electric trucks will help drive cost parity with ICE trucks.

ELECTRIC VEHICLE MARKET SHARE

RANKINGS BY STATE



Source: Data from https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/

Source: Ohio BMV Registration Data

OHIO DEPARTMENT OF TRANSPORTATION

OUTREACH AND BENCHMARKING

UTILITY ORGANIZATIONS

- PUCO
- AEP Ohio – American Electric Power
- AMP – American Municipal Power
- OEC – Ohio's Electric Cooperatives

OHIO STAKEHOLDERS

- Ohio EPA
- OTIC
- MORPC
- City of Columbus

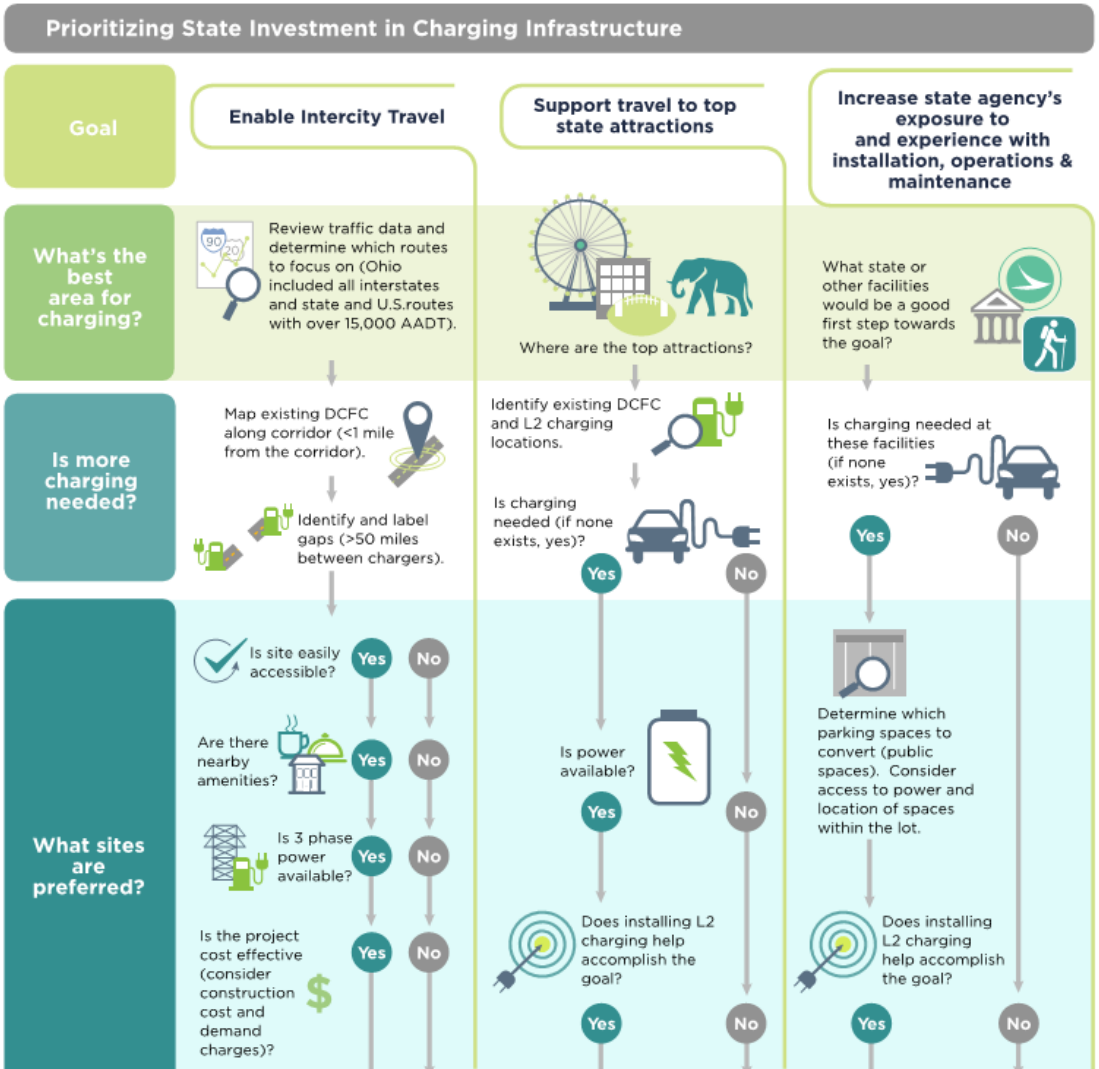
VENDORS

- ChargePoint
- Greenlots

OTHERS

- USDOT
- Colorado Energy Office
- Michigan Department of Environment
- MNDOT
- WSDOT

