Impacts on State Revenue

- Speakers:
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CHARGING ELECTRIC VEHICLES… FOR PUBLIC ROADS

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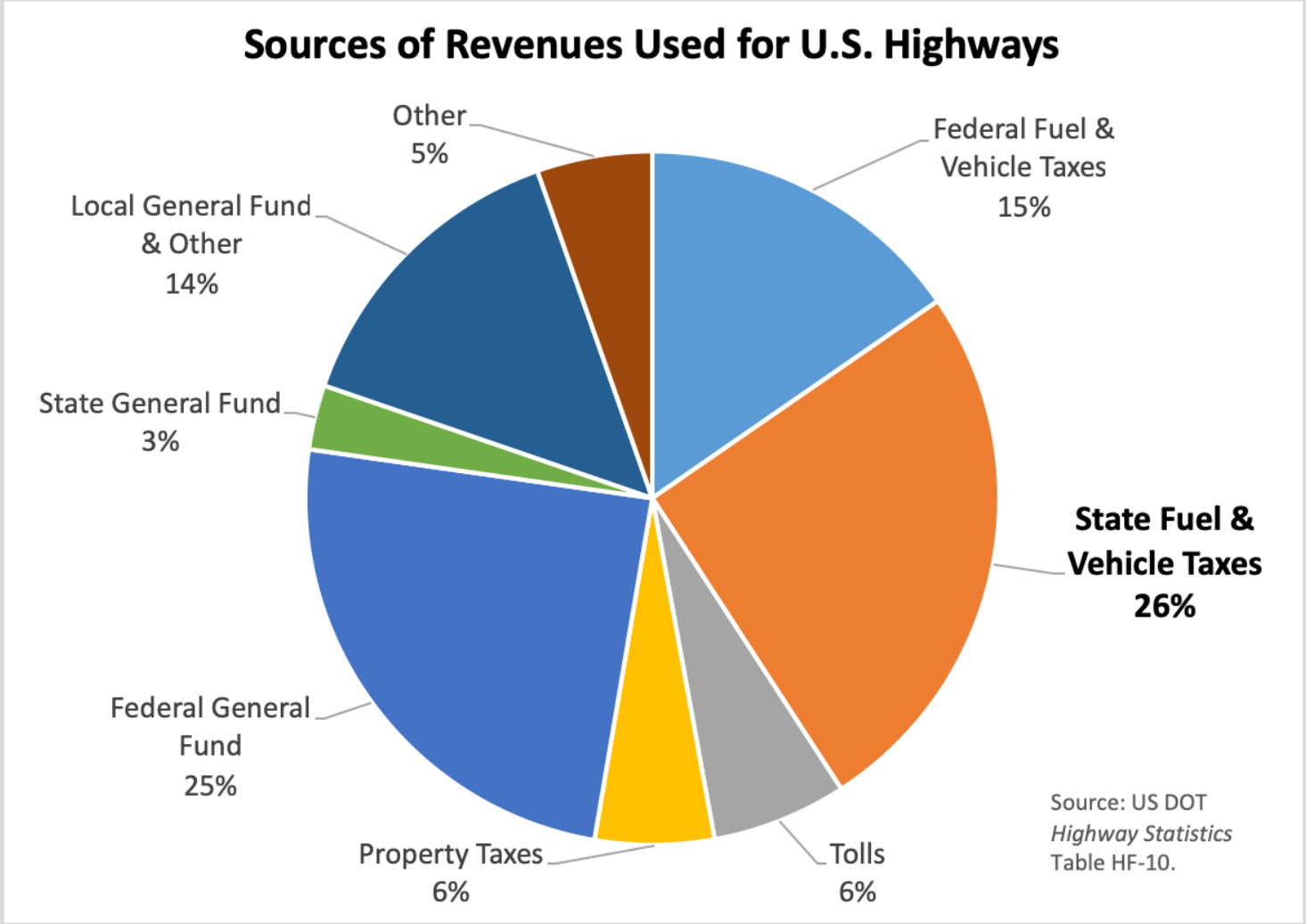
"THE **SCIENTIFIC DEFINITION** OF **WORK** IS: USING A FORCE TO MOVE AN OBJECT A DISTANCE."[1]

"**ENERGY** CAN BE DEFINED AS THE **ABILITY TO DO WORK**."[2]

