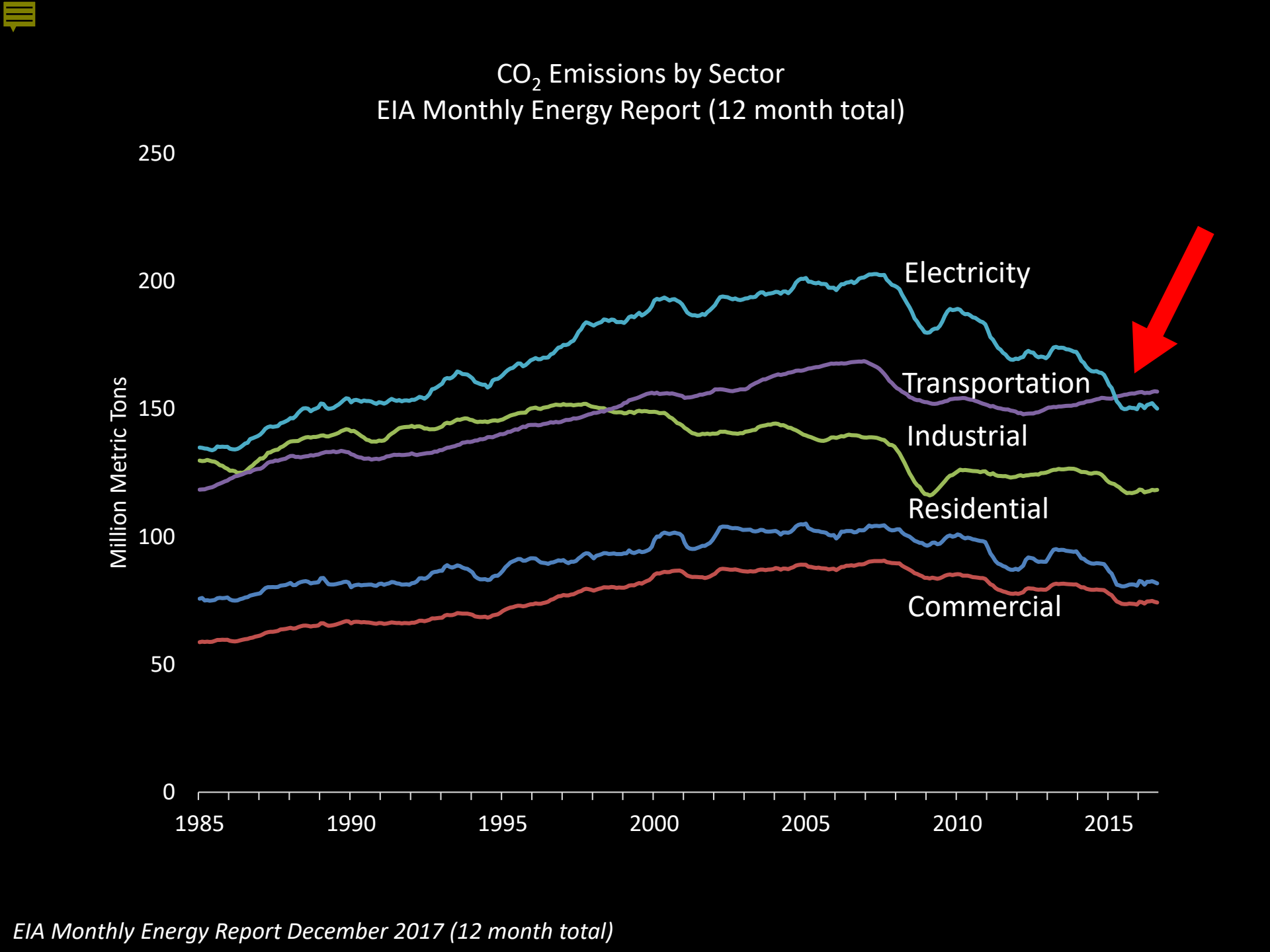
The Future of Mobility: Getting on the Path to Carbon-Free Transportation