PROCESS


Prioritizing State Investment in Charging Infrastructure
Goal
Enable Intercity Travel
Support travel to top state attractions
Increase state agency's exposure to and experience with installation, operations & maintenance
What's the best area for charging?
Review traffic data and determine which routes to focus on (Ohio included all interstates and state and U.S.routes with over 15,000 AADT).
Where are the top attractions?
What state or other facilities would be a good first step towards the goal?
Is more charging needed?
Map existing DCFC along corridor (<1 mile from the corridor).
Identify and label gaps (>50 miles between chargers).
Identify existing DCFC and L2 charging locations.
Is charging needed (if none exists, yes)?
Yes
No
Is charging needed at these facilities (if none exists, yes)?
Yes
No
What sites are preferred?
Is site easily accessible?
Yes
No
Are there nearby amenities?
Yes
No
Is 3 phase power available?
Yes
No
Is the project cost effective (consider construction cost and demand charges)?
Yes
No
Is power available?
Yes
No
Does installing L2 charging help accomplish the goal?
Yes
No
Determine which parking spaces to convert (public spaces). Consider access to power and location of spaces within the lot.
Does installing L2 charging help accomplish the goal?
Yes
No

DATA

- Road Network
- Traffic Volumes
- Electric Vehicle Charging Infrastructure
- Truck Stops/Gas Stations
- State-Owned Facilities
- Transportation Hubs
- Attractions
- Utility Coverage Areas
- Vehicle Registration Data

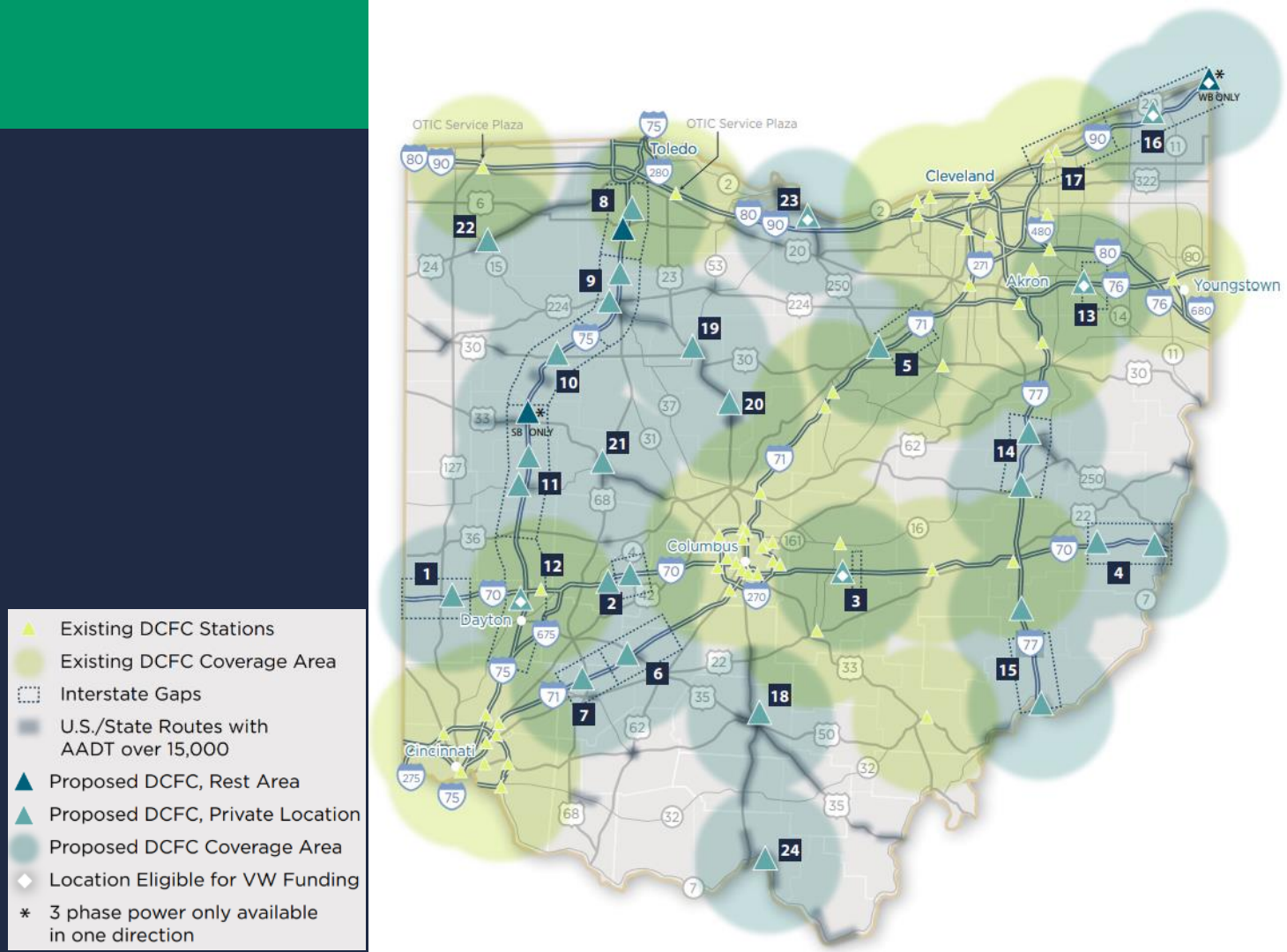
INTERSTATES

1. **Create a 25-mile radius buffer around existing DC Fast Chargers**
2. **Label gaps**
3. **Identify possible DC Fast Charger locations**
   - Have ample parking
   - Are within one mile of the corridor
   - Adjacent to restaurants or other amenities
4. **Identify utility providers and confirm availability of 3-phase power**