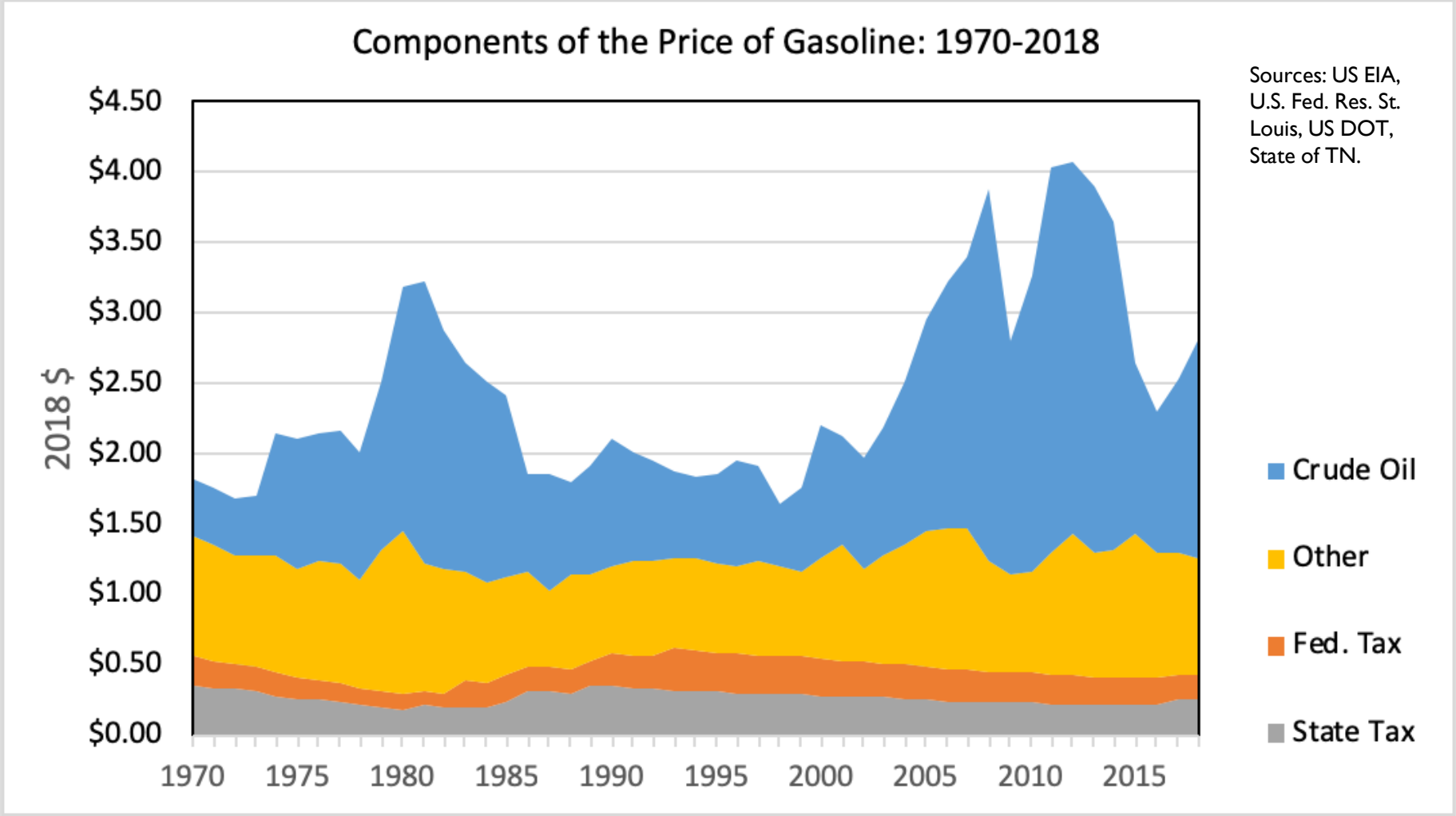
- How do we pay for our roads?
- Why motor fuel taxes?
- Who pays? Who should pay?
- Threats to the motor fuel tax.
- What about electric vehicles?
  - Today
  - In the future
- How do we ***want*** to pay for our roads?

1 https://education.jlab.org/jsat/powerpoint/work_and_simple_machines.ppt
2 www.edinformatics.com/math_science/work_energy_power.htm

MOTOR FUEL TAXES PROVIDE ABOUT 40% OF PUBLIC EXPENDITURES FOR HIGHWAYS.



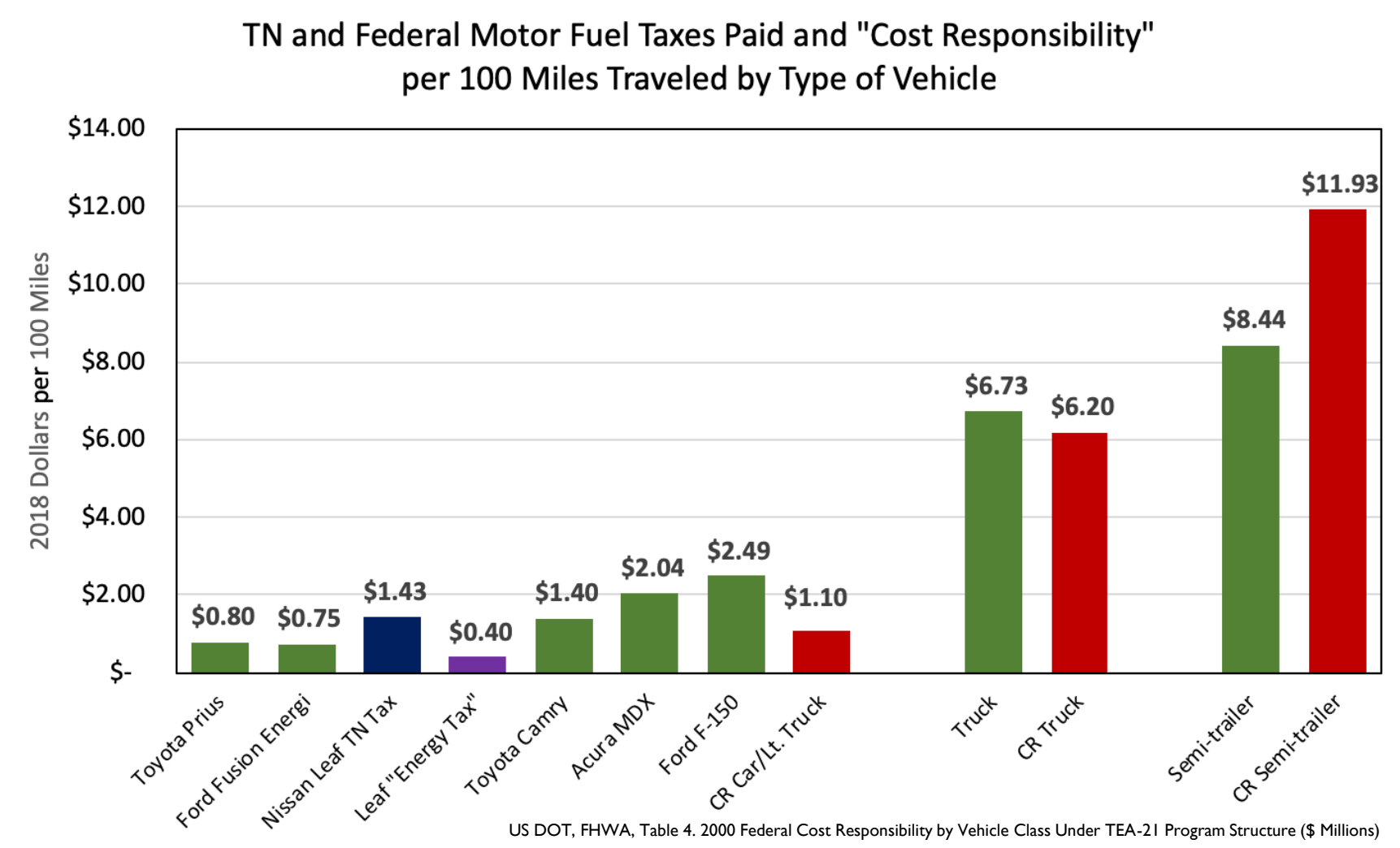
GAS TAXES AVERAGED 20% OF THE PRICE OF GASOLINE OVER THE PAST 50 YEARS.