Don Anair

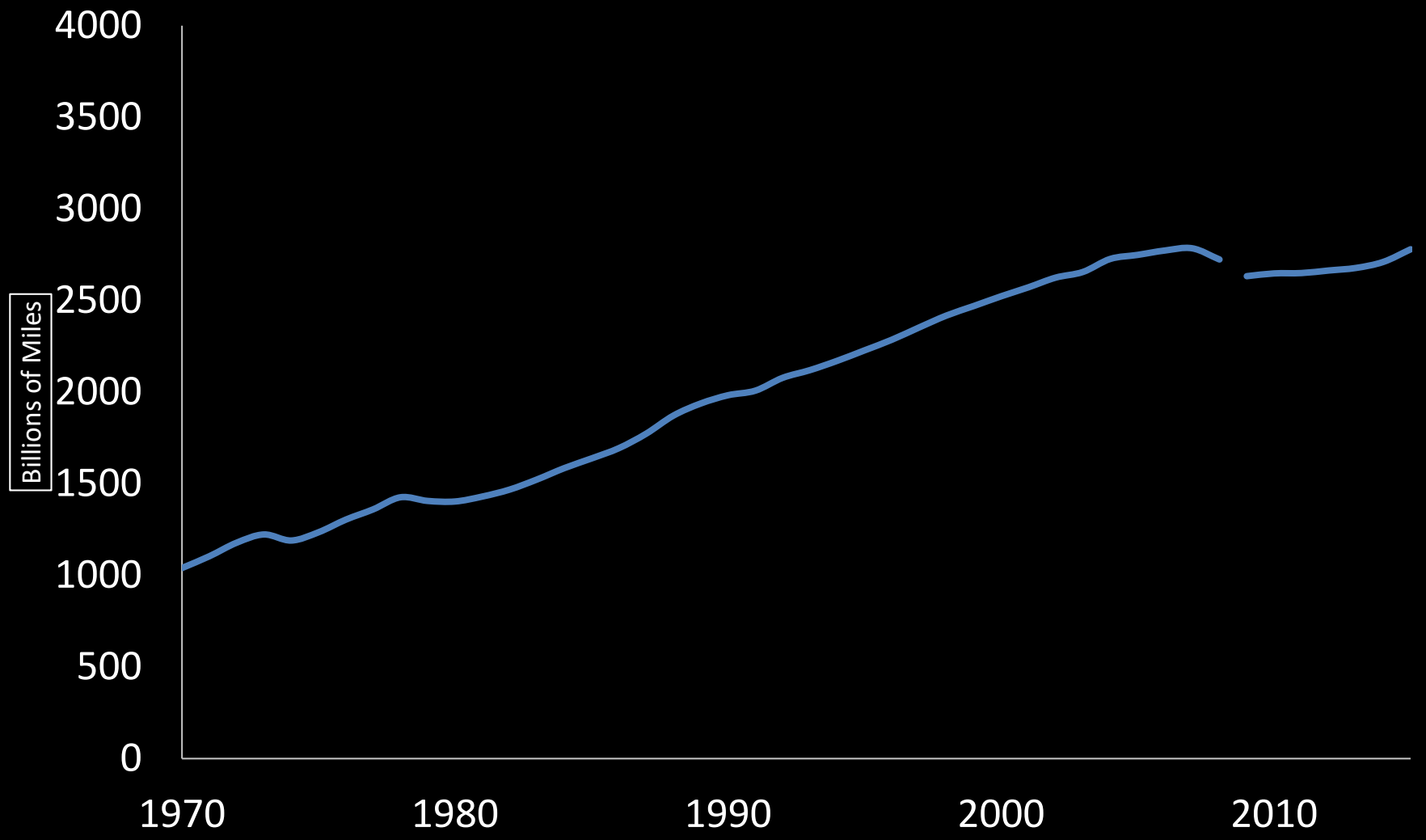
Union of Concerned Scientists

UCS Strategic Goal: Achieve Net-Zero Global Warming Emissions by Mid-Century



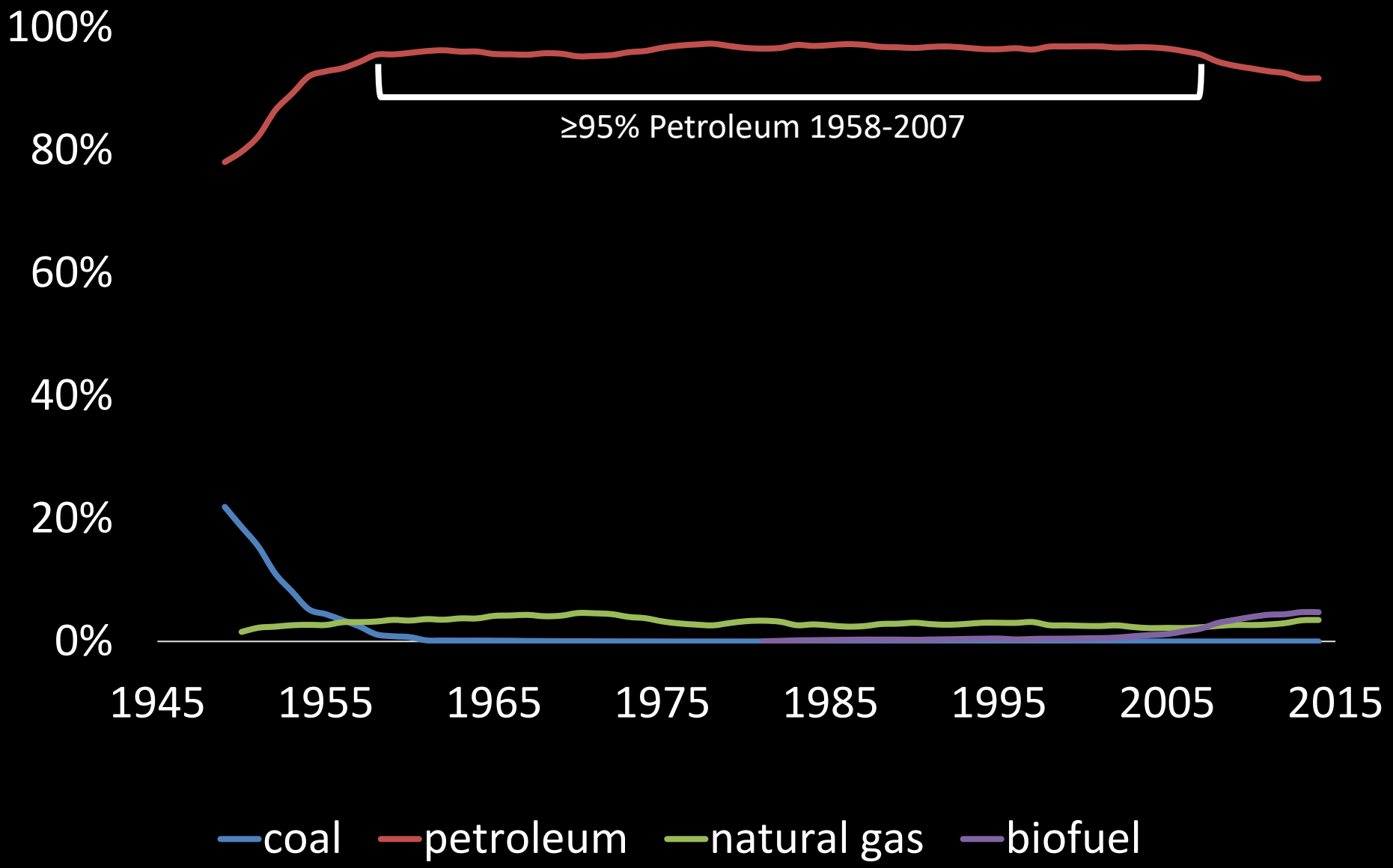
EIA Monthly Energy Report December 2017 (12 month total)

U.S. light duty vehicle miles traveled

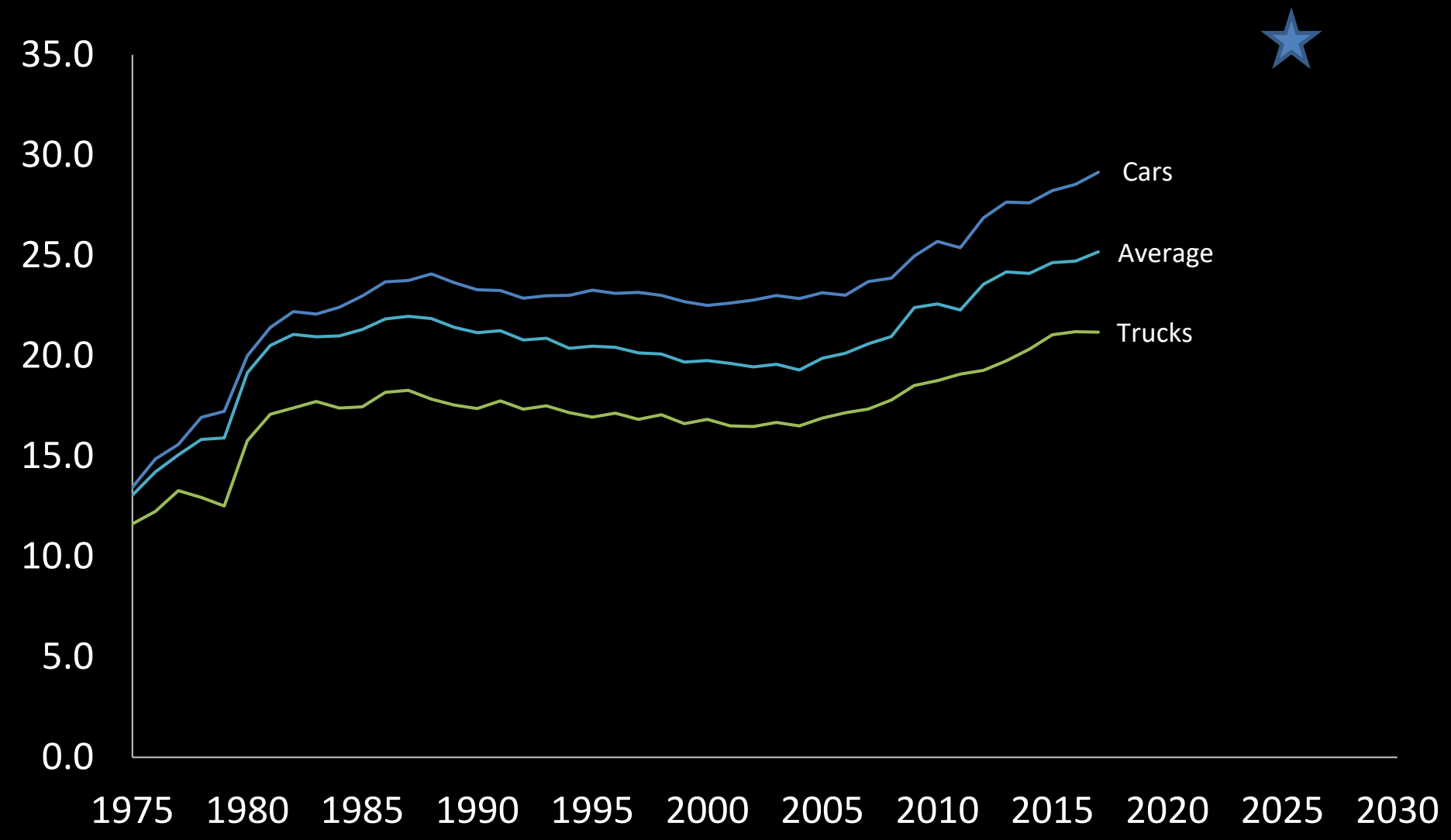


Data Source: 2018 Transportation Energy Data Book, Data collection changed after 2008

