Electric Vehicle Planning Study

Transportation Committee

May 10, 2021

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Overview

- Why electric vehicles?
- Electric vehicle basics
- State of the electric vehicle market today
- Scaling electric vehicles
- Metropolitan Council Electric Vehicle Planning Study

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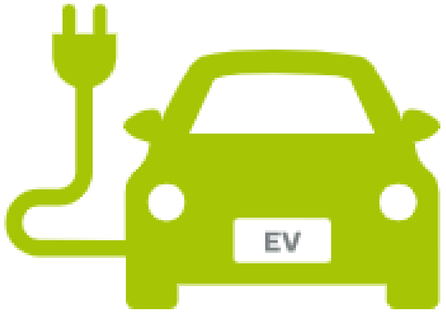

Battery Electric Vehicles (BEVs)

BEVs use a battery to store the electric energy that powers the motor. EV batteries are charged by plugging the vehicle into an electric power source. Examples of BEVs include the Nissan Leaf, Chevy Bolt, Tesla Model 3, etc...

Plug-In Hybrid Electric Vehicles (PHEV)

PHEVs are powered by an internal combustion engine that can run on conventional or alternative fuel and an electric motor that uses energy stored in a battery. The vehicle can be plugged into an electric power source to charge the battery. Examples of PHEVs include the Mitsubishi Outlander, Chrysler Pacifica Hybrid, and Chevy Volt.

Hybrid Ele les (HEV)

HEVs are pri wered by an internal co gine that runs on conver native fuel and an electr s energy stored ery. ehicles do not ge d into ric power source f harging a e not a focus of Drive Electric MN. A common example of an HEV is the Toyota Prius.

Benefits of EVs

- Large greenhouse gas emissions reductions.
- Zero tailpipe emissions from BEVs.
  - As a result, improves air quality and reduces public health impacts from transportation.
- Helps states meet climate and energy goals.
- Less maintenance and more fuel savings for consumers and fleets.
- Operation: Fun to drive, smooth, no acceleration lag, QUIET.

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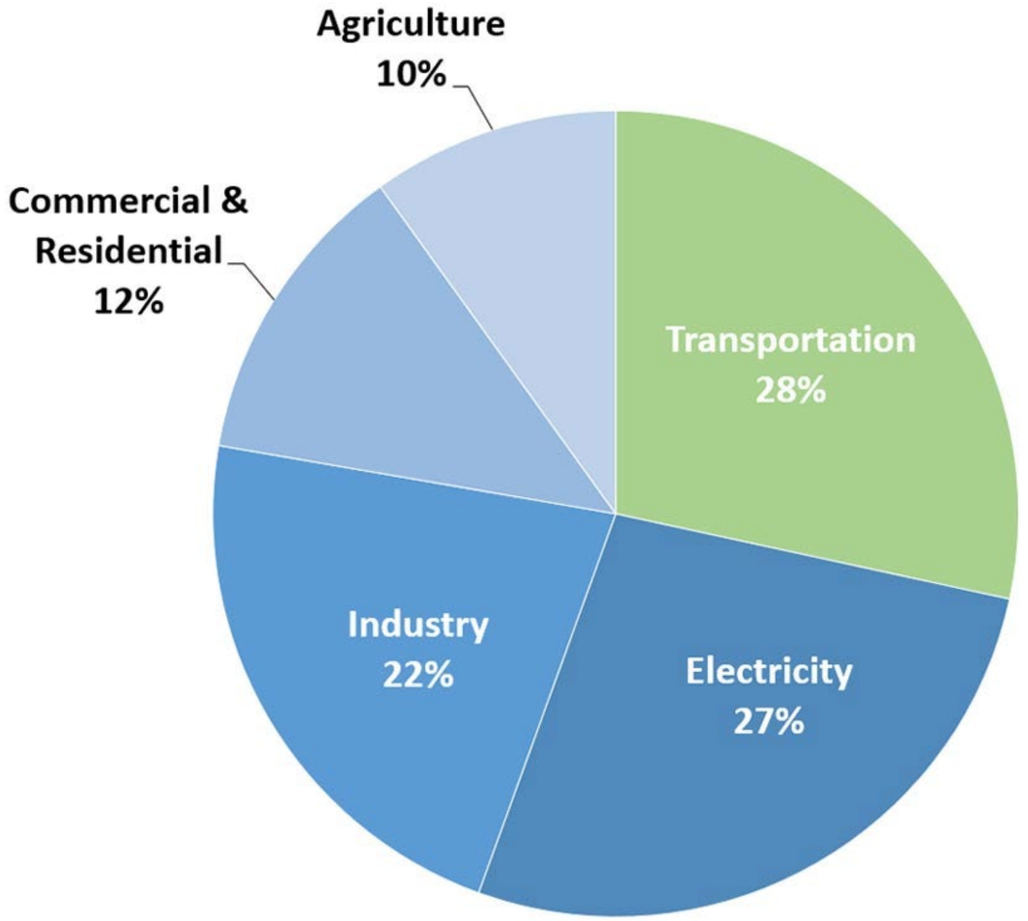
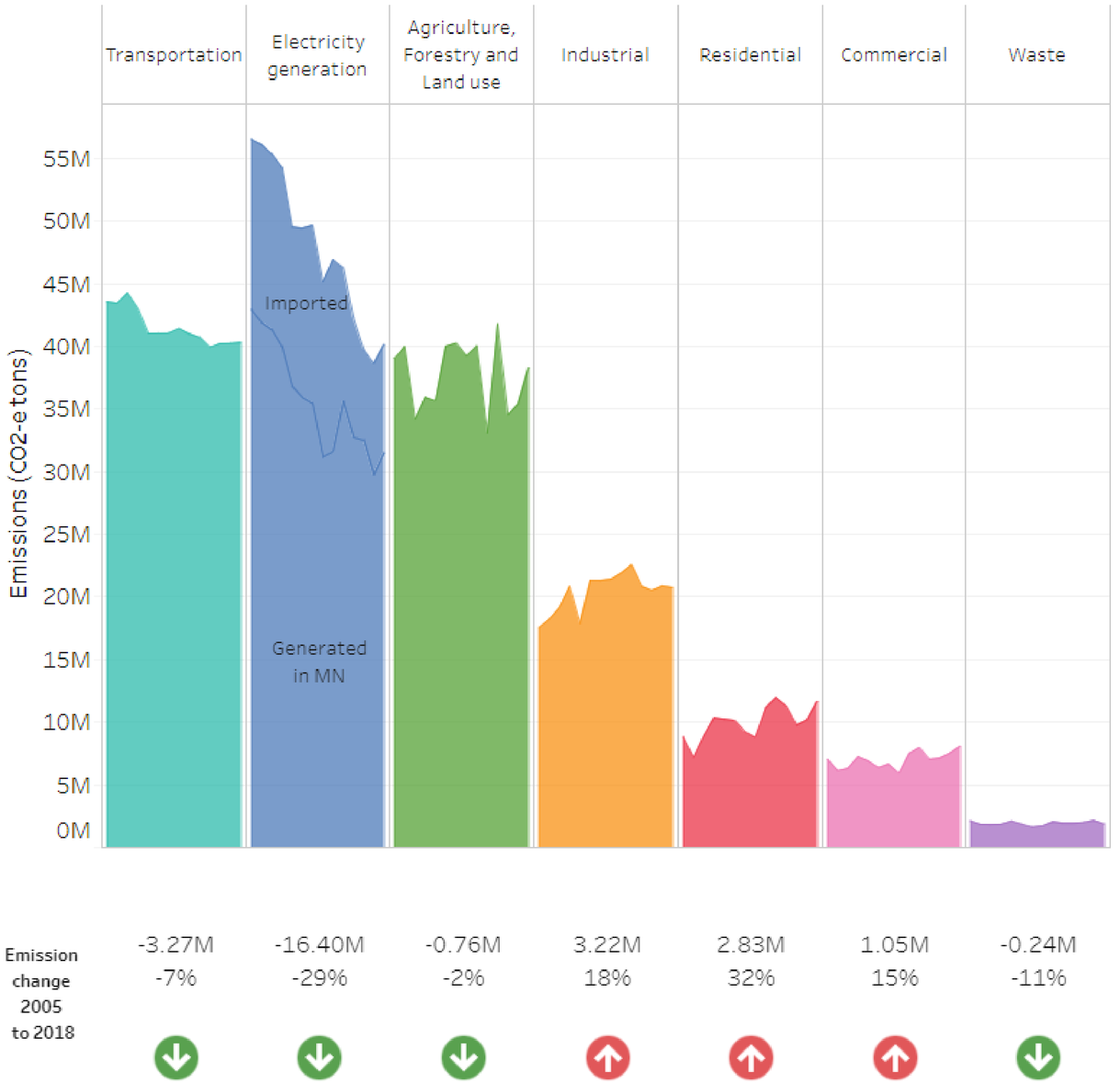
Total U.S. Greenhouse Gas Emissions by Economic Sector in 2018