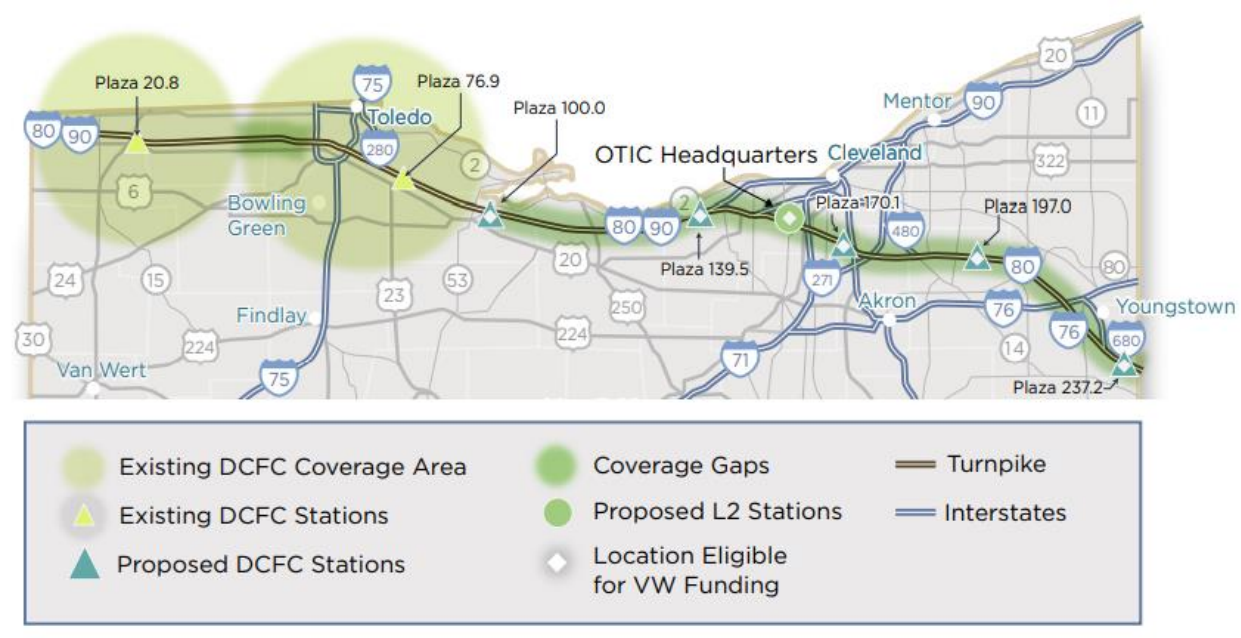
US HIGHWAYS AND STATE ROUTES

1. **Identify U.S. Highways & State Routes with >15k annual average daily traffic (AADT)**
2. **Map existing public DC Fast Chargers within one mile of US/SRs**
3. **Create a 25-mile radius buffer around existing DC Fast Chargers**
4. **Label gaps**
5. **Identify possible DC Fast Charger locations**
   - Have ample parking
   - Are within 1 mile of the corridor
   - Adjacent to restaurants or other amenities
6. **Identify utility providers and confirm availability of 3-phase power**

DCFC


OTIC Service Plaza
OTIC Service Plaza
Toledo
Cleveland
Akron
Youngstown
Columbus
Dayton
Cincinnati
WB ONLY
SB ONLY
Existing DCFC Stations
Existing DCFC Coverage Area
Interstate Gaps
U.S./State Routes with AADT over 15,000
Proposed DCFC, Rest Area
Proposed DCFC, Private Location
Proposed DCFC Coverage Area
Location Eligible for VW Funding
* 3 phase power only available in one direction