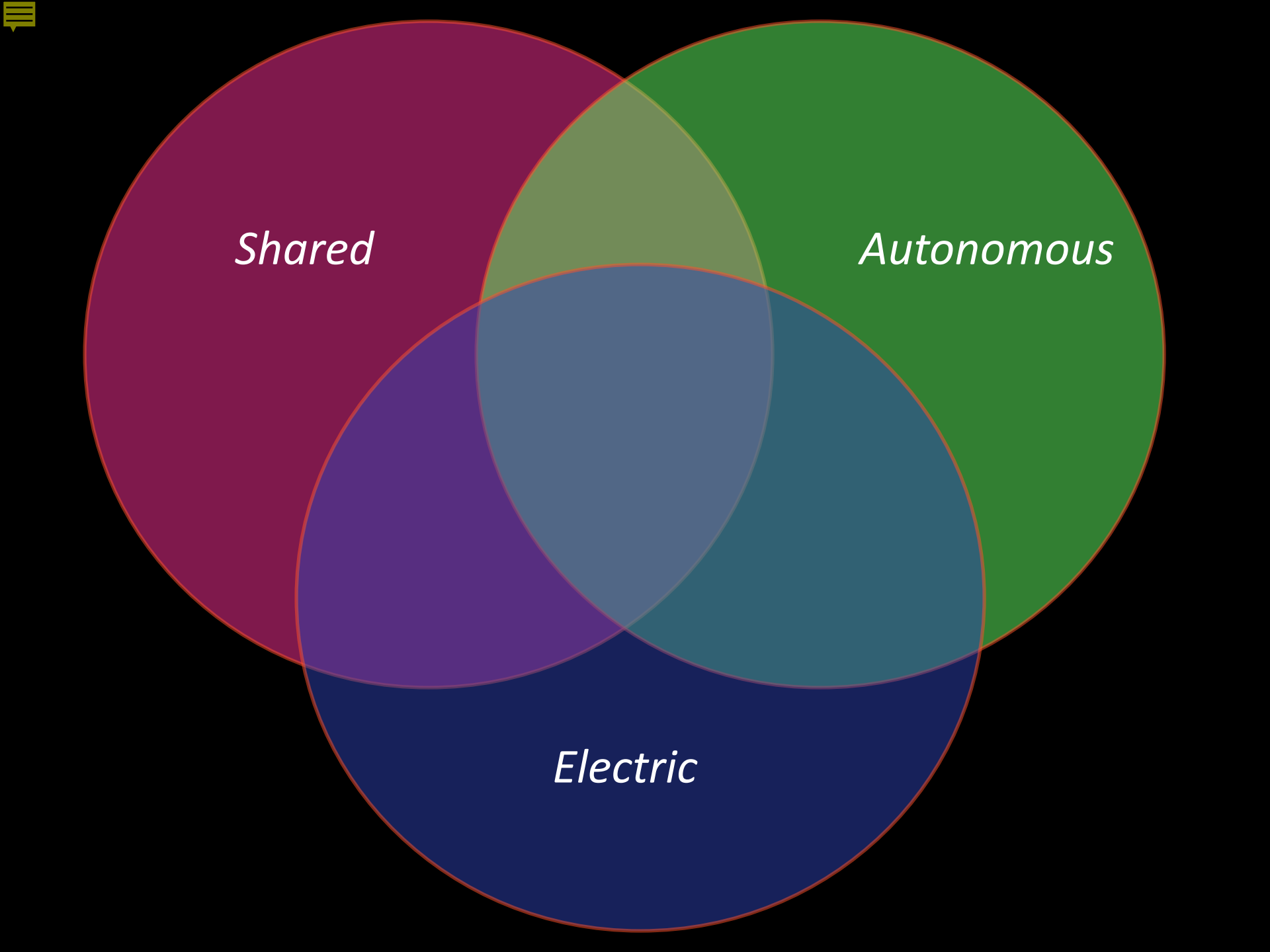
U.S. transportation energy consumption

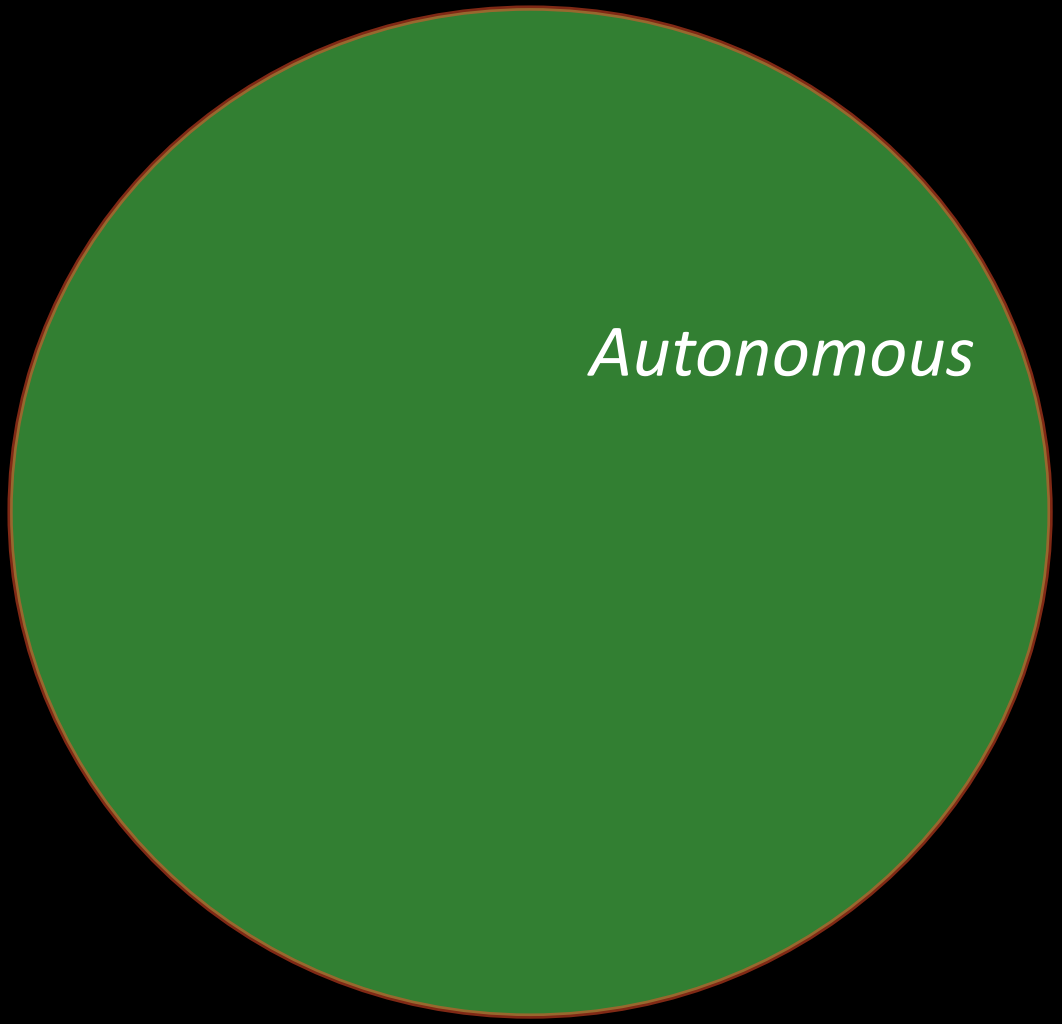


New Vehicle Real World Fuel Economy

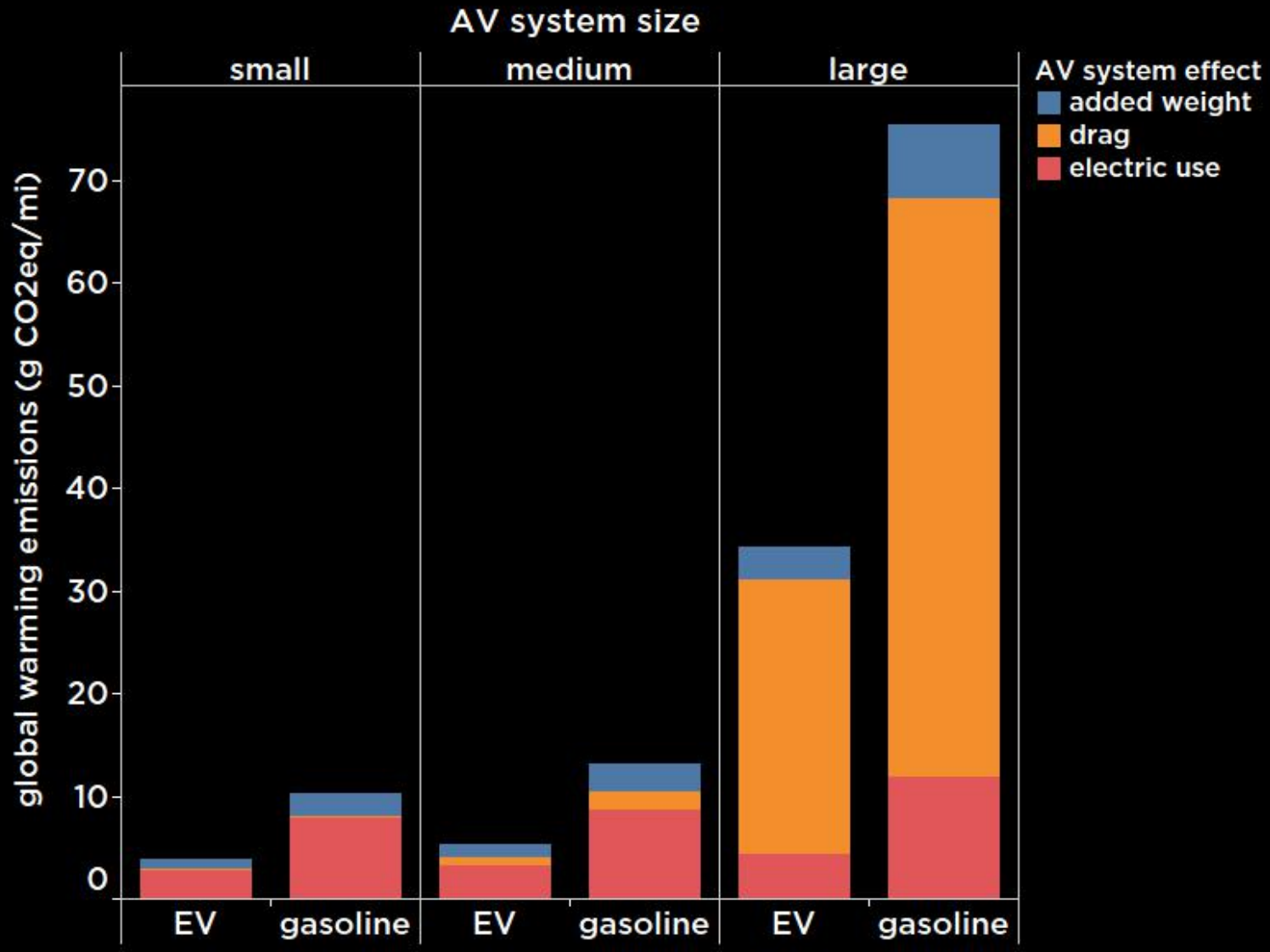


What are the environmental impacts of future mobility?