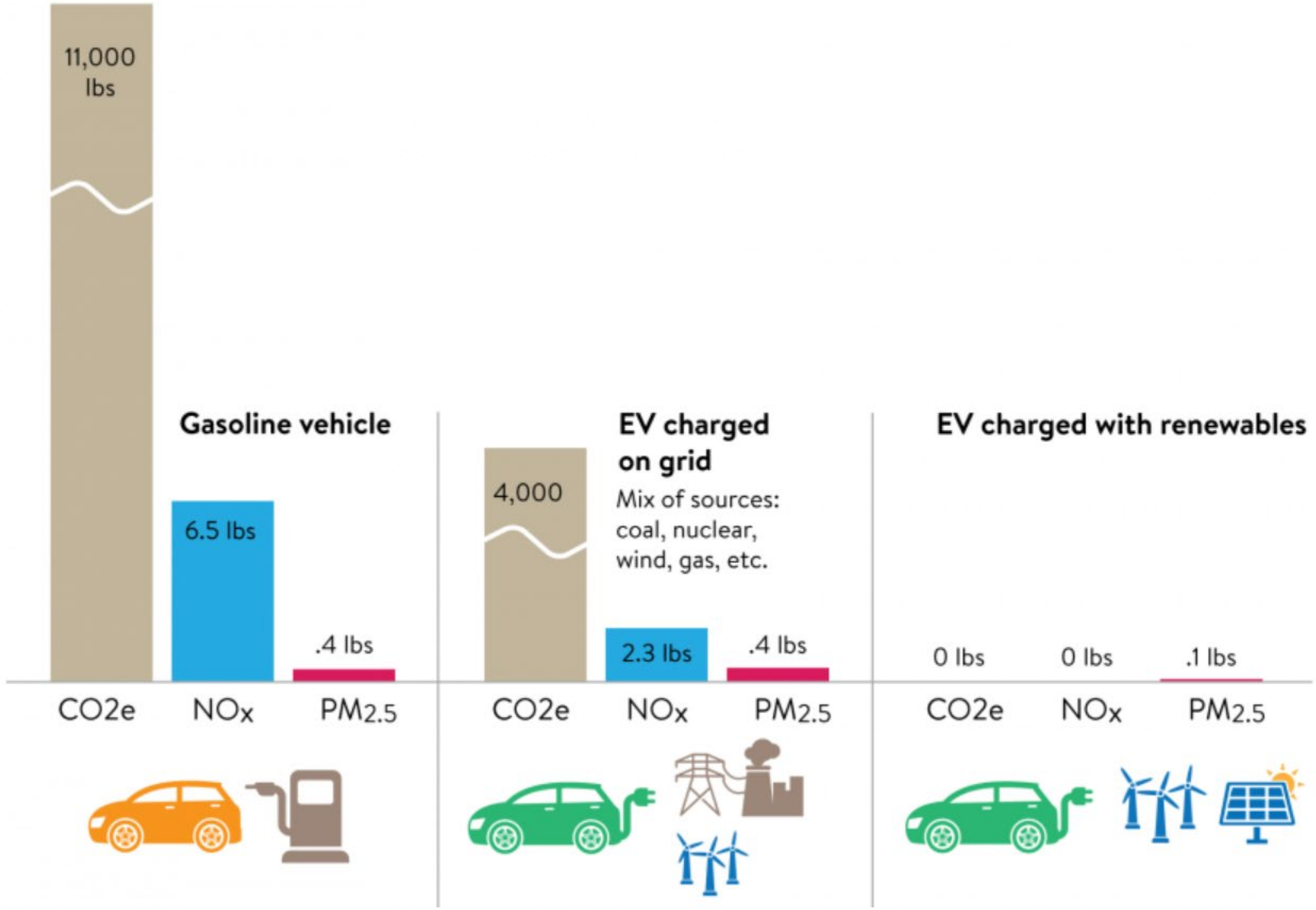


U.S. Environmental Protection Agency (2020). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018



