Impacts on State Revenue

• Speakers:
  • Dr. David Greene, Senior Fellow and Research Professor, Howard Baker Center for Public Policy, University of Tennessee
  • Faye DiMassimo, Specialist Leader, Deloitte
“THE SCIENTIFIC DEFINITION OF WORK IS: USING A FORCE TO MOVE AN OBJECT A DISTANCE.”

“ENERGY CAN BE DEFINED AS THE ABILITY TO DO WORK.”

- 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](https://education.jlab.org/jsat/powerpoint/work_and_simple_machines.ppt)
2 [www.edinformatics.com/math_science/work_energy_power.htm](http://www.edinformatics.com/math_science/work_energy_power.htm)
MOTOR FUEL TAXES PROVIDE ABOUT 40% OF PUBLIC EXPENDITURES FOR HIGHWAYS.

Sources of Revenues Used for U.S. Highways

- Federal General Fund: 25%
- State General Fund: 3%
- Local General Fund & Other: 14%
- Other: 5%
- Federal Fuel & Vehicle Taxes: 15%
- State Fuel & Vehicle Taxes: 26%
- Tolls: 6%
- Property Taxes: 6%

Source: US DOT Highway Statistics Table HF-10.
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.
  \[ \text{Work (joules)} = \text{force} \times \text{distance} = \text{energy use (joules)} \]
- 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

Tennessee Gasoline Tax per Gallon and per Vehicle Mile
Since 1950 in 2018 Dollars

Sources: Tennessee Dept. of Transportation, Federal Reserve Bank of St. Louis, Federal Highway Administration.
WHAT ABOUT ELECTRIC VEHICLES? 1.4% OF SALES. ¼% VEHICLES ON ROAD.

Annual U.S. Sales of Plug-in Electric Vehicles

Sources: 2011-17, Alternative Fuels Data Center; 2018, Insideevs.
THE ENERGY INFORMATION ADMINISTRATION’S REFERENCE CASE PROJECTION FORESEES A GRADUAL INCREASE IN BATTERY EV TRAVEL.
IT’S EASY TO FIND MORE OPTIMISTIC FORECASTS, HOWEVER.

EV Share of New Vehicle Sales: US versus California 2016-2025
Data: GoodCarBadCar.net | InsideEVs | Auto Manufacturers Alliance/IHS Markit
Chart & Projections: Loren MacDonald / EVAduction.com
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.

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.

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

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

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

### 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

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.

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.

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

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

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

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

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

**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