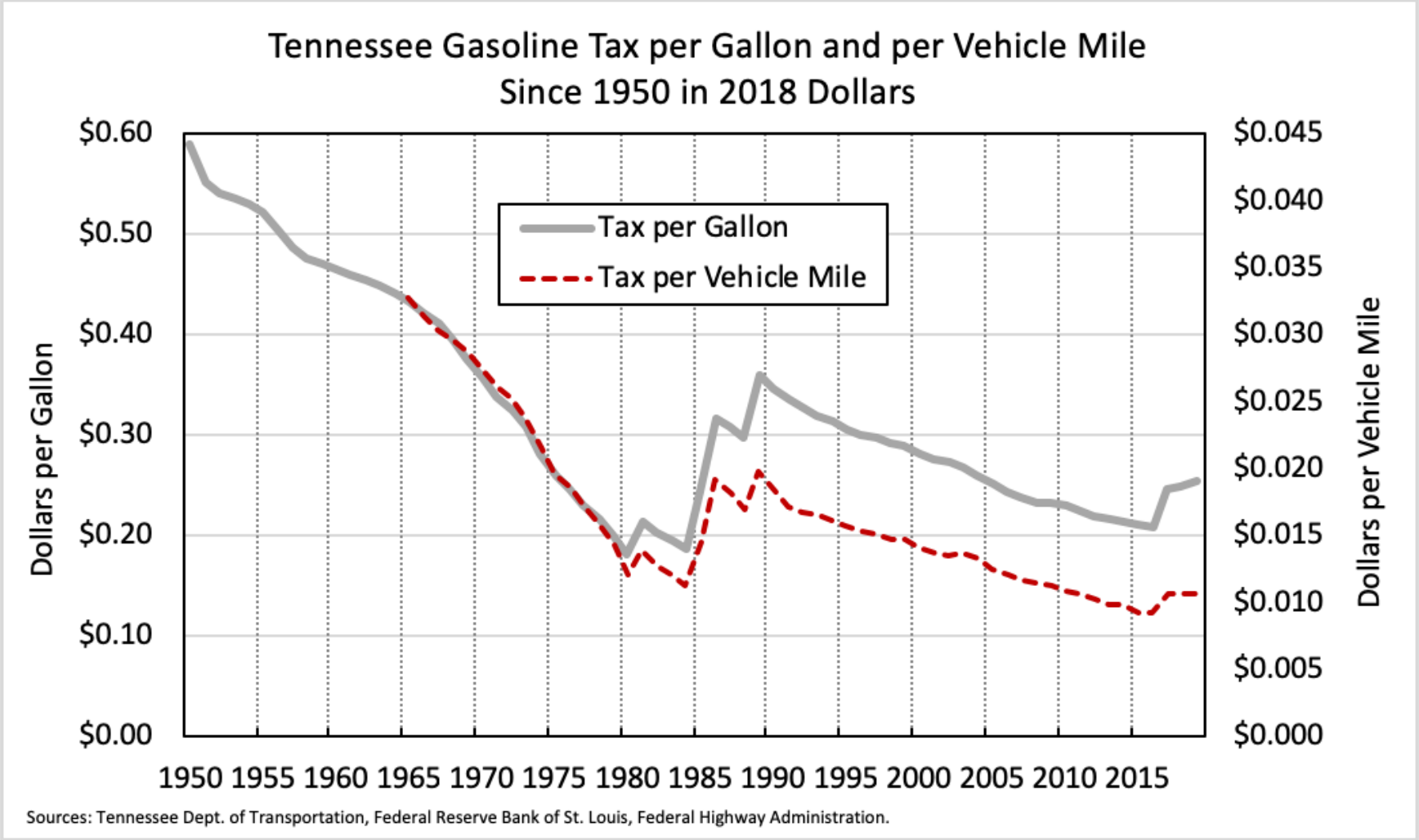
WHY TAX MOTOR FUEL?

- Taxing energy is an effective way to tax transportation.
- Transportation is work.
  Work (joules) = force x distance = energy use (joules)
- Tax paid is proportional to work (transportation) done.
- What makes a good tax?
  - Certainty/reliability
  - Adequacy
  - Simplicity & administrative efficiency
  - Economic efficiency
  - Equity/fairness