Shared
Autonomous
Electric

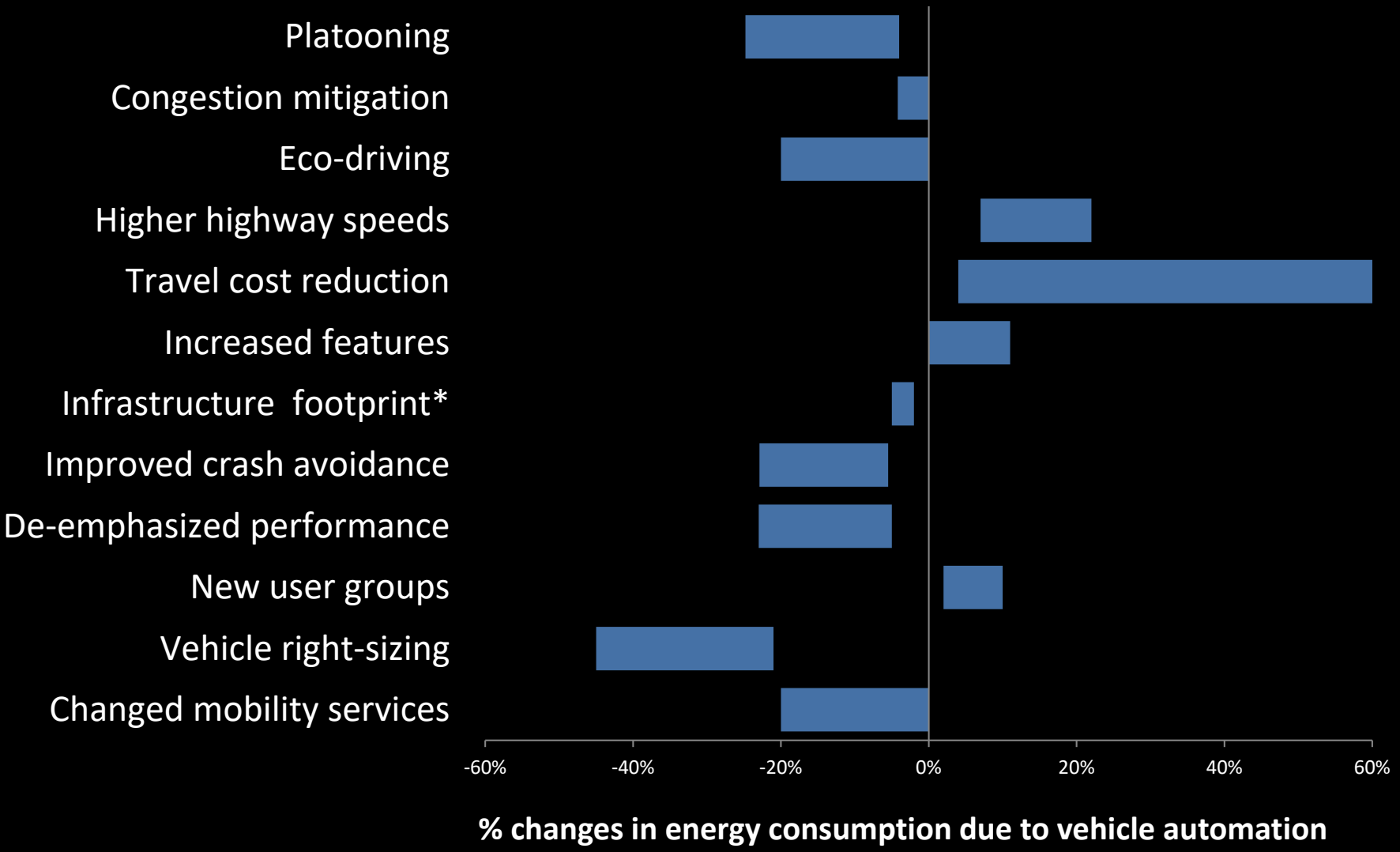

Autonomous

Impact of AV systems on vehicle emissions



Adapted from: Gawron et al. , "Life Cycle Assessment of Connected and Automated Vehicles: Sensing and Computing Subsystem and Vehicle Level Effects". Environmental Science and Technology, 2018

Potential Energy Impacts of Self-Driving Cars



Wadud, Mackenzie, and Leiby. "Help or Hindurance? The travel, energy and carbon impacts of highly automated vehicles," February 2016.

Three Revolutions in Urban TRANSPORTATION

How to achieve the full potential of vehicle electrification, automation and shared mobility in urban transportation systems around the world by 2050

Lew Fulton, UC Davis
Jacob Mason, ITDP
Dominique Meroux, UC Davis

Research supported by:
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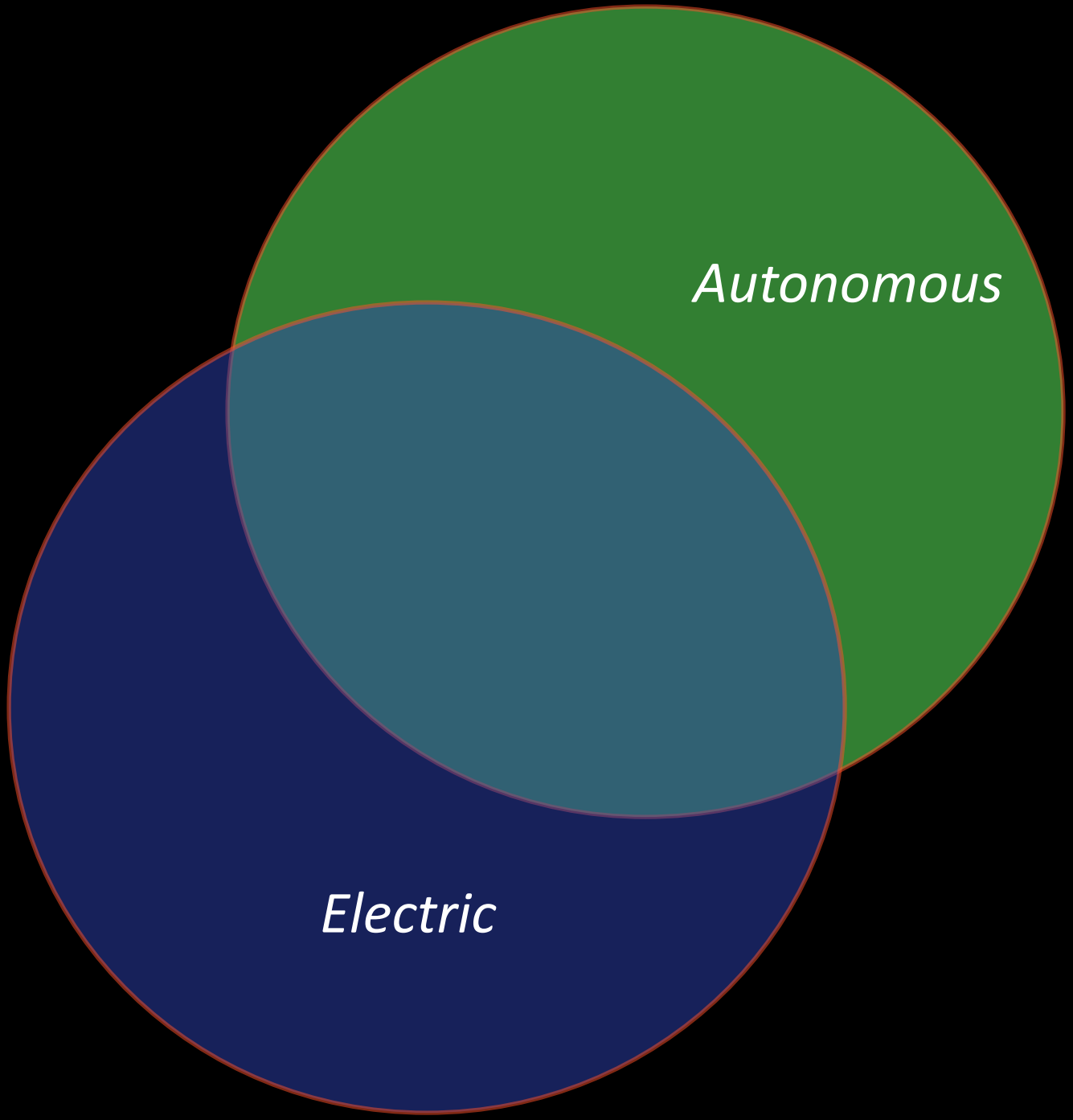
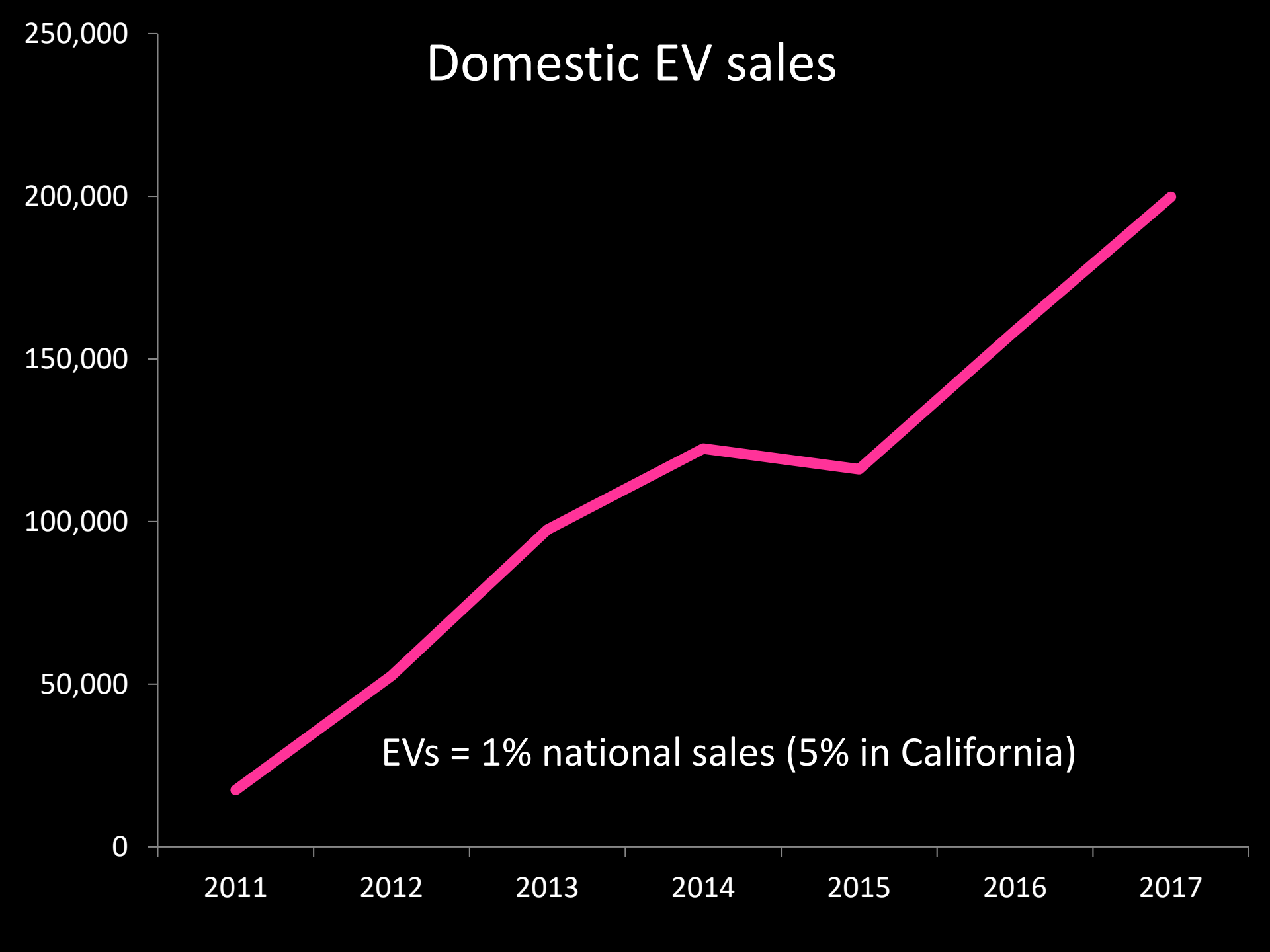
UCDAVIS
SUSTAINABLE TRANSPORTATION ENERGY PATHWAYS
of the Institute of Transportation Studies