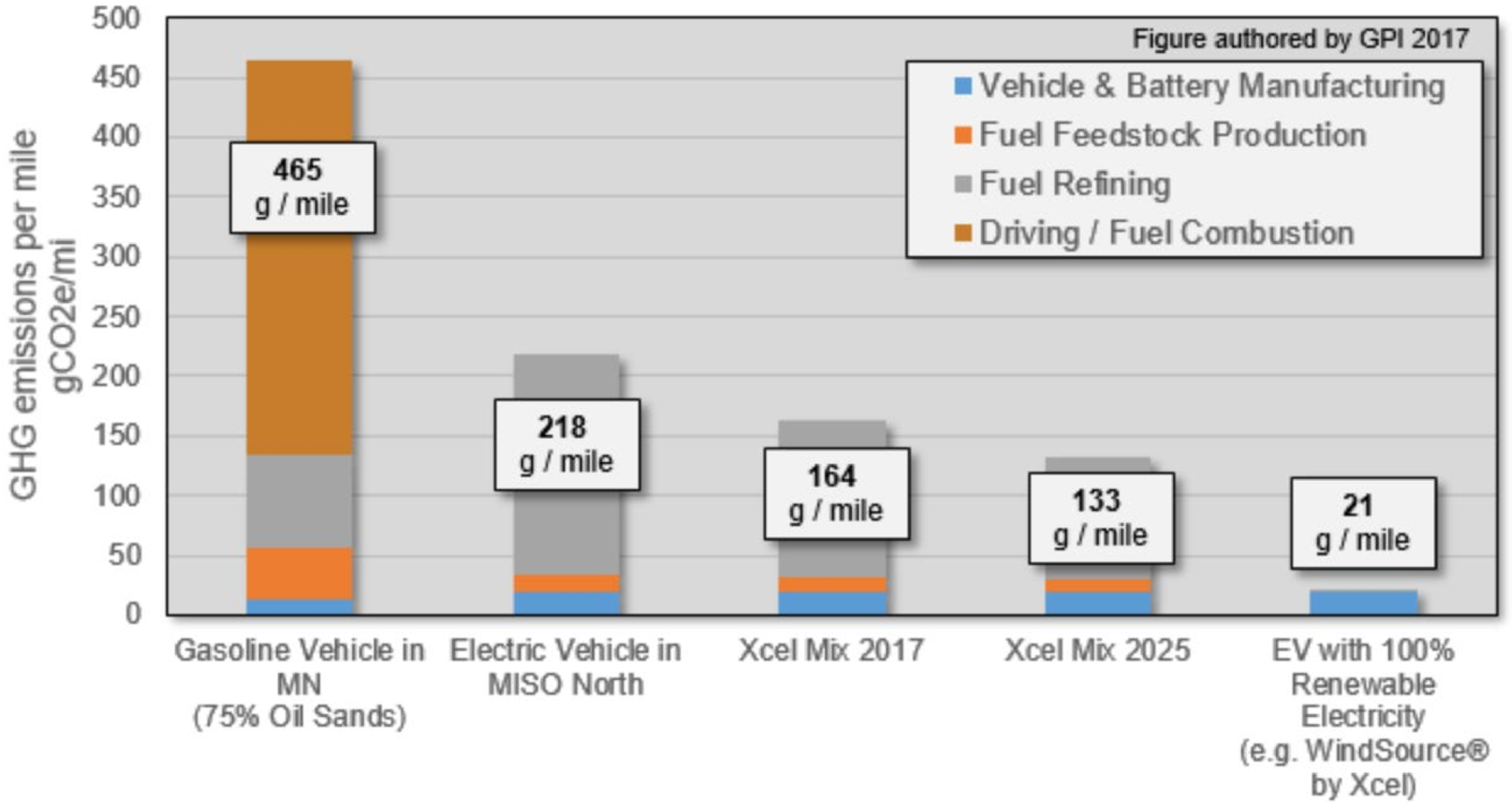
Source: Minnesota Pollution Control Agency, https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data

Annual well-to-wheel car emissions by fuel type (12,000 miles compact / midsize car)



Source: Minnesota Pollution Control Agency, https://www.pca.state.mn.us/air/electric-vehicles

GHG Emissions: Gasoline vs. Electric in Minnesota



Source: Great Plains Institute, 2017

Opportunity for Greenhouse Gas Emissions through EV Adoption by 2030

Electric Grid Mix	% Reduction in Lifecycle GHG Emissions from Gasoline Vehicle	# of Electric Vehicles (% of Passenger Fleet)	Annual Reduction (Tons CO_2)
Xcel Energy (2025 Mix)	71%	91 thousand (5%)	364 thousand
		274 thousand (15%)	1.1 million
100% Renewable	95%	91 thousand (5%)	487 thousand
		274 thousand (15%)	1.5 million

Note: Remaining emissions associated with 100% renewable electricity mix are attributable to vehicle development, battery, etc. Analysis assumes average annual VMT of 12k miles per vehicle and assumptions around total passenger fleet based on cumulative MN vehicle registrations by 2030 with a 2020 baseline.