OHIO TURNPIKE INFRASTRUCTURE COMMISSION



OHIO DEPARTMENT OF TRANSPORTATION

LEVEL 2


Maumee Bay State Park
Toledo Zoo
Toledo
Marblehead Lighthouse State Park
Cleveland Zoo
Cleveland Museum of Art
Cleveland
Punderson State Park
D12
Bowling Green
D2
Cedar Point
OTIC
Findlay
Akron
Youngstown
D4
Van Wert
D3
Mansfield
Canton
Pro Football Hall of Fame
Lima
D1
Wooster
New Philadelphia
Mohican State Park
D11
D6
D7
ODPS EMA
Hueston Woods State Park
Columbus
D5
Cambridge
Salt Fork State Park
ODPS HQ
CO
ODPS Alum Creek
Dayton
Hocking Hills State Park
Burr Oak State Park
Caesar Creek State Park
Deer Creek State Park
D8
Marietta
D10
Athens
Chillicothe
D9
Cincinnati
Kings Island
National Underground Railroad Freedom Center
Portsmouth
Cincinnati Union Terminal
Shawnee State Park
L2, Ohio Attraction
L2, State Agency
Location Eligible for VW Funding

DCFC & L2


Toledo
Cleveland
OTIC
D12
D2
Akron
D4
Youngstown
D3
D1
SB ONLY
WB ONLY
D11
D6
D7
ODPS
EMA
Columbus
ODPS
HQ
CO
ODPS
Alum
Creek
D5
Dayton
D8
D10
D9
Cincinnati
DCFC, Rest Area or Service Plaza
DCFC, Private Location
L2, Ohio Attraction
L2, State Agency
Location Eligible for VW Funding
Interstate Gaps
3 phase power only available in one direction

AGENCY INVOLVEMENT

Ohio EPA

Administer $11.2m in electric vehicle charging infrastructure funds from Ohio's Volkswagen settlement funds. 26 Ohio counties eligible. Three funding rounds anticipated. First round for Level 2. Second round for DC Fast Chargers. Third round scope TBD.

ODNR

Participate in RFP for Level 2 charging at state lodges and key state parks.

AGENCY INVOLVEMENT

ODAS

Vet chargers and vehicles for universal term contract list and publicize models available to Ohio agencies.

ODPS

Support installation of Level 2 chargers at three of their Franklin County facilities.

ODSA

Identify the top 5 tourist attractions for Level 2 charging.

AGENCY INVOLVEMENT

PUCO

Support rate setting for DC Fast Charging locations served by investor-owned utilities.

OTIC

Continue to install DC Fast Chargers at service plazas. Participate in ODOT RFP for public Level 2 charging at OTIC headquarters.

ODOT

Support and coordinate initial infrastructure installations recommended in Ohio Electric Vehicle Charging Siting Study, including Level 2 sites at ODOT offices.

FRAMEWORK FOR ROLES IN SUPPORTING EV ADOPTION

State	MPO/Regional	County/City
•Maintain a list of available EVs on the market (ODPS/Ohio BMV). •Provide latest trends on EV adoption by zip code, city and county to local and regional agencies (ODOT). •Add (ODAS) and publicize to Ohio agencies EV vehicle models that are on the states universal term contract list. •Consider offering EV purchase incentives. •Evaluate state fleet and duty cycles to determine which vehicles may be appropriate for conversion. •Ensure state vehicles have telematics capable of reporting state of charge and other key indicators.	•Publicize to member agencies EV vehicle models that are on the states universal term contract list. •Educate members on needed local policies and encourage adoption. •Educate elected officials and staff on fleet electrification. •Provide forums to consider electrification of government fleets and strategies to incentivize electrification of private fleets.	•Set local fleet electrification goals. •Analyze opportunities to add EVs to local government and other fleets. •Consider, then clarify/adopt EV parking, signage and other regulations. •Ensure vehicles have telematics capable of reporting state of charge and other key indicators.

FRAMEWORK FOR ROLES IN SUPPORTING EV CHARGING

State	MPO/Regional	County/City
•Plan EV corridor charging: gap identification, power supply analyses, priority locations for private sites. •Identify top destination targets for charging. •Develop state-owned sites for corridor DCFC. •Maintain and publicize to Ohio agencies EV chargers that are on the states universal term contract list. •Facilitate (PUCO) utility EV charging programs and adopt EV-related policies and goals. •Develop template for local EV charging planning. •Update state building code for parking garages to facilitate minimum % of “make ready” wiring.	•Identify gaps in regional DCFC charging network, based on shared mobility services and fleets. •Help identify private or government site hosts to fill DCFC gaps. •Identify additional L2 locations based on traffic flows and site characteristics. •Facilitate project partnerships with utilities, charger providers and installers to develop facilities. •Consider establishing EV charging incentives.	•Develop community based EV charging plan addressing multi-unit dwelling, workplaces, public and fleet charging. •Identify priority locations (government, private); set goals for development. •Enact local policies such as “right to charge,” “make ready” building codes for new builds and renovations, charging facilities in rights of way, others.

DriveOhio
The Future of Smart Mobility

Electric Vehicle Charging Study
June 2020

Questions?

Comments?