ITDP | Institute for Transportation & Development Policy

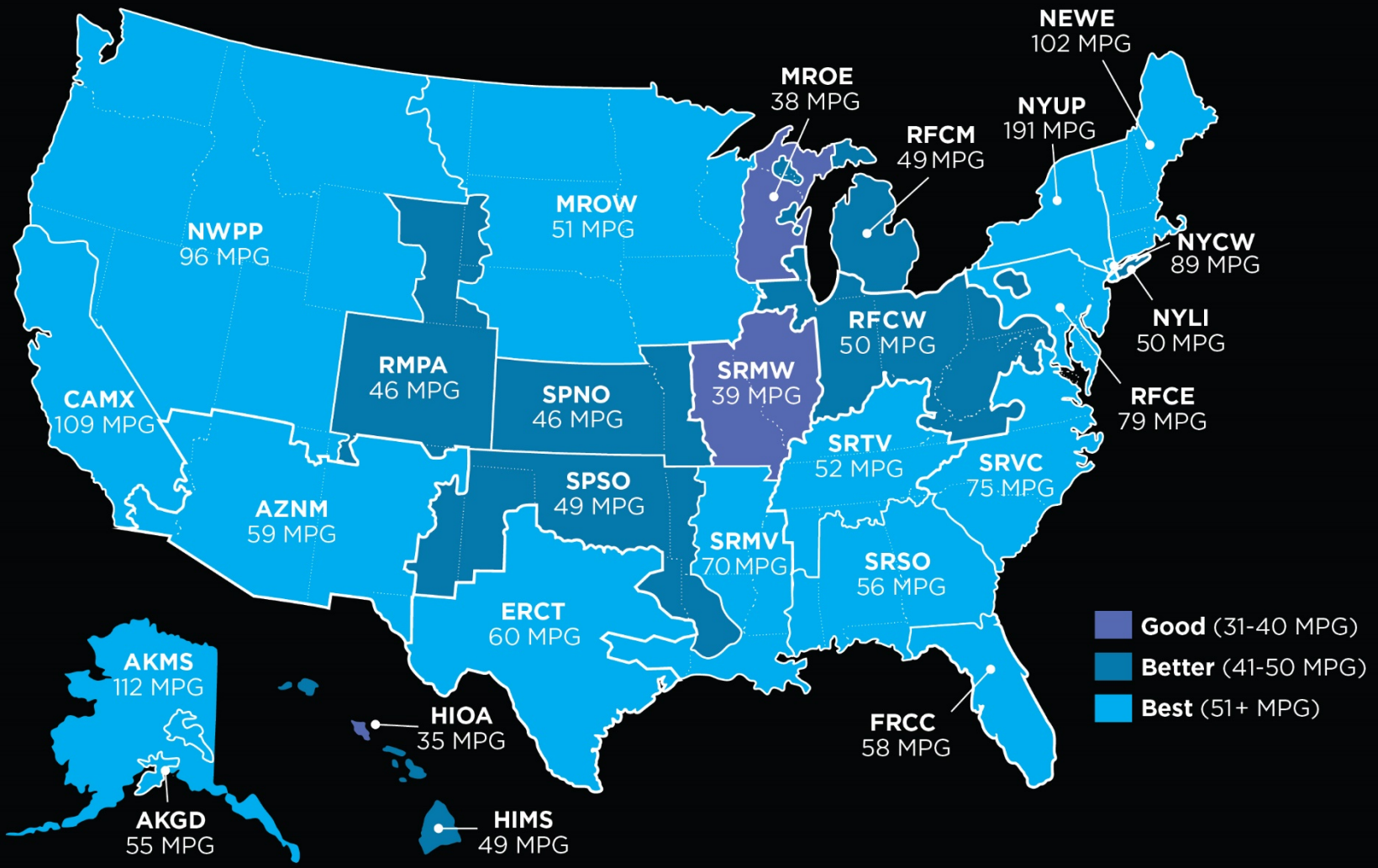
Business as Usual:
Emissions increases of 50% compared to today

Automation Revolution:
Average per vehicle VMT increase of 15-20%

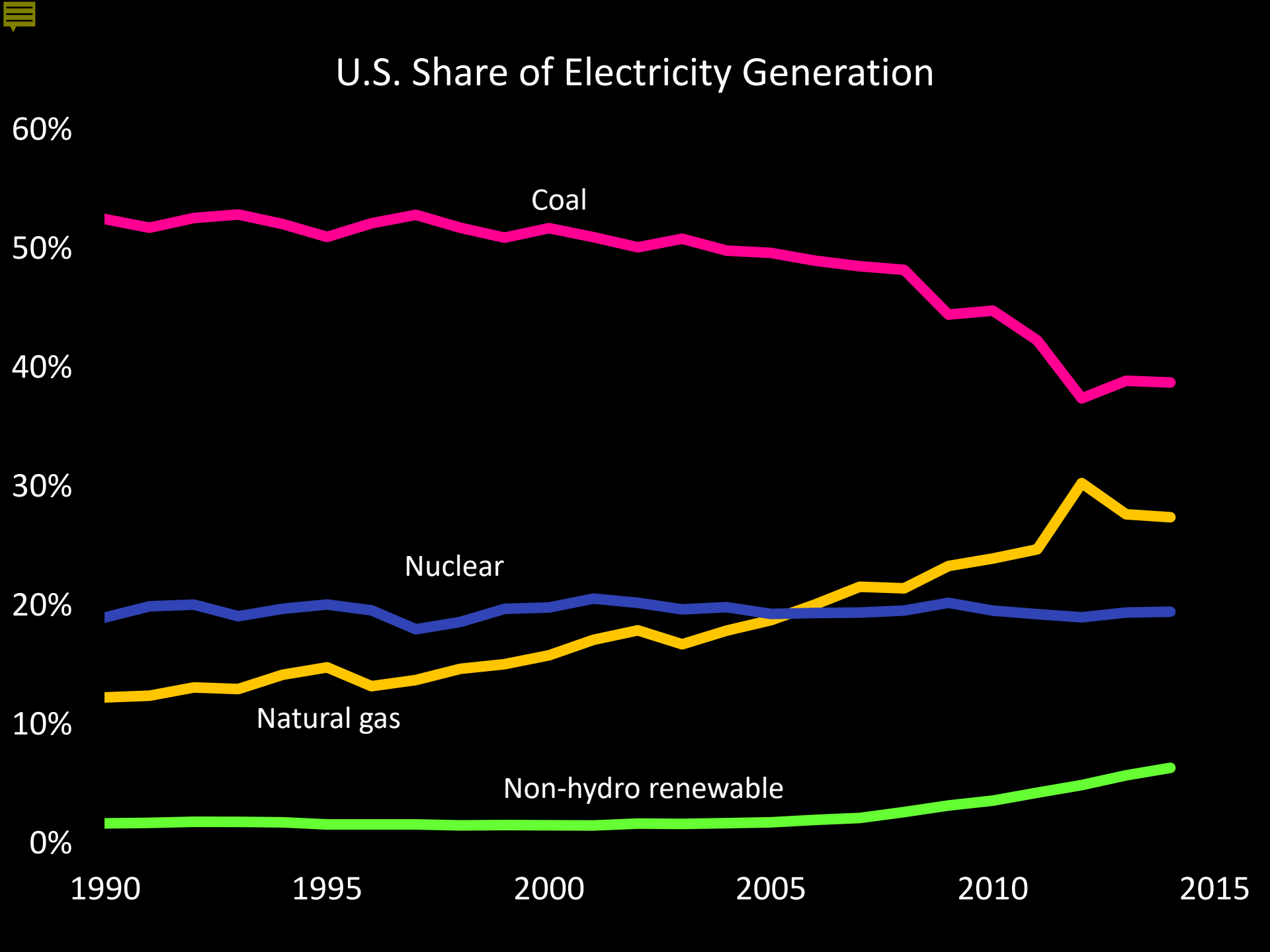

Autonomous
Electric


Domestic EV sales
250,000
200,000
150,000
100,000
50,000
0
2011
2012
2013
2014
2015
2016
2017
EVs = 1% national sales (5% in California)