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Source: Great Plains Institute, 2017

Maintenance Schedule for your 2016 Chevrolet Cruze Limited

Certified Service	7,500 miles	15,000 miles	22,500 miles	30,000 miles	37,500 miles	45,000 miles	52,500 miles	60,000 miles	67,500 miles	75,000 miles	82,500 miles	90,000 miles	97,500 miles	105,000 miles	112,500 miles	120,000 miles	127,500 miles	135,000 miles	142,500 miles	150,000 miles
Rotate tires, if recommended for the vehicle, and perform Required Services. Check engine oil level and oil life percentage. Change engine oil and filter, if needed.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Replace passenger compartment air filter (or 2 years, whichever comes first).			✓			✓			✓			✓			✓			✓		
Replace engine air cleaner filter (or every 4 years, whichever occurs first).						✓						✓						✓		
Replace spark plugs and inspect spark plug wires.													✓							
Replace spark plugs. Inspect ignition coils boots. (Applies to: 1.4 L)								✓								✓				
1.8L Engine Only: Rplace timing belt, idler pulley, and timing belt tensioner (or every 3 years, whichever comes first). (Applies to: 1.8 L)													✓							
Change automatic transmission fluid, if equipped. If filter is serviceable, change filter. (Applies to: Severe)						✓						✓						✓		
Change manual transmission fluid. (Applies to: Manual, Severe)						✓						✓						✓		
Drain and fill engine cooling system (or every 5 years, whichever comes first).																				✓
Change brake fluid (or every 3 years, whichever occurs first).						✓						✓						✓		
Change clutch fluid (or every 3 years, whichever occurs first). (Applies to: Manual)						✓						✓						✓		
Inspect evaporative control system.						✓						✓						✓		
Inspect engine accessory drive belts for fraying, excessive cracks or obvious damage (or every 10 years, whichever occurs first).																				✓

Maintenance Schedule for your 2017 Chevrolet Bolt EV

Certified Service	7,500 miles	15,000 miles	22,500 miles	30,000 miles	37,500 miles	45,000 miles	52,500 miles	60,000 miles	67,500 miles	75,000 miles	82,500 miles	90,000 miles	97,500 miles	105,000 miles	112,500 miles	120,000 miles	127,500 miles	135,000 miles	142,500 miles	150,000 miles
Rotate tires, if recommended for the vehicle, and perform Required Services.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Replace passenger compartment air filter (or 2 years, whichever comes first).			✓			✓			✓			✓			✓			✓		
Drain and fill vehicle coolant circuits.																				✓

Source: Shift2Electric.com

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EV Basics

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EV Basics: Light-duty

- Nearly all new BEVs have ranges over 150 miles—suitable for a lot of use cases
  - Use cases: Commuting, Road trips, Car sharing programs, Fleet, Uber/Lyft, others
- Charging: Need to plug in to a charging station or outlet to refuel
  - Level 1: Slowest charge; 120-volt outlet; 2-5 miles of range per hour (24-60 miles of range if plugged in for twelve hours overnight)
  - Level 2: Faster charge; 240-volt outlet; 10-20 miles of range per hour
  - DCFC: Fastest charge, speeds up to 350kW; typically charges vehicle in 30 minutes or less
- Locating public chargers:
  - PlugShare.com
  - All EVs come with technology to locate chargers for that vehicle

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EV Basics: Medium & Heavy-Duty

- Technology is still nascent
- Most common use cases today: delivery, transit (including school buses)
- Charging technology:
  - Plug-in: Utilize same plug standards as light-duty
  - Overhead: Typically used to charge buses; can output greater power than plug-in
- Further out: long-range semis, garbage trucks, airplanes
  - Currently in demonstration phase

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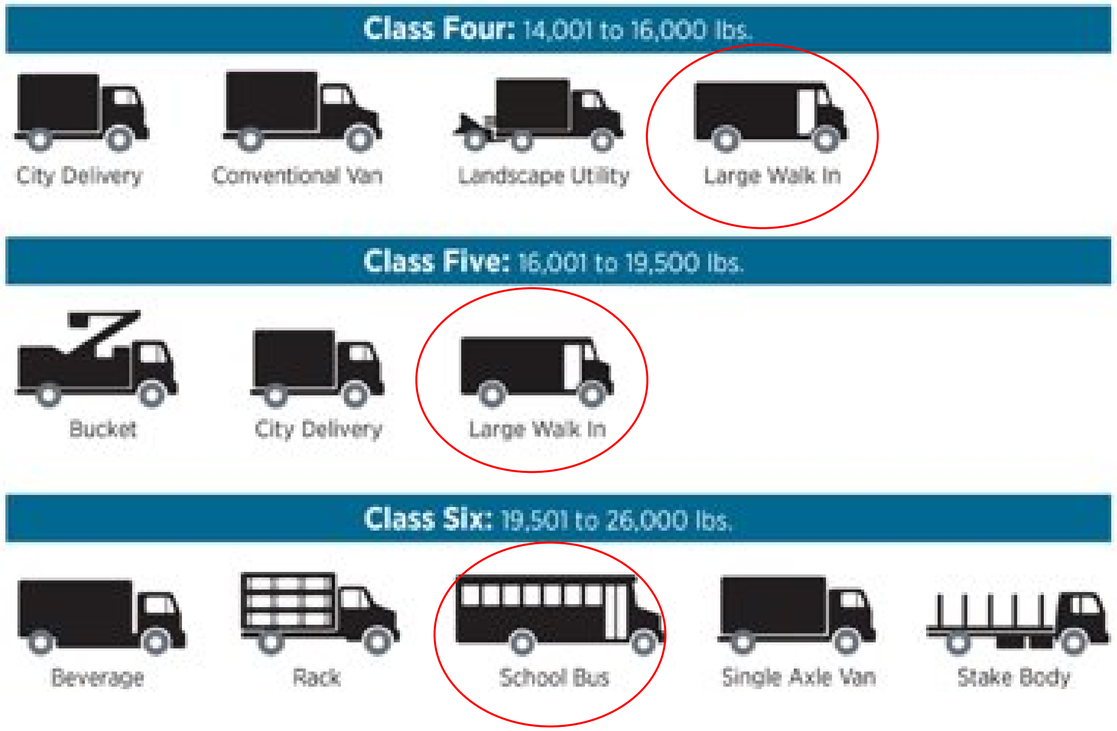
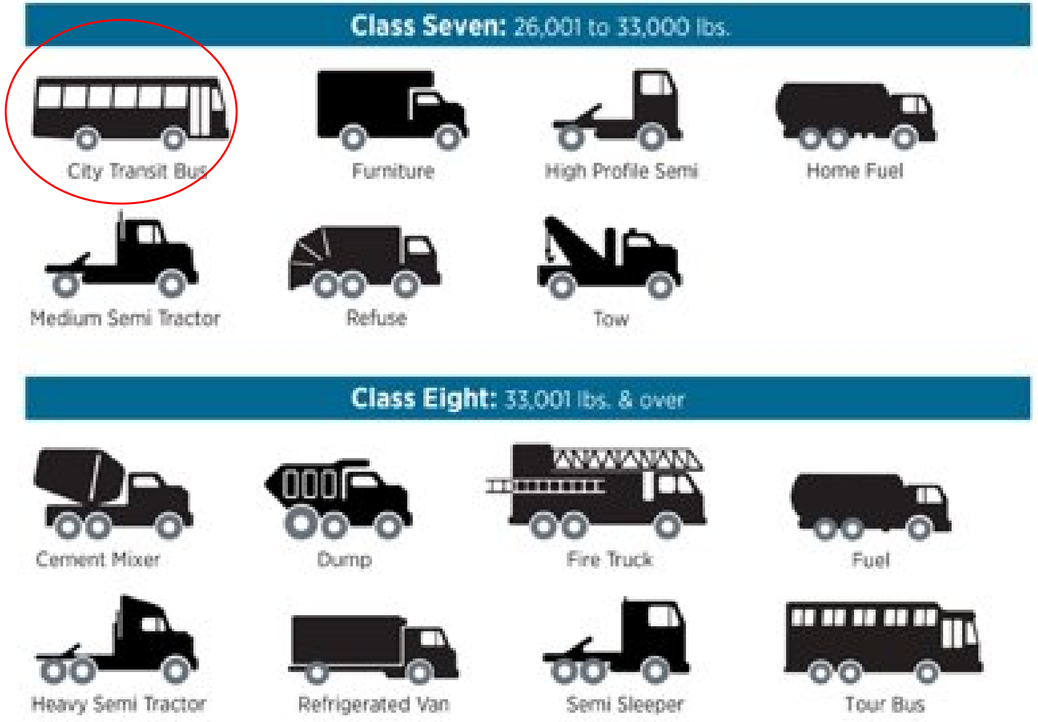
Medium & heavy-duty options for fleets