Ohio Department of Transportation

Electric Vehicle Charging Study
June 2020

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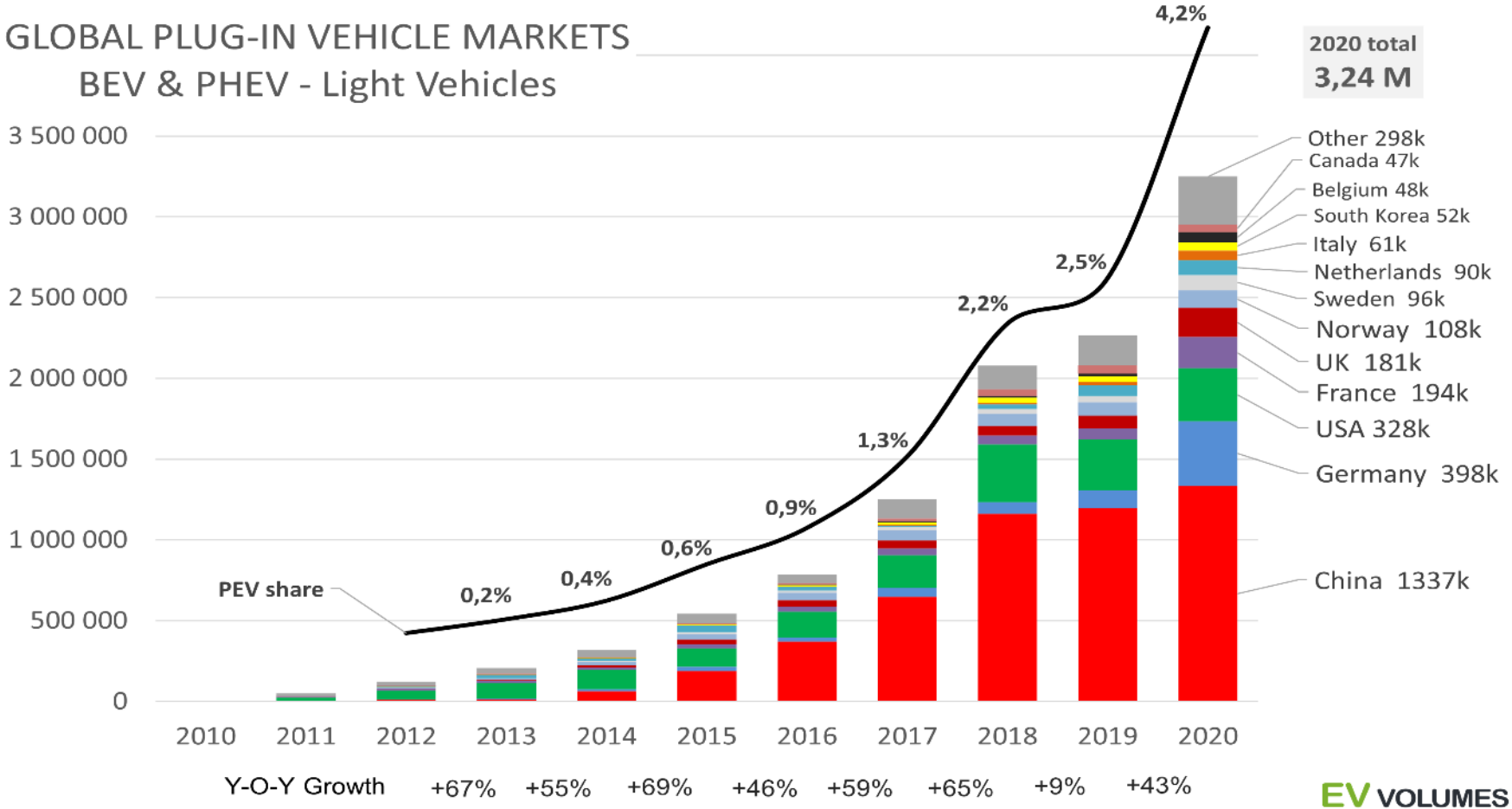
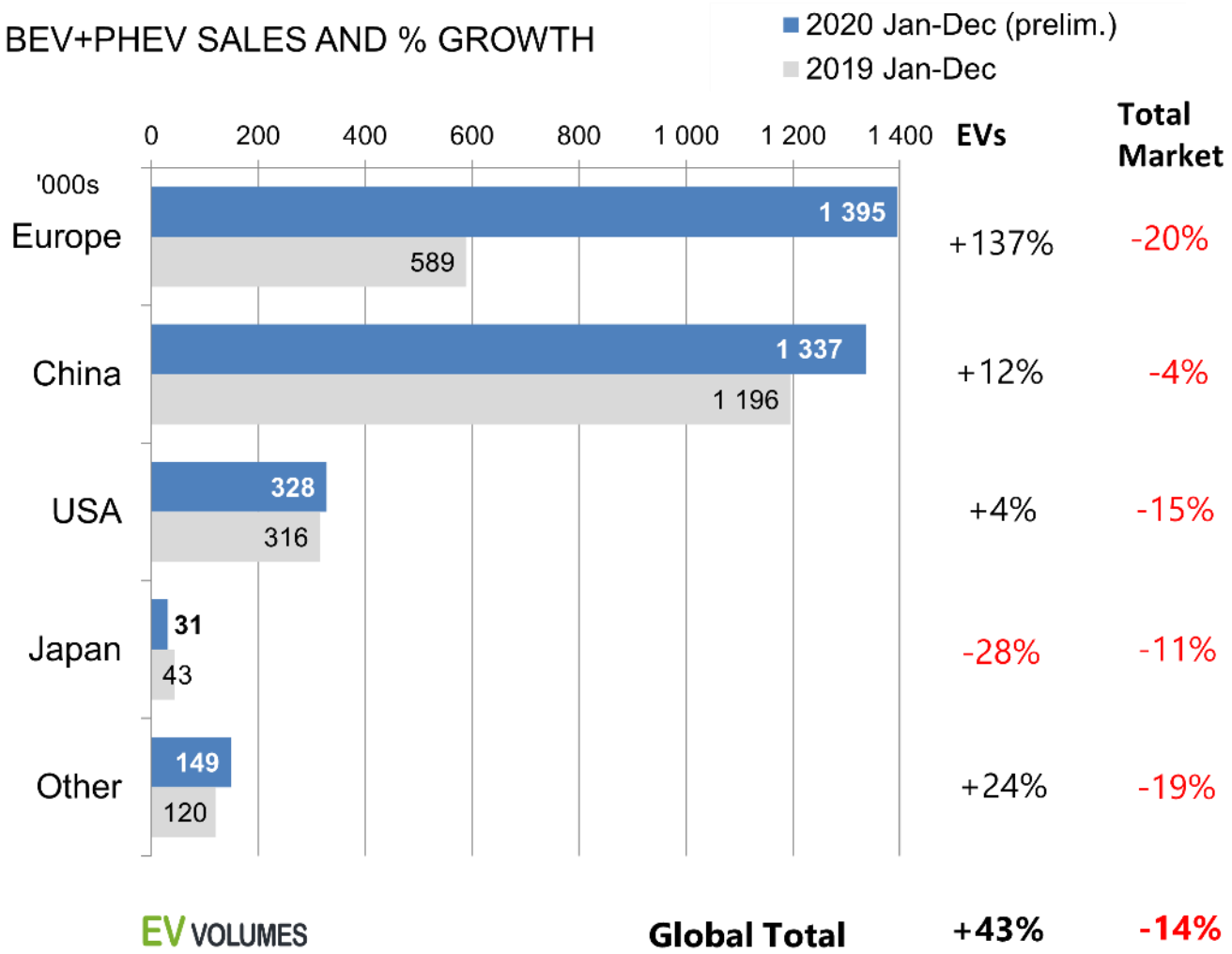