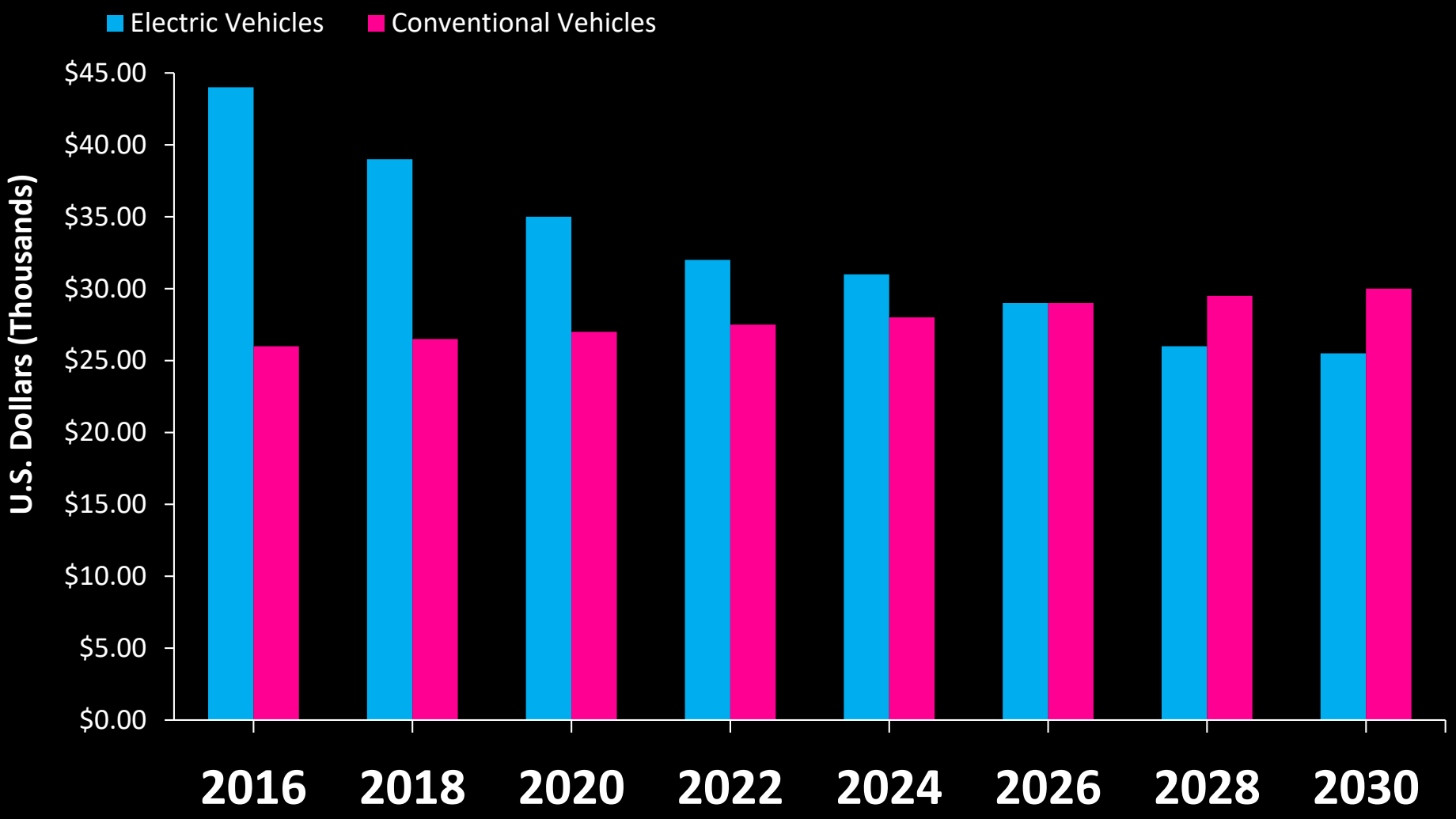
EV Global Warming Emissions



2016

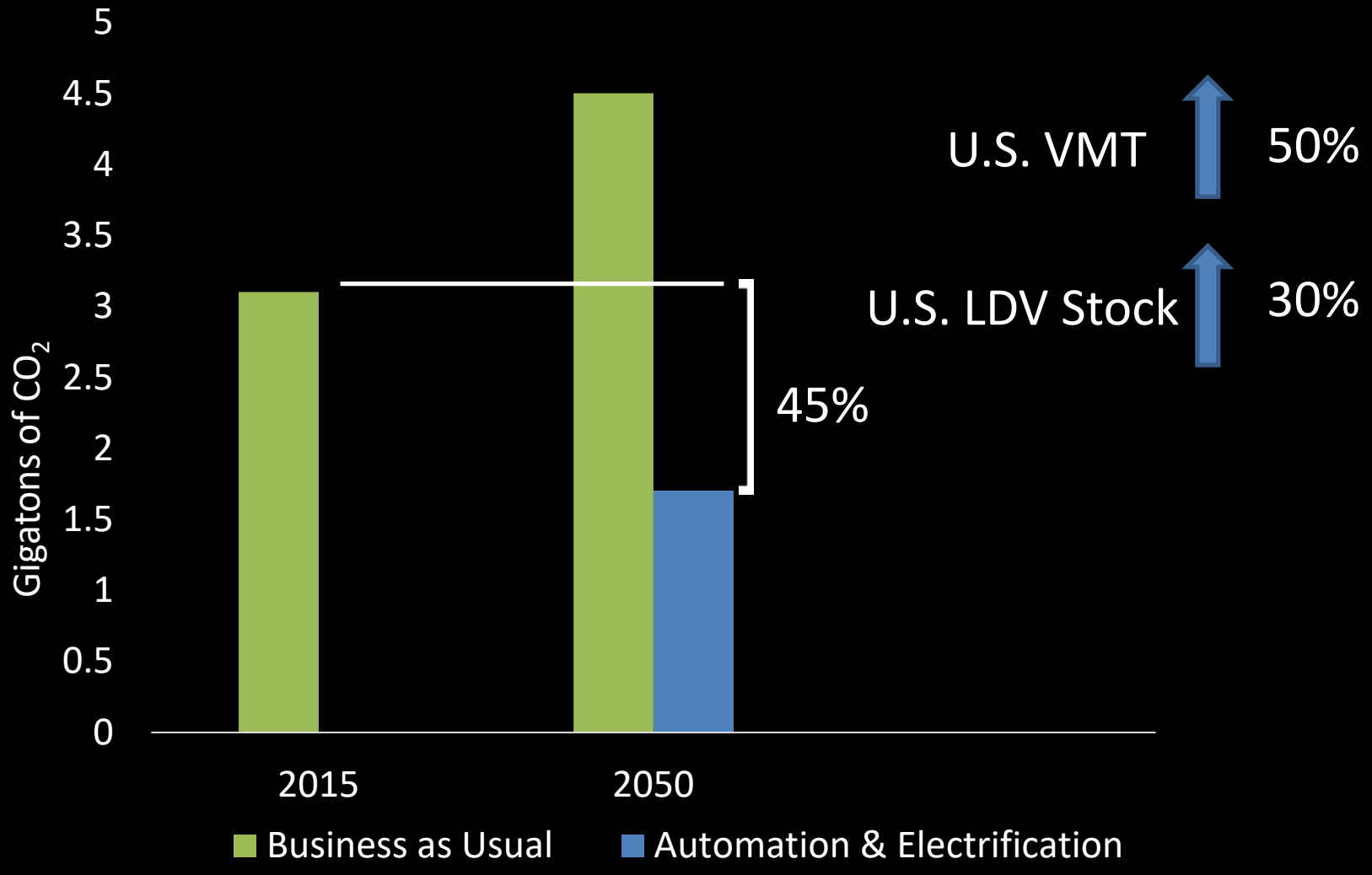

U.S. Share of Electricity Generation
60%
50%
40%
30%
20%
10%
0%
Coal
Nuclear
Natural gas
Non-hydro renewable
1990
1995
2000
2005
2010
2015