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State of the EV Market Today

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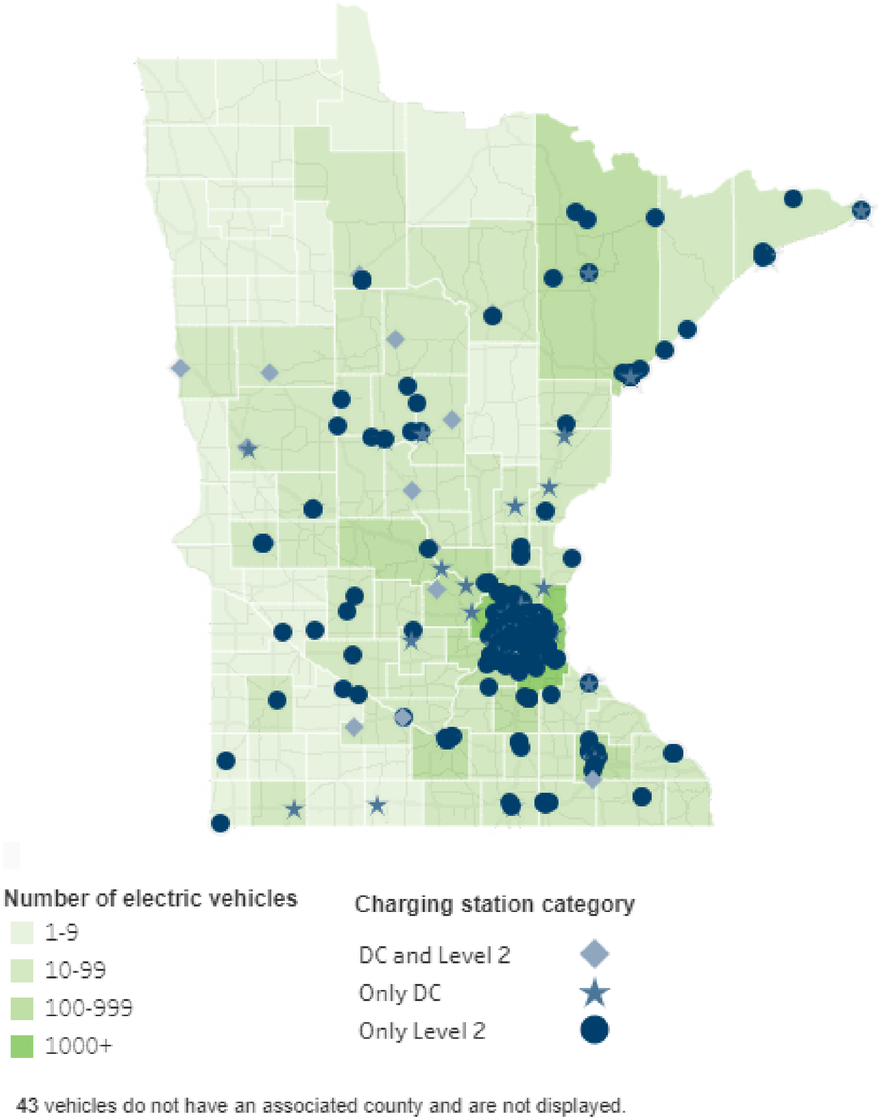
Minnesota EV Registrations & Charging Availability



Charging points

Level 2 charger	DC fast charger	Total
953	191	1,144

Total vehicles per Level 2 charger	Total vehicles per DC fast charger
20	98

Vehicles

Battery electric vehicles (BEV)	Plug-in hybrid electric vehicles (PHEV)	Total
11,184	7,565	18,749

Download data

Last update : February 13, 2021

Source: MPCA

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Source: Minnesota Pollution Control Agency, https://www.pca.state.mn.us/air/minnesota-ev-dashboard