GLOBAL PLUG-IN VEHICLE MARKETS
BEV & PHEV - Light Vehicles
2020 total
3,24 M
3 500 000
3 000 000
2 500 000
2 000 000
1 500 000
1 000 000
500 000
0
PEV share
0,2%
0,4%
0,6%
0,9%
1,3%
2,2%
2,5%
4,2%
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Y-O-Y Growth
+67%
+55%
+69%
+46%
+59%
+65%
+9%
+43%
Other 298k
Canada 47k
Belgium 48k
South Korea 52k
Italy 61k
Netherlands 90k
Sweden 96k
Norway 108k
UK 181k
France 194k
USA 328k
Germany 398k
China 1337k
EV VOLUMES

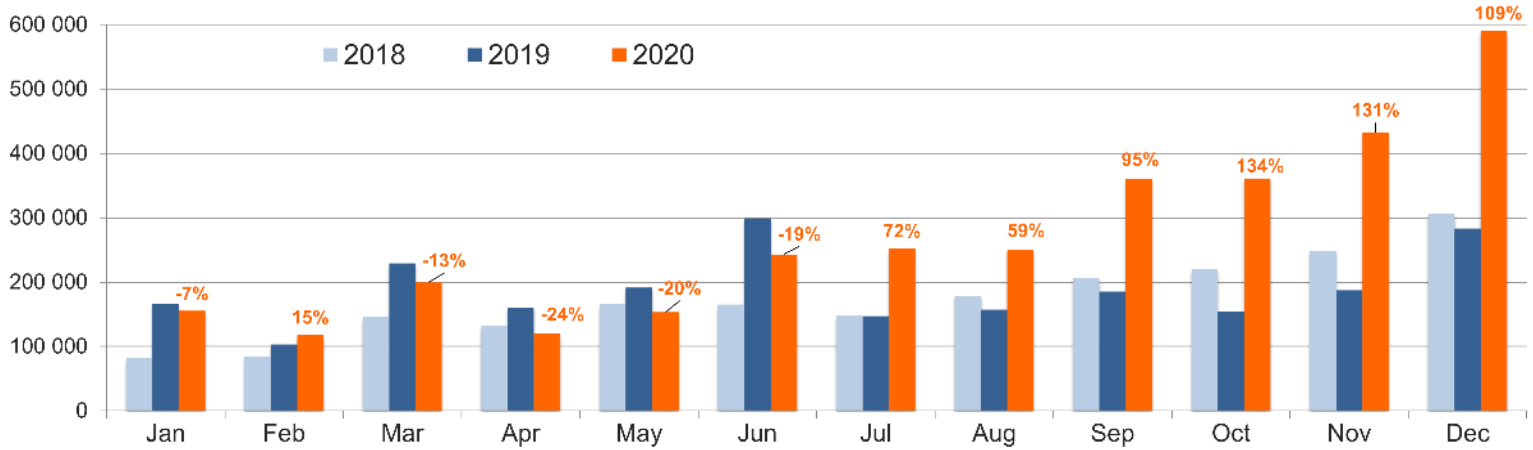

BEV+PHEV SALES AND % GROWTH
2020 Jan-Dec (prelim.)
2019 Jan-Dec
0
200
400
600
800
1 000
1 200
1 400
'000s
EVs
Total Market
Europe
1 395
589
+137%
-20%
China
1 337
1 196
+12%
-4%
USA
328
316
+4%
-15%
Japan
31
43
-28%
-11%
Other
149
120
+24%
-19%
EV VOLUMES
Global Total
+43%
-14%