Electric vehicle vs. conventional vehicle cost

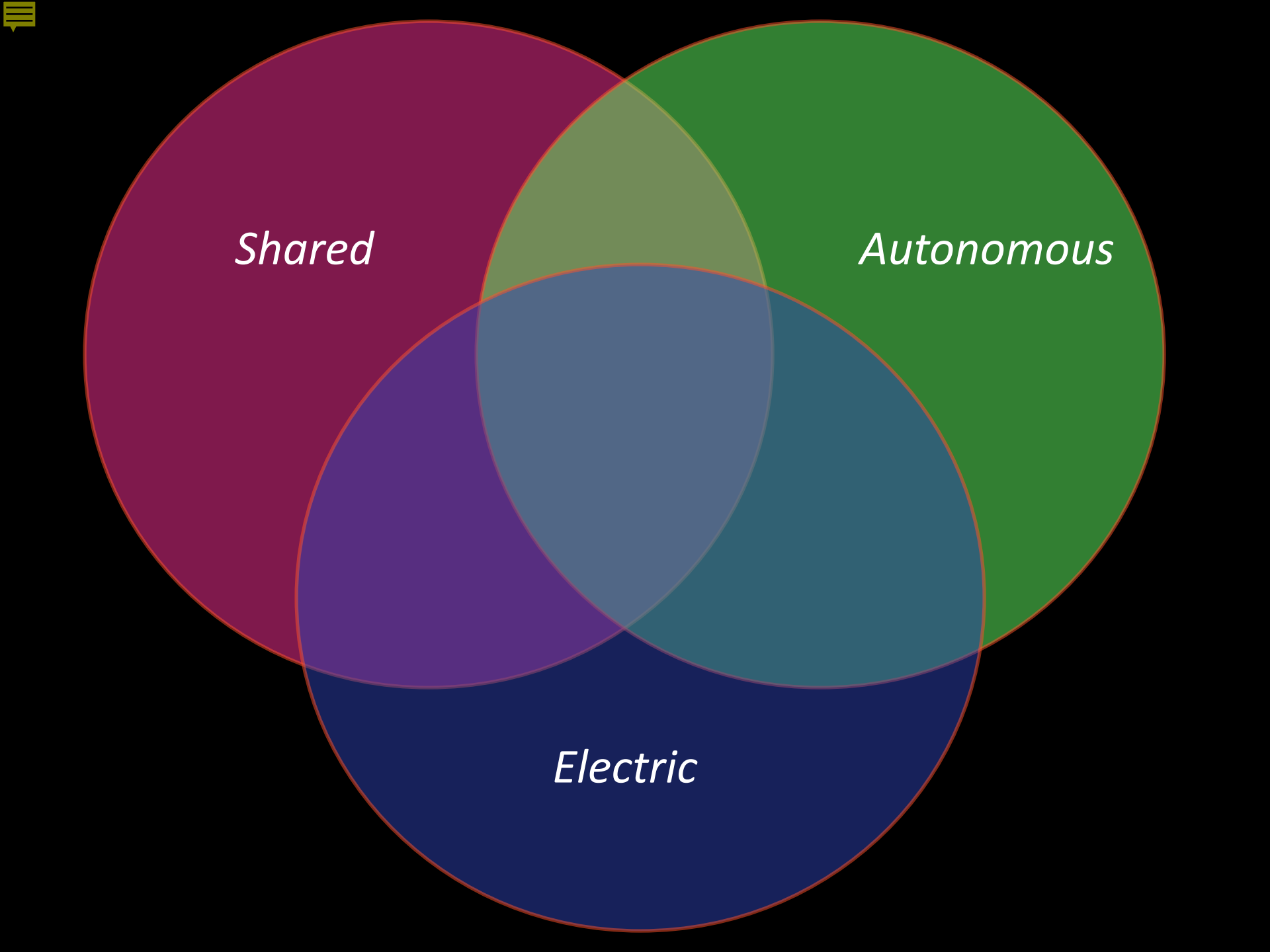


Bloomberg New Energy Finance

Global Urban Passenger Transport CO_2 Emissions Automation & Electrification



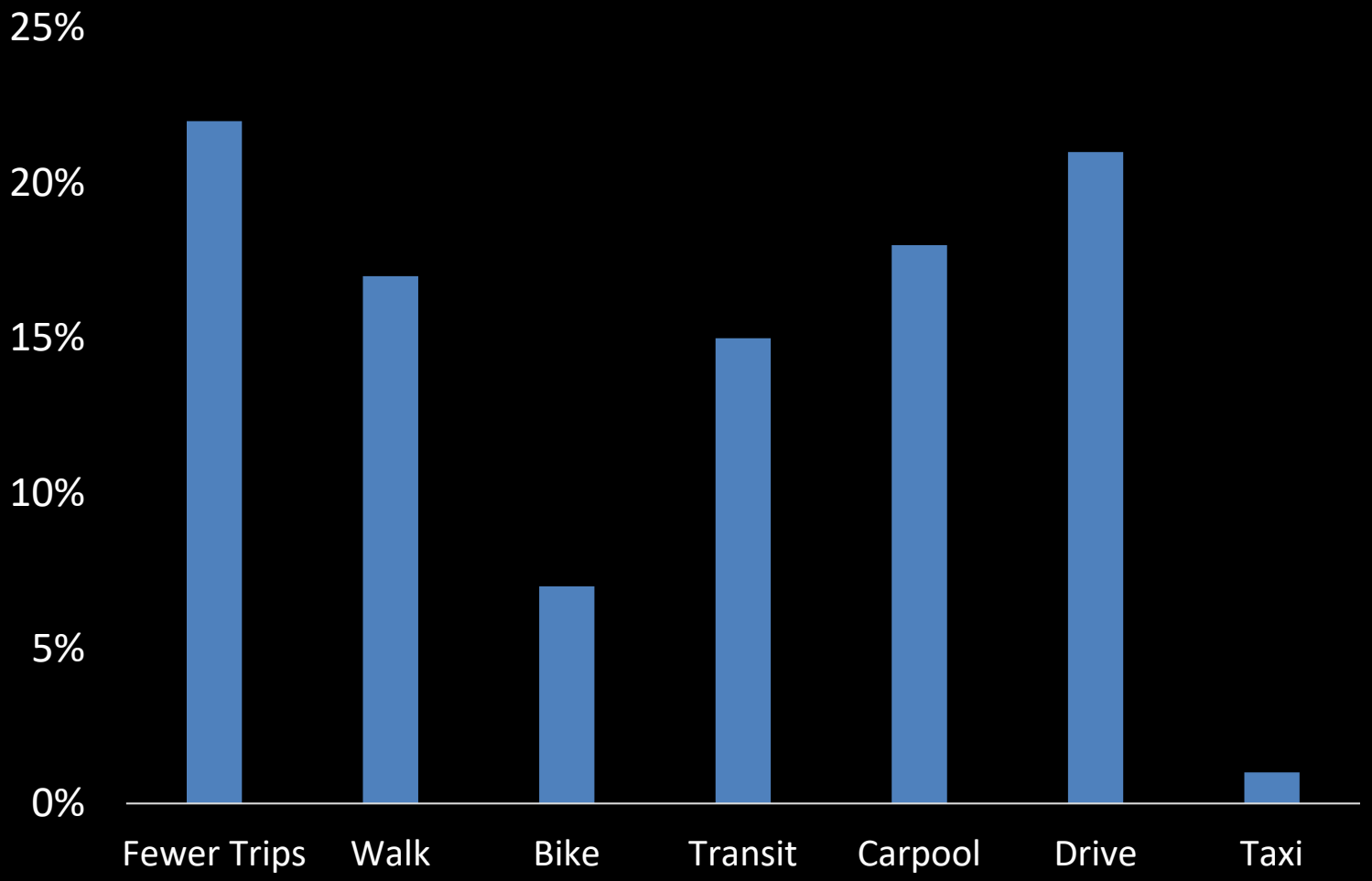
Fulton et al. “Three Revolutions in Urban Transportation”, 2017


Shared
Autonomous
Electric

zipcar®

chariot

How would you get there without Lyft or Uber?



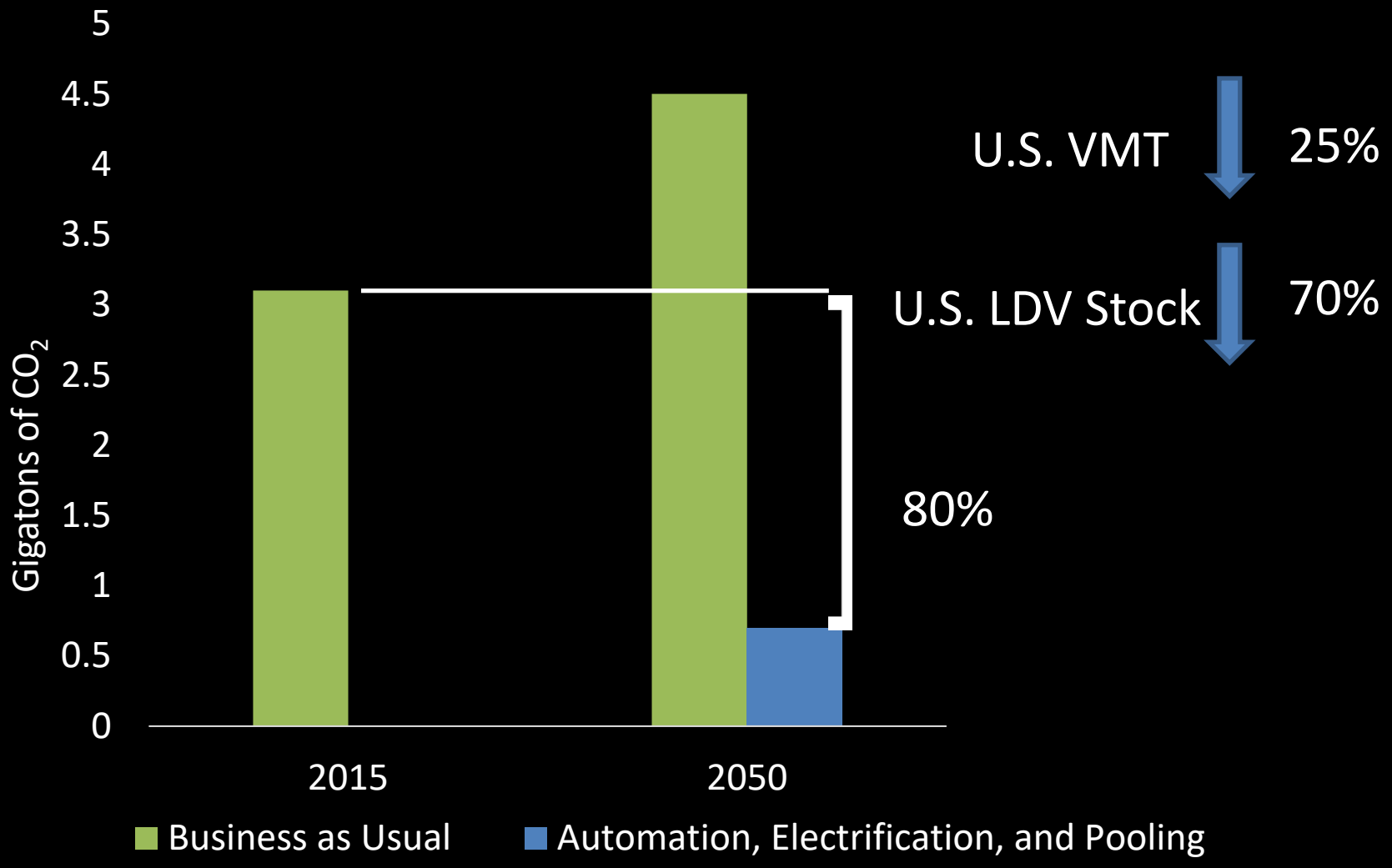
"Ride-hailing is currently likely to contribute to growth in vehicle miles traveled (VMT) in the major cities represented in this study".