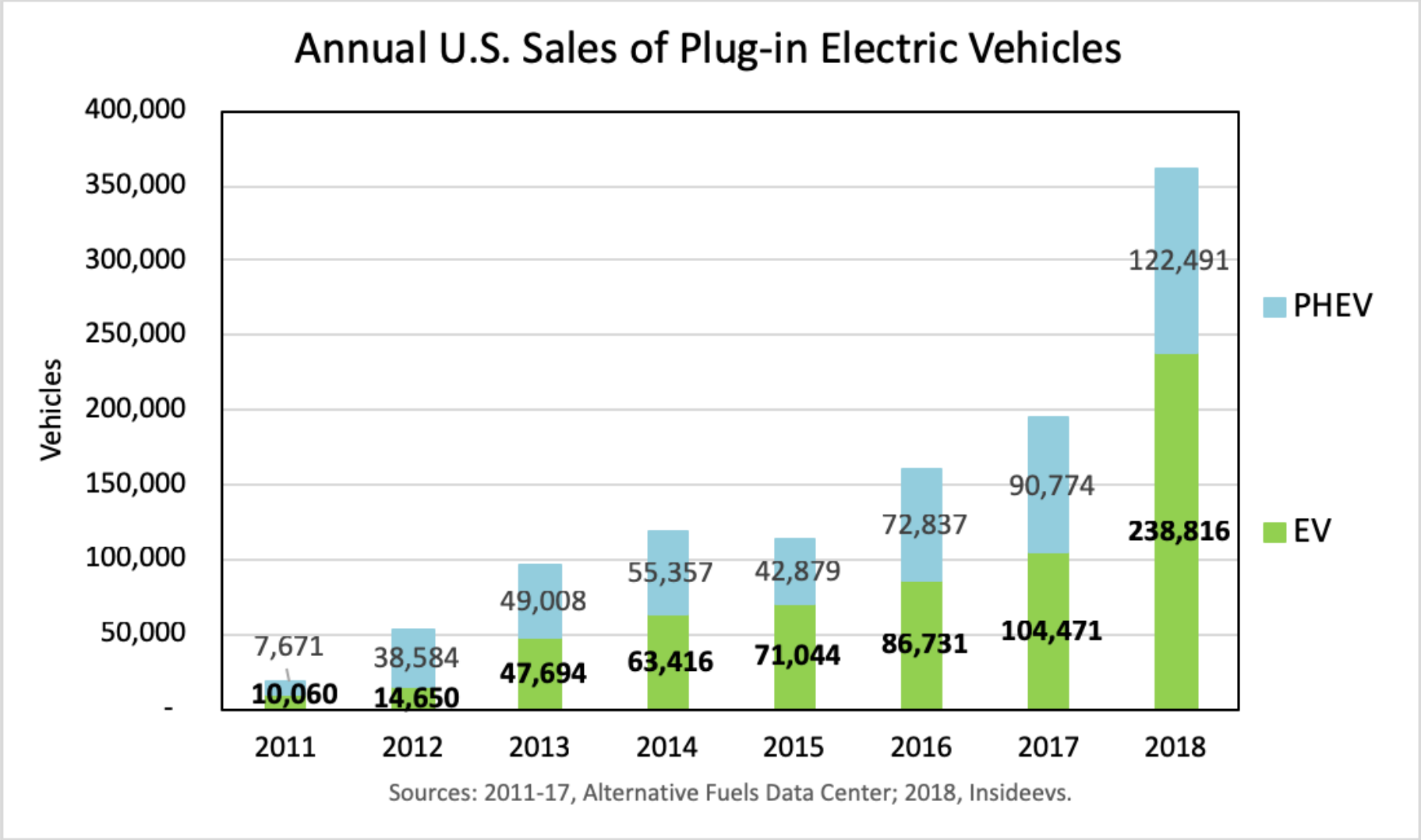
WHO PAYS? WHO SHOULD PAY?
(COST RESPONSIBILITY ESTIMATES ***FUZZY***)



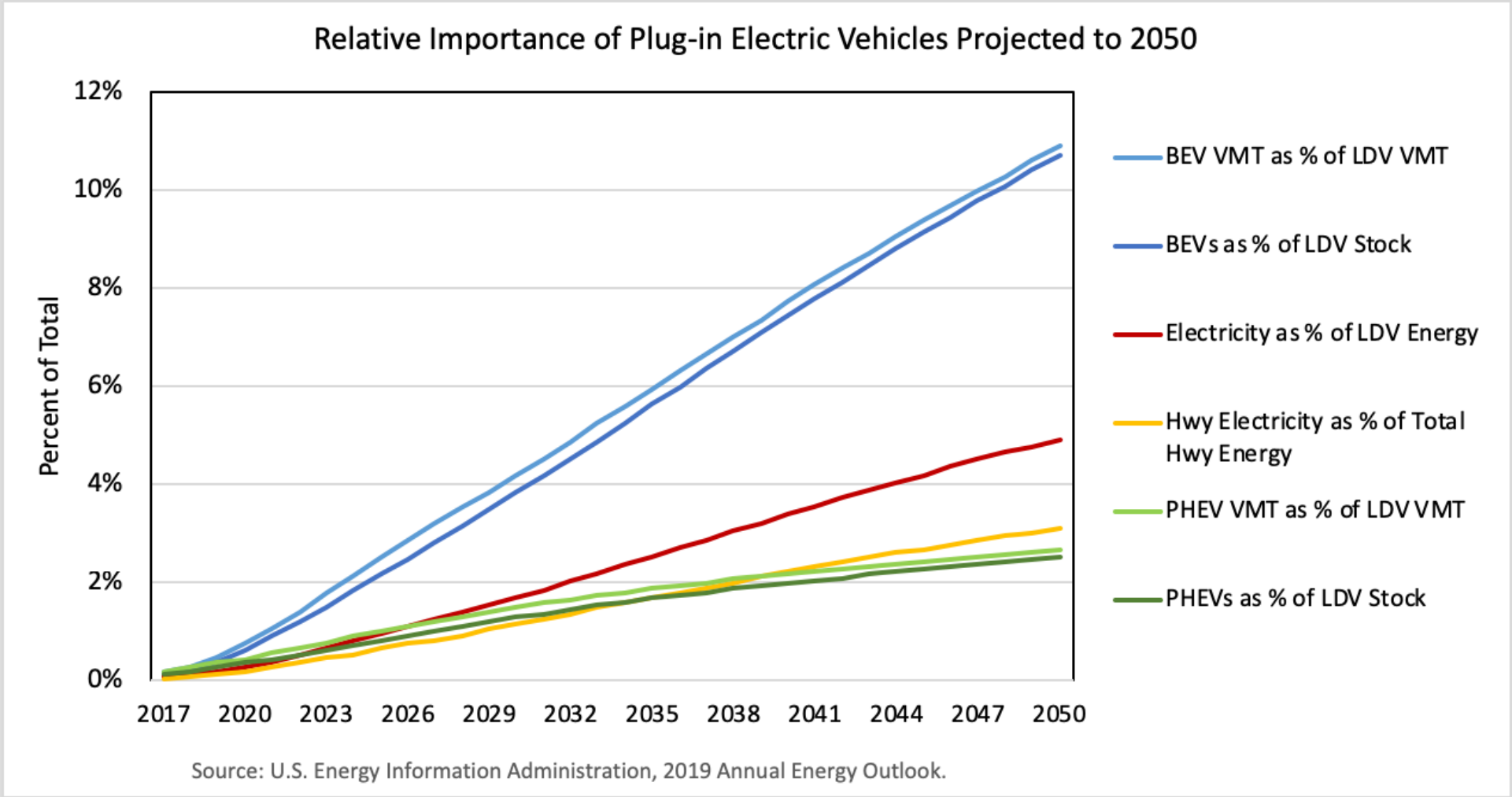
THREATS TO ADEQUACY & RELIABILITY? #1. INFLATION #2. FUEL ECONOMY



WHAT ABOUT ELECTRIC VEHICLES? 1.4% OF SALES. ¼% VEHICLES ON ROAD.