Minnesota Charging Corridors

Volkswagen Settlement Phase 2

Aims to fund 39 new charging stations along corridors

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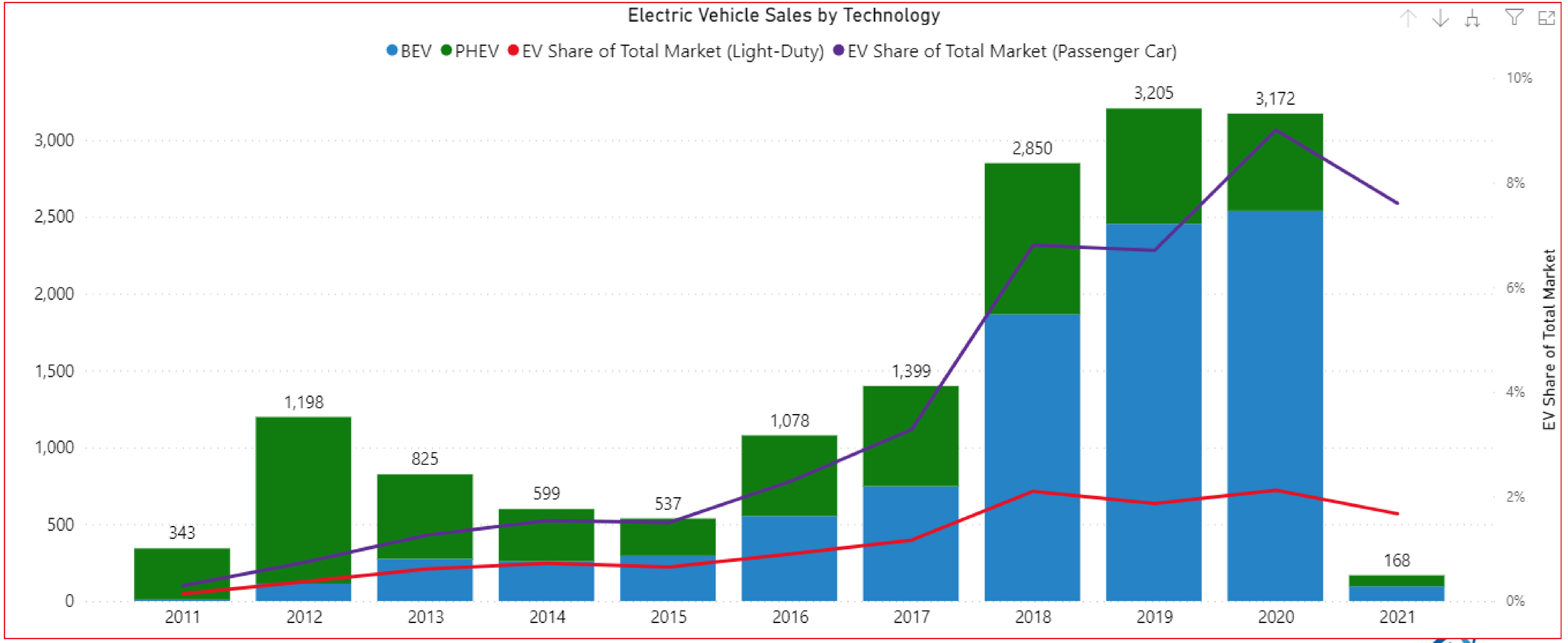
Source: Minnesota Pollution Control Agency, https://www.pca.state.mn.us/sites/default/files/aq-mvp2-35c.pdf

Minnesota EV Sales



Source: Atlas Public Policy EV Hub, 2021

Big EV Commitments

G.M. Will Sell Only Zero-Emission Vehicles by 2035

The move, one of the most ambitious in the auto industry, is a piece of a broader plan by the company to become carbon neutral by 2040.

FORD EUROPE GOES ALL-IN ON EVS ON ROAD TO SUSTAINABLE PROFITABILITY; COLOGNE SITE BEGINS $1 BILLION TRANSFORMATION

Volvo Plans to Sell Only Electric Cars by 2030

The Swedish company would phase out internal combustion engine vehicles faster than other automakers.

Xcel Energy's new electric vehicle vision to save customers billions while delivering cleaner air

Transitioning 20% of all vehicles to electric by 2030 will reduce carbon emissions and save customers billions in fuel costs

From Amazon To FedEx, The Delivery Truck Is Going Electric

March 17, 2021 · 5:01 AM ET

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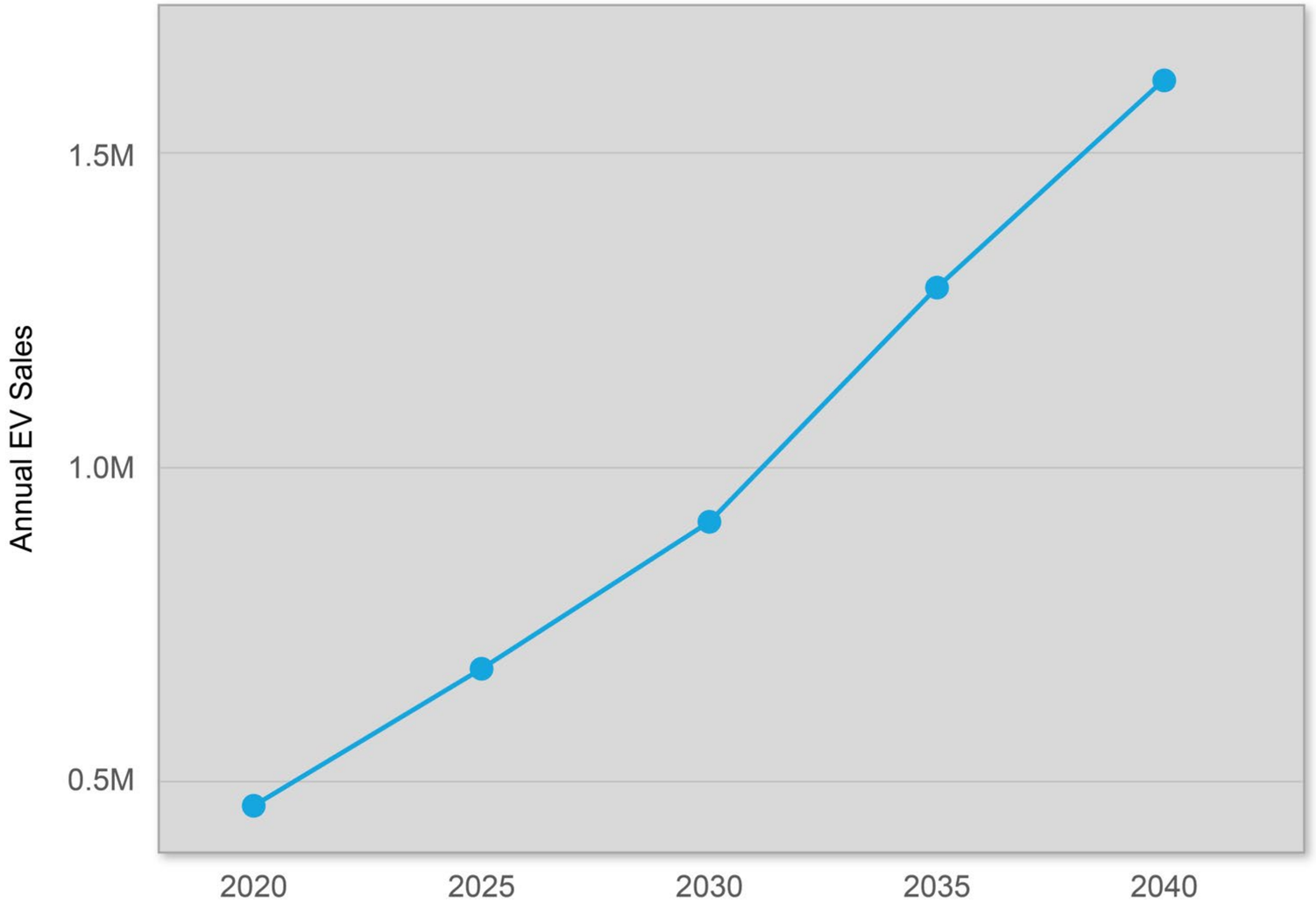
US Annual EV Sales Forecast, 2020-2040