Clewlow and Shankar, "Disruptive Transportation: The Adoption, Utilization, and Impacts, of Ride-Hailing in the U.S.", 2017

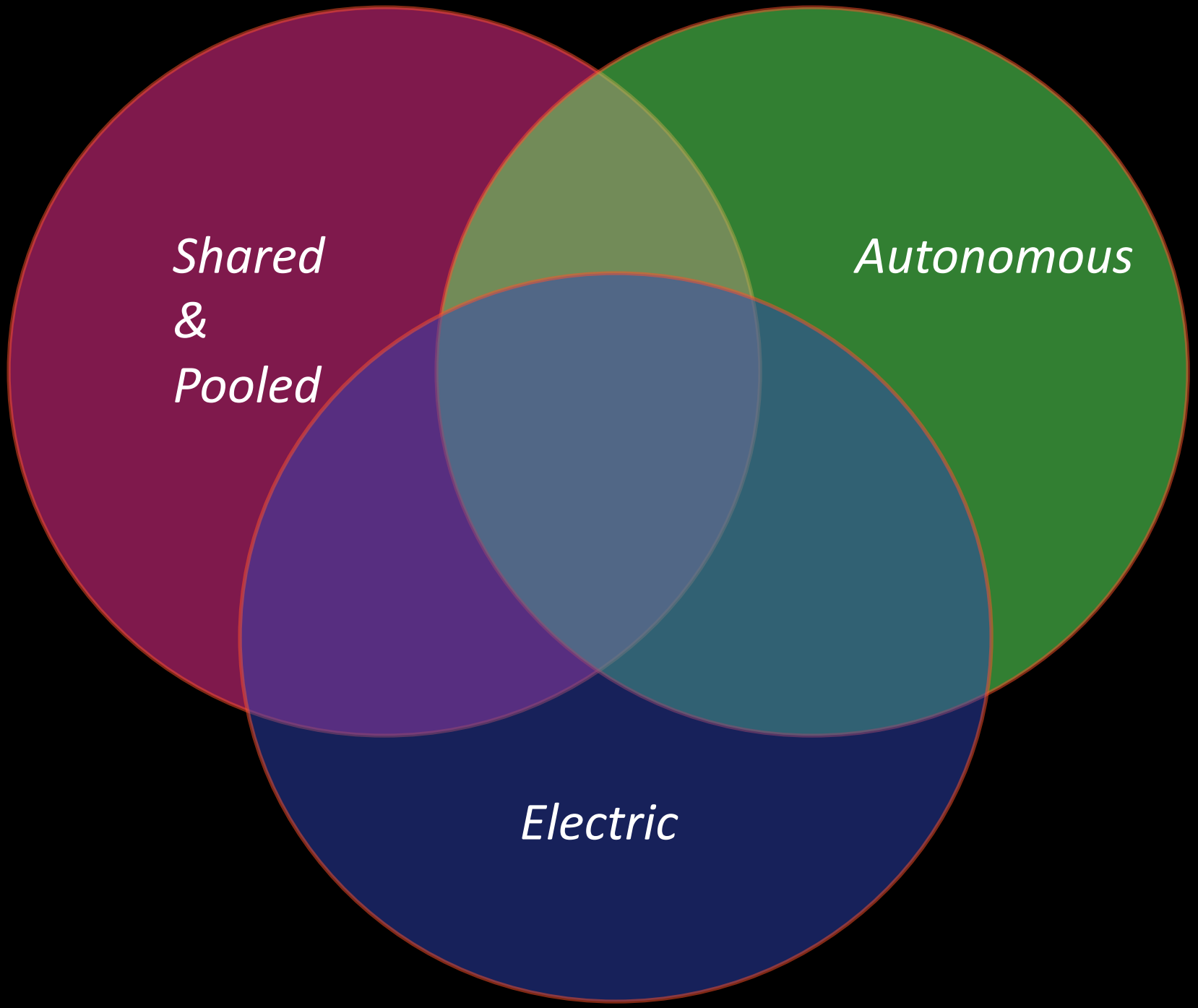
Percent of requested rides for UberPool and Lyft Line in CA

CA Public Utilities Commission, “Electrifying the Ride-Sourcing Sector in California: Assessing the Opportunity”, 2018

Global Urban Passenger Transport CO_2 Emissions
Automation & Electrification & Sharing



Fulton et al. “Three Revolutions in Urban Transportation”, 2017


Shared
&
Pooled
Autonomous
Electric


capital bikeshare


CASEY'S

Policy is critical to a low carbon mobility future

- Ensure the race for automation is safe
- Continue to accelerate vehicle electrification and overcome barriers to adoption
- Expand clean transportation choices: walking, biking, car share, improved transit, and mobility services.
- Encourage pooling through pricing, access, or other strategies.
- Improve access to transportation on an equitable basis
- Policy development and evaluation based on data

Principles for Self-Driving Vehicles

Union of Concerned Scientists

POLICY BRIEF

Maximizing the Benefits of Self-Driving Vehicles

Principles for Public Policy

HIGHLIGHTS

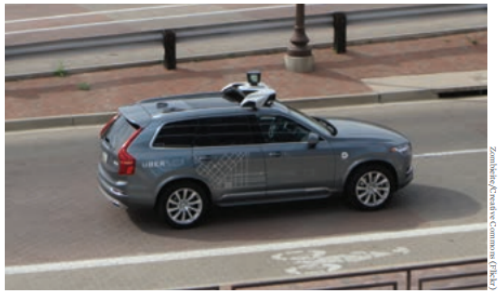
Self-driving vehicles have the potential to improve the safety, accessibility, and convenience of transportation substantially, but they also may increase energy use, transportation-related pollution, and roadway congestion. Public policy must take into account both the positive and negative potential of this emerging technology on communities and the environment. Doing so will help ensure that the introduction and use of self-driving vehicles reduce oil consumption and global warming emissions, improve public health and safety, and enhance mobility for all.

Autonomous, or self-driving, vehicle technology may be the most significant innovation in transportation since the mass introduction of automobiles in the early 20th century. Whether the widespread adoption of self-driving vehicles results in positive outcomes in the years ahead will depend largely on how public policy guides the introduction of this emerging technology today. The potential benefits include safer roads, more affordable transportation, improved access to jobs, and a cleaner, healthier environment. Without well-crafted policy, though, self-driving vehicles could increase vehicle miles traveled and global warming emissions, worsen congestion, exacerbate air pollution, and put millions of Americans out of work (Litman 2016).

UCS has outlined a set of principles that policymakers, businesses, and other stakeholders can follow to shape the introduction of self-driving vehicles in ways that reduce oil consumption and global warming emissions, protect public health, and enhance mobility for all.

1. Make Transportation Safer for Everyone, Not Just Motorists

While self-driving vehicles have the potential to reduce vehicle-related fatalities, this is not a guaranteed outcome (Kockelman et al. 2016). Vehicle computer systems must be secure from hacking, and rigorous testing and regulatory oversight of vehicle programming are essential to ensure that self-driving vehicles protect both their occupants and those outside the vehicle. Therefore, public policy related to self-driving vehicles must improve safety for all Americans, whether they are driving, walking, or biking.



Jonathan Weiss/Shutterstock (File)

Well-crafted policy is critical to ensuring that self-driving vehicles—such as the one being tested by ride-hailing service Uber, above—make a positive contribution to the US transportation sector, including safer roads, more affordable transportation, improved access to jobs, and a cleaner, healthier environment.

Thank You

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