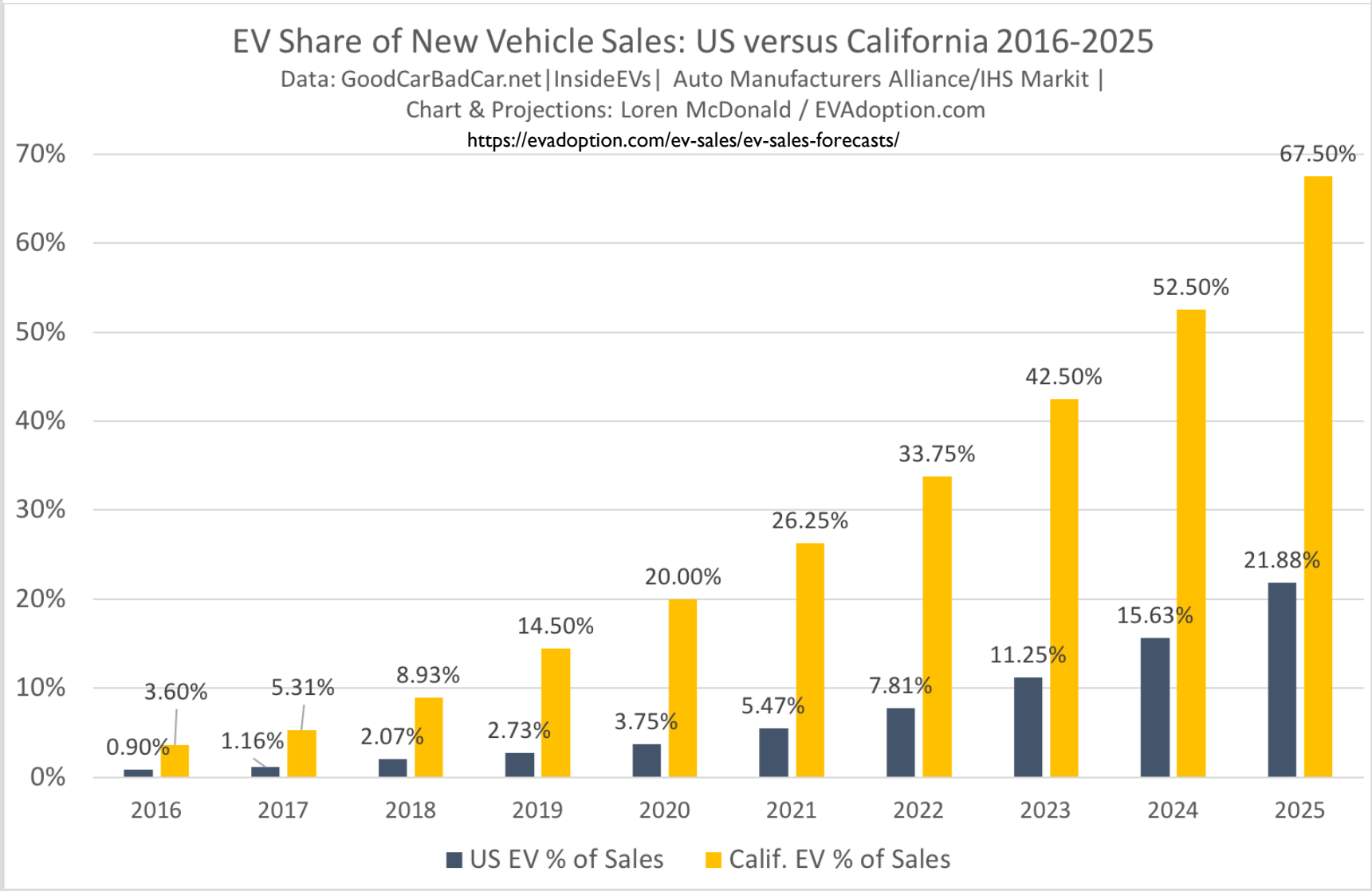


THE ENERGY INFORMATION ADMINISTRATION'S REFERENCE CASE PROJECTION FORESEES A GRADUAL INCREASE IN BATTERY EV TRAVEL.