Actual 2020 EV sales
US: 306 thousand
MN: 3 thousand

Current Automobiles
US: 109 million
MN: 1.8 million

Annual Sales
US: 16.8 million
MN: 250 thousand

Source: GPI Analysis based on EIA AEO 2020

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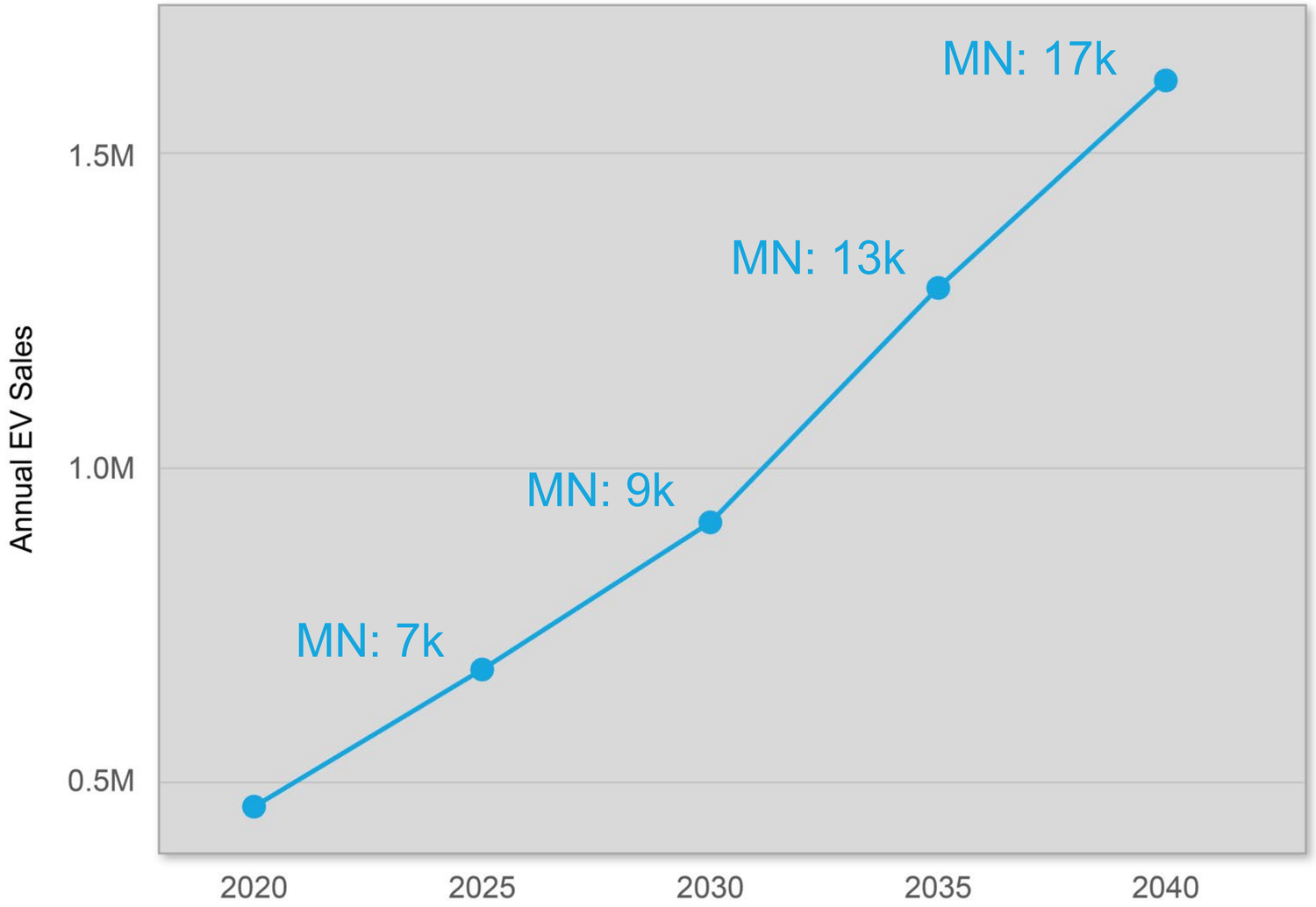
Correlating EV Sales Forecast for MN