GLOBAL

MONTHLY
PLUG-IN
VEHICLE SALES
&
Y-O-Y GROWTH

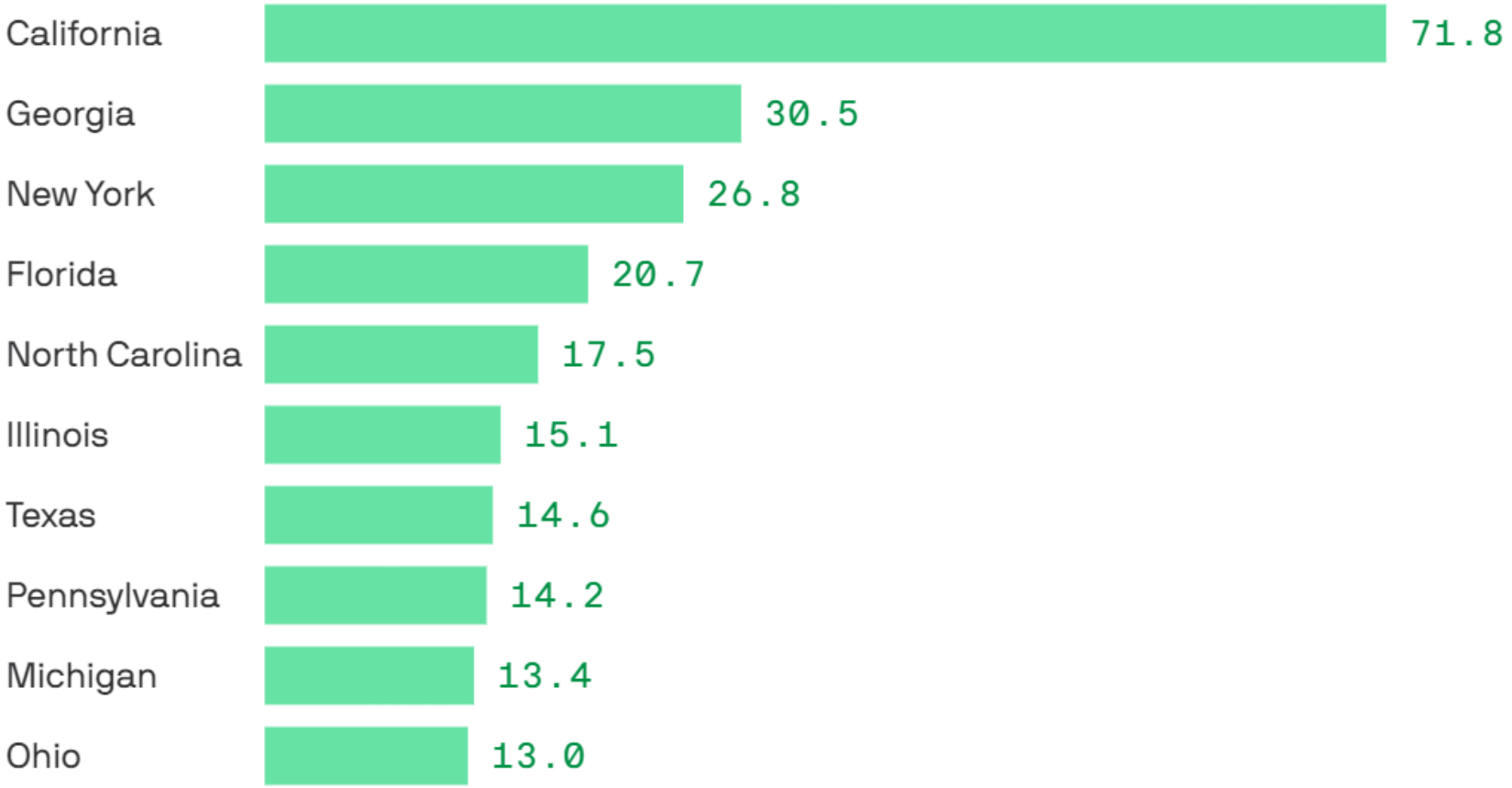
Light
Vehicles

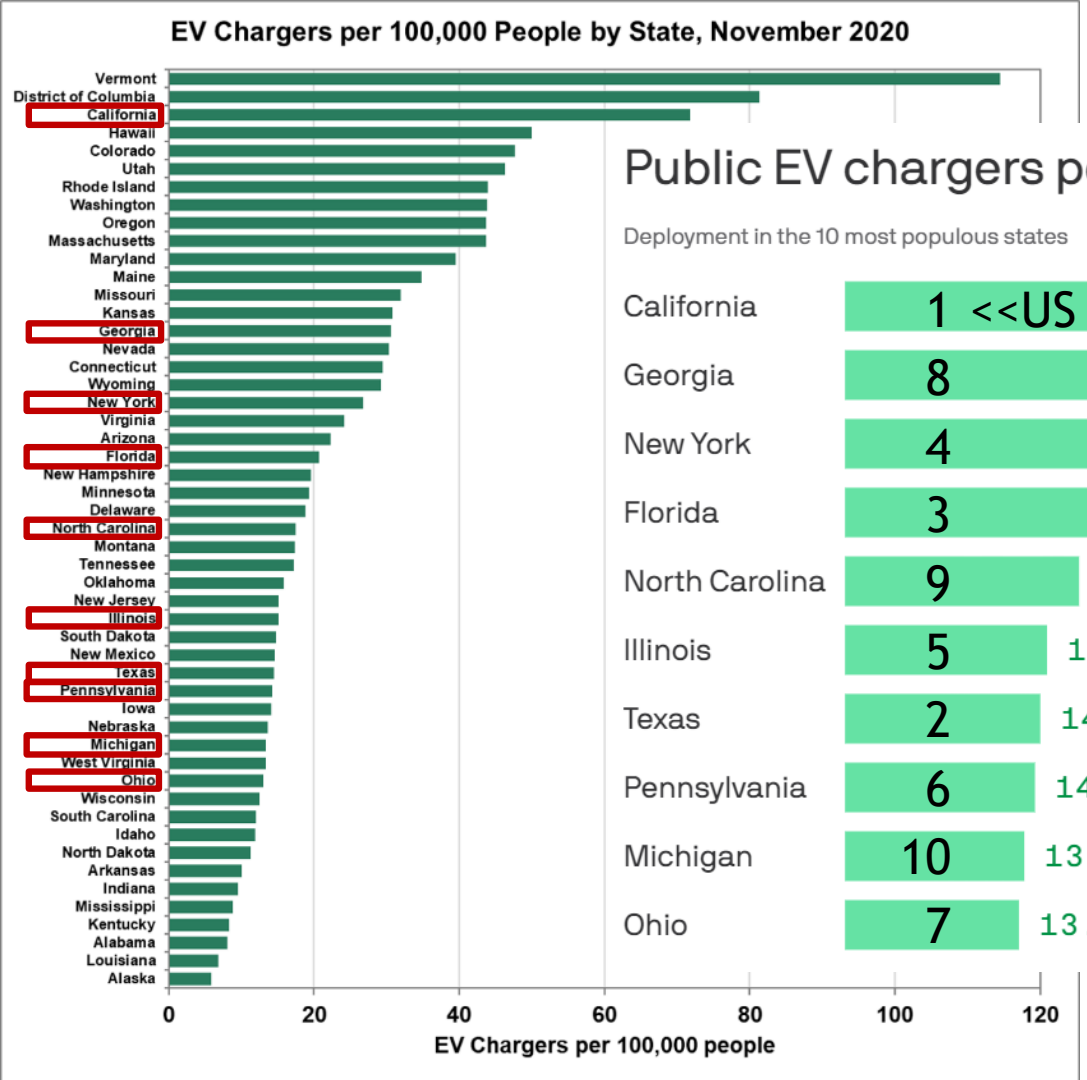
EV VOLUMES



Public EV chargers per 100k people

Deployment in the 10 most populous states





Public EV chargers per 100k people

Deployment in the 10 most populous states

California	1 <<US Population Rank	71.8
Georgia	8	30.5
New York	4	26.8
Florida	3	20.7
North Carolina	9	17.5
Illinois	5	15.1
Texas	2	14.6
Pennsylvania	6	14.2
Michigan	10	13.4
Ohio	7	13.0