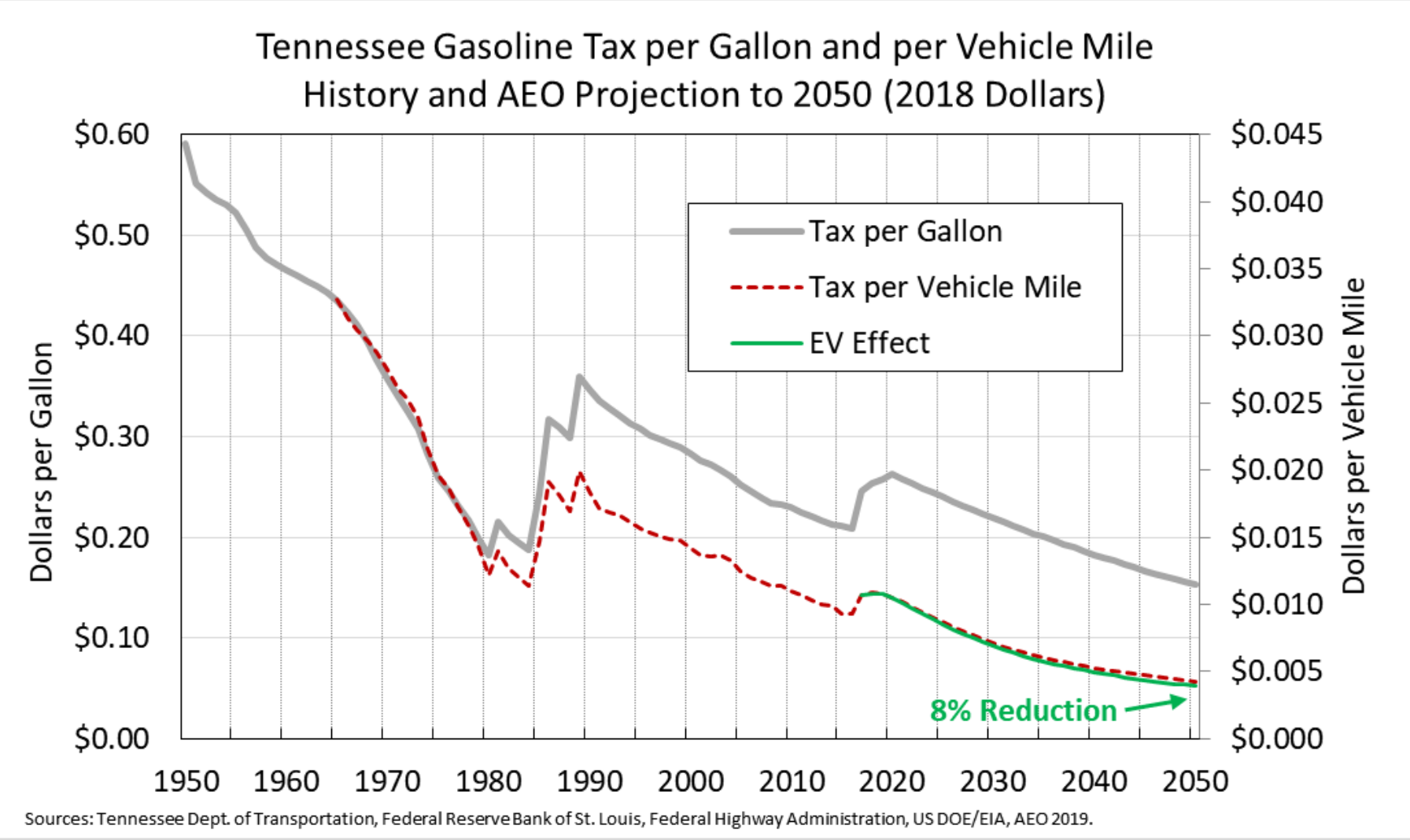


Source: U.S. Energy Information Administration, 2019 Annual Energy Outlook.

IT'S EASY TO FIND MORE OPTIMISTIC FORECASTS, HOWEVER.



INFLATION AND FUEL ECONOMY REMAIN THE BIGGEST THREATS.



HOW SHOULD ALL-ELECTRIC VEHICLES PAY THEIR FAIR SHARE?

- What is an EVs fair share?
  - Based on vehicle miles traveled?
  - Based on energy use? (On road or fuel cycle?)
  - Based on cost responsibility?
  - Should environmental impacts be considered?
- How urgent is the problem of taxing EVs?
  - Practically
  - Politically
- And what about connected automated vehicles, shared vehicles and shared travel?

THANK YOU.

D.L. Greene, "What's Greener than a VMT Tax? The Case for an Indexed Energy User Fee to Finance U.S. Surface Transportation," *Transportation Research D-Environment*, vol. 16, pp. 451-458, 2011.

Deloitte.

Electric Vehicle Infrastructure

Faye DiMassimo

March 12, 2019

An accelerating electric vehicle market presents opportunities…

Consumers are increasingly likely to shift to electric vehicles to meet mobility demands

Over 1.1 million electric vehicles are on the road in the US. In 2018 alone, 360,000 were sold, an 81% increase from 2017.

INSIDEEVs

The average range of an electric vehicle will increase to over 200 miles in 2019.

Forbes

Approximately 20% of drivers will look to choose an electric drivetrain for their next vehicle purchase.

…But there are roadblocks on the horizon

Vehicle charging infrastructure deployment lags behind EV market penetration and will require strategic investments to alleviate consumer anxiety

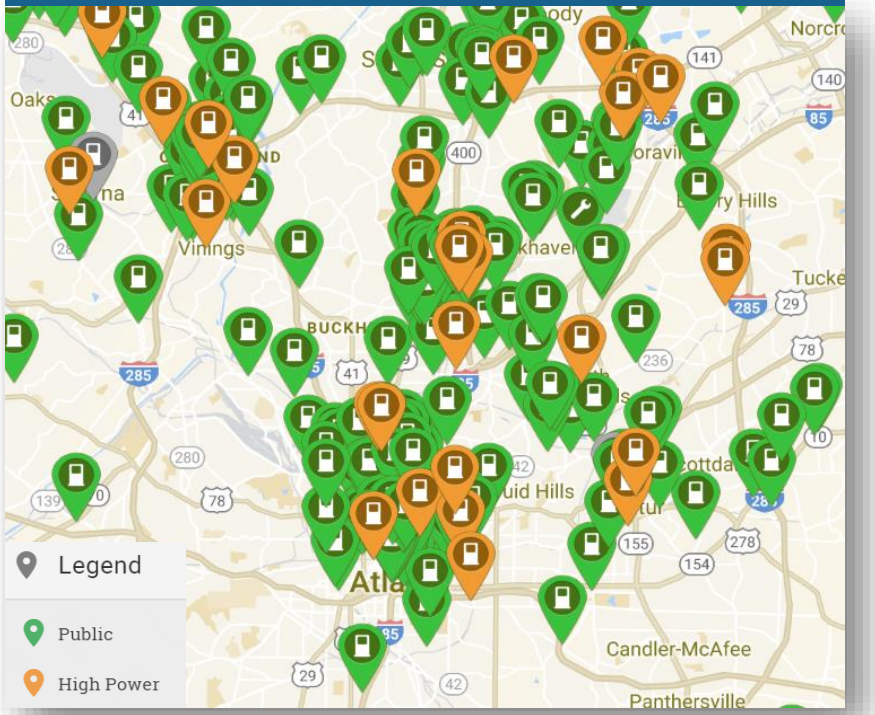
Only one-fourth of the charging infrastructure required to meet electric vehicle demand in 2025 is currently constructed