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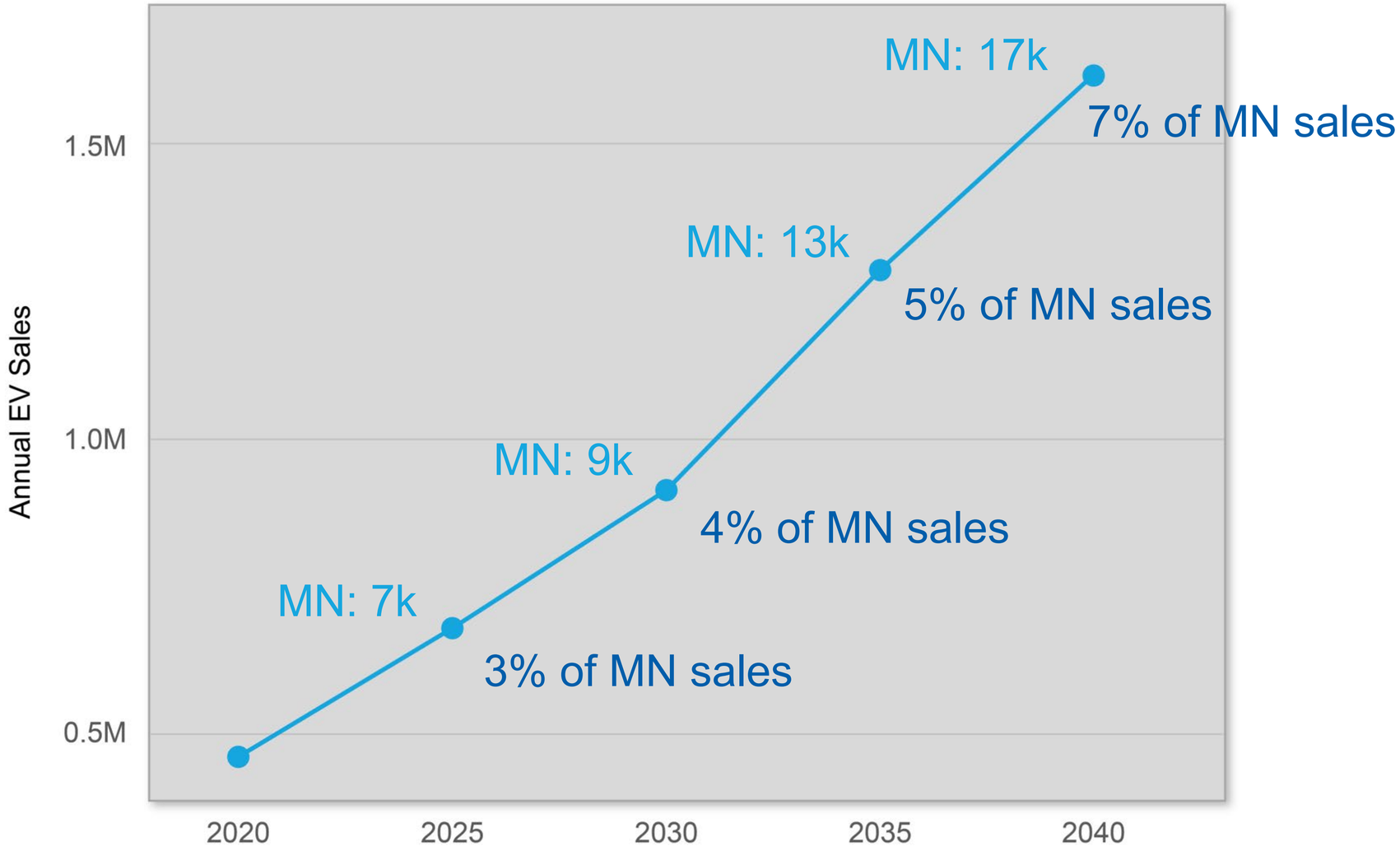

2030:
91 thousand cumulative EVs in MN, out of ~2 million automobiles

< 5% of MN fleet

Source: GPI Analysis based on EIA AEO 2020

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Scaling EVs—Pillars of Success

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Public Policy

- Policies include HOV lane access, EV rebates, low carbon fuel standard, LEV/ZEV, infrastructure rebates and grants, and more
- Minnesota is behind other states when it comes to supportive EV policy
  - Ranked 12th in State Transportation Electrification Scorecard by American Council for an Energy-Efficient Economy. **39.5/100 score.**

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Vehicle Availability

- MN offers 48 EV models compared to 66 offered in other states
  - 19 are BEV; 29 are PHEV
- Consumers want greater selection (body style, trims, colors)
  - More EVs are coming including trucks, vans, SUVs
    - 8 BEV pickups coming in 2021-2022
    - 24 SUVs coming 2021-2024 (mostly BEVs)
- Fleets need more medium & heavy-duty options

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Charging Stations

- Lack of charging in multi-unit dwellings means tenants cannot switch over to EVs
- Correlation has been shown between access to public charging and EV adoption—more public charging stations are needed
- More charging stations provide greater comfort to travelers

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Utility EV Programs

- Common programs include deploying charging infrastructure, supporting fleet adoption, specialized EV rates, and educating consumers
- Lower cost for charging reduces fueling cost and encourages shift to EV

EV Ready Cities

- **Policy**: acknowledge EV benefits and support development of charging infrastructure
- **Regulation**: implement development standards and regulations that enable EV use
- **Administration**: create transparent and predictable EV permitting processes
- **Programs**: develop public programs to overcome market barriers
- **Leadership**: demonstrate EV viability in public fleets and facilities

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Metropolitan Council EV Planning Study

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Study Goals

- Identify strategies to accelerate EV adoption in the Twin Cities as a way to reduce greenhouse gas emissions and improve public health
- Guide future investments, policies, and other work to accelerate EV adoption for the Met Council and partner agencies
- Inform the 2040 Transportation Policy Plan and other investment and policy proposals
- Deliver final products by December 2021

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Planned Engagement

- Technical Advisory Committee consisting of industry, NGOs, academia, local government, state agencies, and others
- Fleet managers as part of fleet analysis
- Interviews with equity groups
- Webinar

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Planned Outcomes

- EV white paper
  - EV landscape
  - Data analysis on travel patterns, vehicles, streetlight data, public awareness
  - Fleet analysis
- EV use case identification and evaluation
- EV charging needs assessment for Twin Cities
- Identification and recommendation of strategies to help Twin Cities scale EV adoption and improve public health, including an equity analysis
- Summary report and presentation

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Questions?

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