The rate of deployment will need to increase 20% annually to close the gap

Nearly 60% of drivers that are unwilling or unsure of purchasing an electric vehicle feel that way because of "range anxiety"

Range anxiety can come from the perception of a lack of charging locations or the concern of running out of charge

Charging Locations in the Atlanta Metro Area



Source: PlugShare.com

Electric vehicle charging stations networks will differ from gas stations

Strategic electric vehicle infrastructure investments must be planned now

Fundamental shifts in vehicle refueling patterns and revenue streams require a cohesive, detailed electric vehicle strategy

Charger Speed Implications

Charging speed and cost are positively correlated, but even the fastest chargers **cannot compete with traditional refueling speeds**

Consumer Charging Behavior

Trip origins and destinations might **provide better charging opportunities** than traditional gas station models based on consumer preferences

Electric Vehicle Registration Fees

20 states have enacted special registration fees, creating **new annual revenue streams** all of which remain in-state, unlike traditional fuel taxes

One-Time Investment Opportunities

New Federal grant programs, Electrify America ($2B) and Volkswagen Mitigation ($2.9B) funds create a **one-time investment opportunities**

Electric Vehicle Strategy Considerations

Infrastructure

- Station location
- Charging level
- Ownership (commercial, government, private)

Stakeholders

- Uncertain commercial freight adoption rates
- Transit opportunities
- Load balancing for utilities

Funding

- Annual Registration Fees
- User fees (vehicle miles traveled, tolls)
- Public/Private Partnerships (P3s)

Incentives/Regulations

- Income tax credits
- Charging station rebates
- Corporate Average Fuel Economy (CAFE) standards

Electric vehicle registration fees may be a source for replacing gas taxes over time

Electric vehicle strategy

Our recommended approach to a successful strategy consists of assessing opportunities, prioritizing actions, and implementing solutions

1. Assess Opportunities

Meet the challenges of disruptive technology with innovative opportunities

- **Imagine and quantify** new funding streams
- **Benchmark** current system and available resources
- **Construct** alternative responses

2. Prioritize Actions

Make data-driven decisions incorporating robust analysis, thought leadership, and innovative customer strategy

- **Identify and measure** the impact of potential solutions in different scenarios
- **Understand** location and charging level tradeoffs
- **Communicate** state and regional direction for commercial sector alignment

3. Implement Solutions

Act with confidence in the face of an uncertain market by investing in the right place at the right time

- **Coordinate** investment rollout understanding budget considerations
- **Deliver** superior asset performance
- **Shape** the future of mobility

FutureScape™ is a modeling and simulation solution platform that creates digital replicas of large-scale infrastructure systems

States can use a Digital Twin to analyze the effects of disruptions on infrastructure and population safety and behavior, felt at real-world scale, before they occur

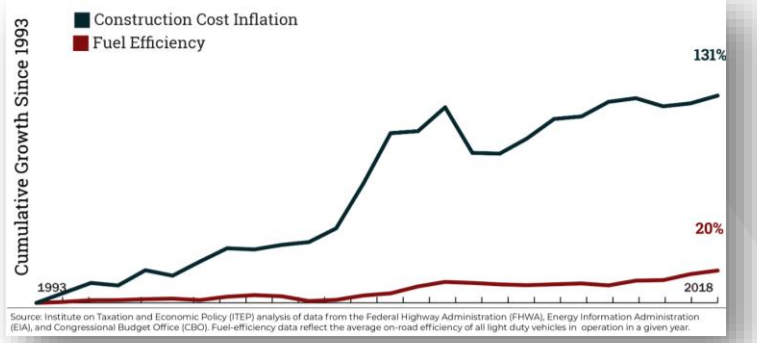
States investigate how local travel patterns, electric vehicle adoption rates and charging locations might interrelate and be impacted by external forces.

The Gas Tax might be running on empty

In the 25 years since the Gas Tax was last raised (and not tied to inflation) vehicles have become more fuel efficient while construction cost and inflation have risen

The Construction Cost Index and Inflation has risen as fuel efficiency has increased, meaning **the relative value of funds raised from Gas Taxes has decreased**

Construction Cost/Inflation and Fuel Efficiency Increases from 1993 to 2018



States are **not receiving the same level of Federal assistance** from Gas Tax revenues as they once were

Many states are taking matters into their own hands. Since 2013, **27 states have risen or reformed their state gas tax policies.** Several of those that have increase their fuel taxes have instituted measures that are tied to inflation

Key Trends

- Vehicle Fuel Efficiency
- Vehicle Electrification
- Land Use Choices
- Consumer Preference
- Construction Cost Index
- Inflation

Vehicle Miles Traveled (VMT) taxes may also be a source to replace gas taxes

A Vehicle Miles Traveled (VMT) tax

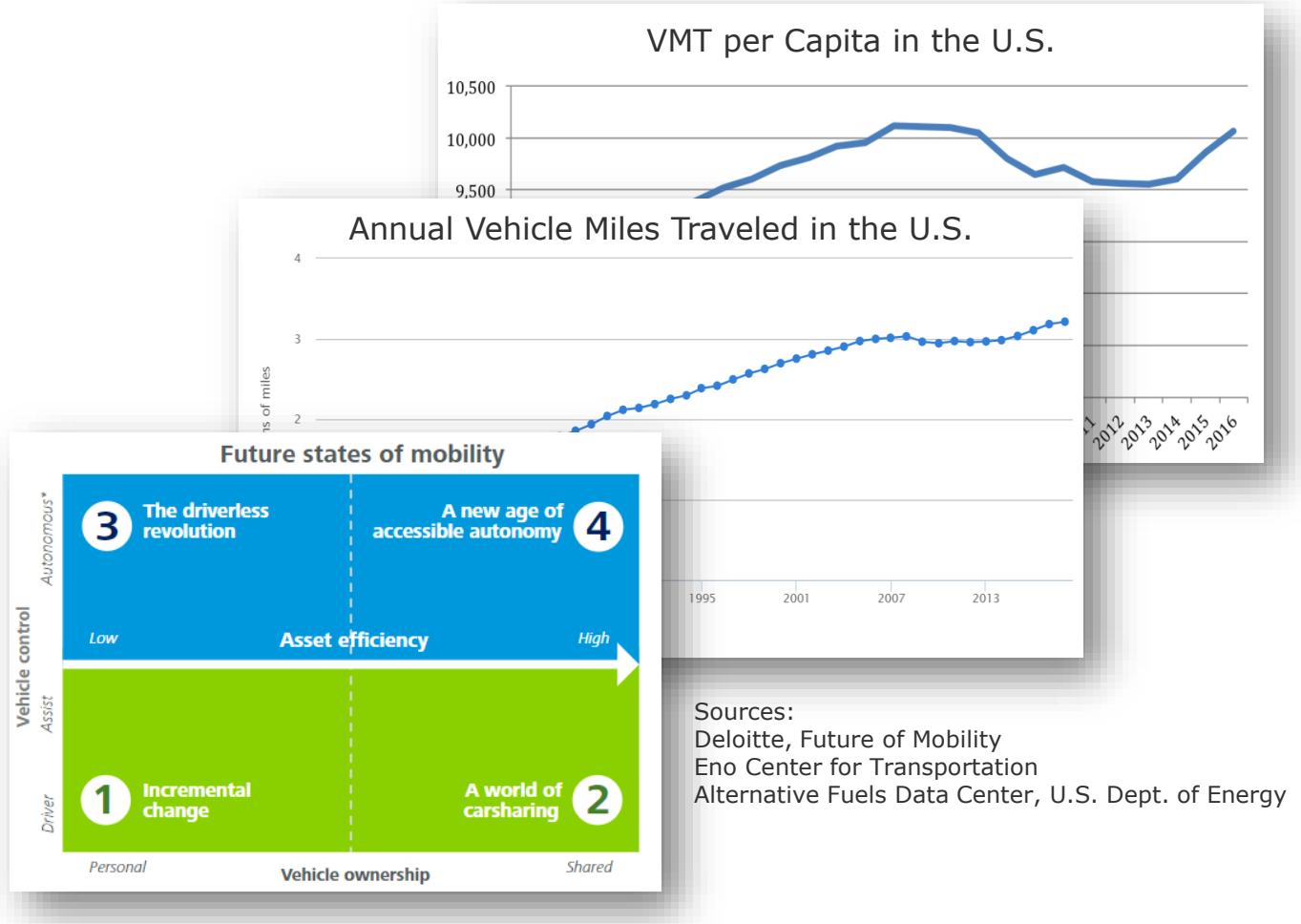
As travel behaviors change, a road usage charge, such as a VMT tax, could provide a more equitable solution but presents its own challenges and opportunities

Challenges

- Potential **privacy concerns**
- **Getting drivers to "opt-in"** without providing too much incentive
- Uncertainty surrounding the **rate and penetration** of underlying mobility trends
- Requires some **technology implementation**

Opportunities

- **Reduced dependency** on motor fuel sales and addresses electric vehicles
- Perceived as an **equitable solution**, since it is tied to usage which can be related to road wear
- Potential technology requirements could also **enable congestion pricing** in the future



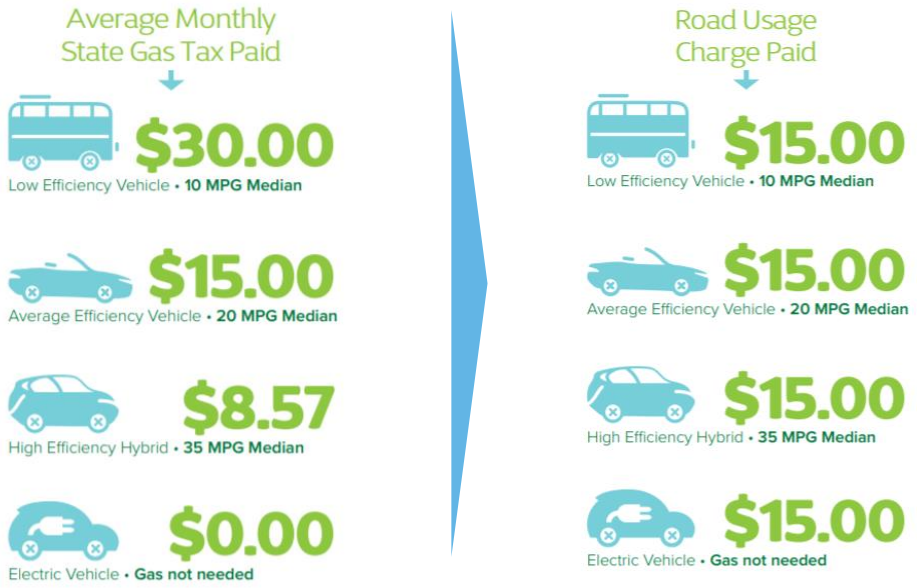
Sources:
Deloitte, Future of Mobility
Eno Center for Transportation
Alternative Fuels Data Center, U.S. Dept. of Energy

States have choices to make when it comes to replacing gas tax revenues

Some states are piloting a VMT tax

It will be important for states to establishing a strategic plan to prepare for the uncertain future of transportation funding

What VMT means to road users



States Piloting VMT Tax

- California*
- Colorado*
- Delaware
- Minnesota*
- Missouri
- Oregon*
- Pennsylvania
- Utah
- Washington

*Pilot Completed

Lessons Learned from Oregon

- **Privacy concerns decreasing** as cell phones become more prevalent
- Privacy can be protected through aggregation and transmission controls
- Framework should be **technology agnostic** so it can flex as the market changes
- A system that relies exclusively on devices installed in vehicles will create challenges for a mandatory tax program
- Integration with current systems can be achieved to allow a **phased introduction**
- The mileage fee could be paid at the pump with little perceived difference by motorists
- **Rural drivers tend to benefit** as they avoid higher gas tax fees from driving typically less fuel efficient vehicles

States can take a leading role in the future of transportation funding