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# Funding Roadway Infrastructure in an Electrified World

## RAP Webinar


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# Our Presenters

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**Mark LeBel**

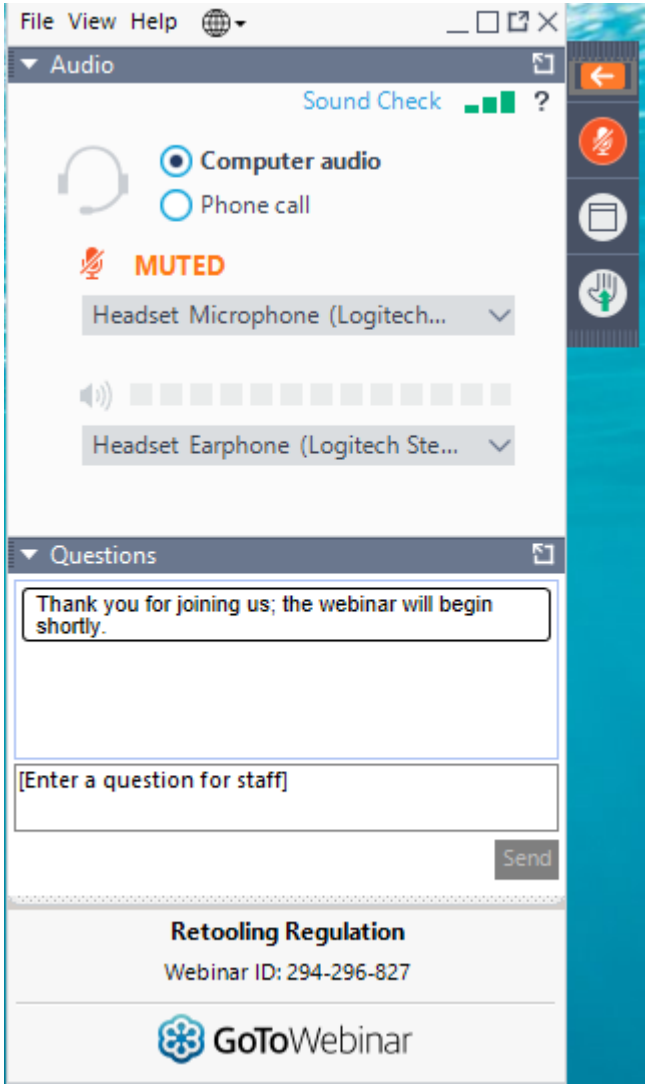
**Karen Glitman**

RAP®

Center for Sustainable Energy™

# Questions?

**Please send questions through the Questions pane**



# 1 Transportation Funding

Center for Sustainable Energy™

# Areas of Expertise

**Clean Transportation**

Adoption of electric vehicles and deployment of charging infrastructure

**Built Environment**

Advancing energy efficiency and renewable resources

**Technology Convergence**

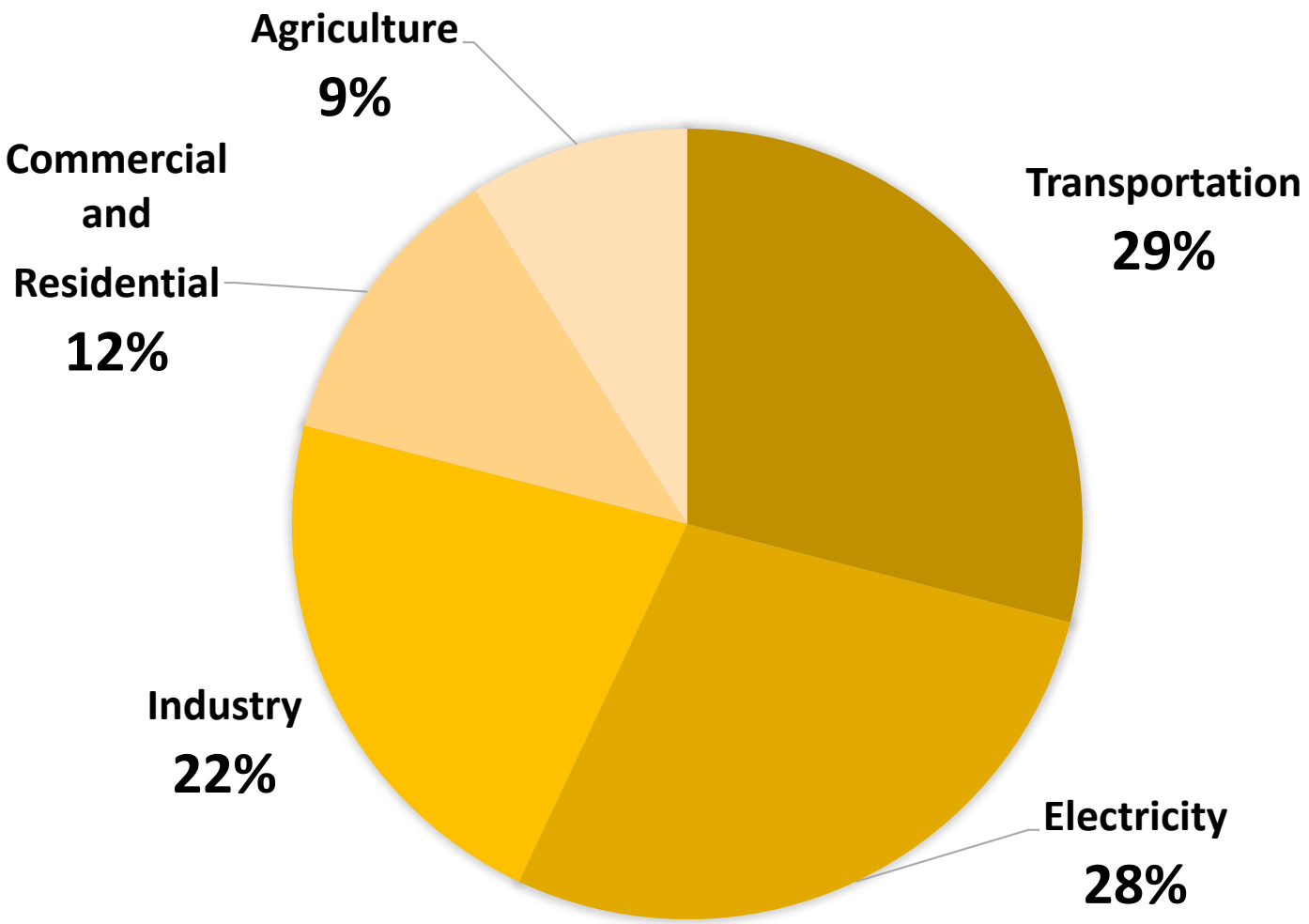
Interconnecting systems to achieve decarbonization

One simple mission —

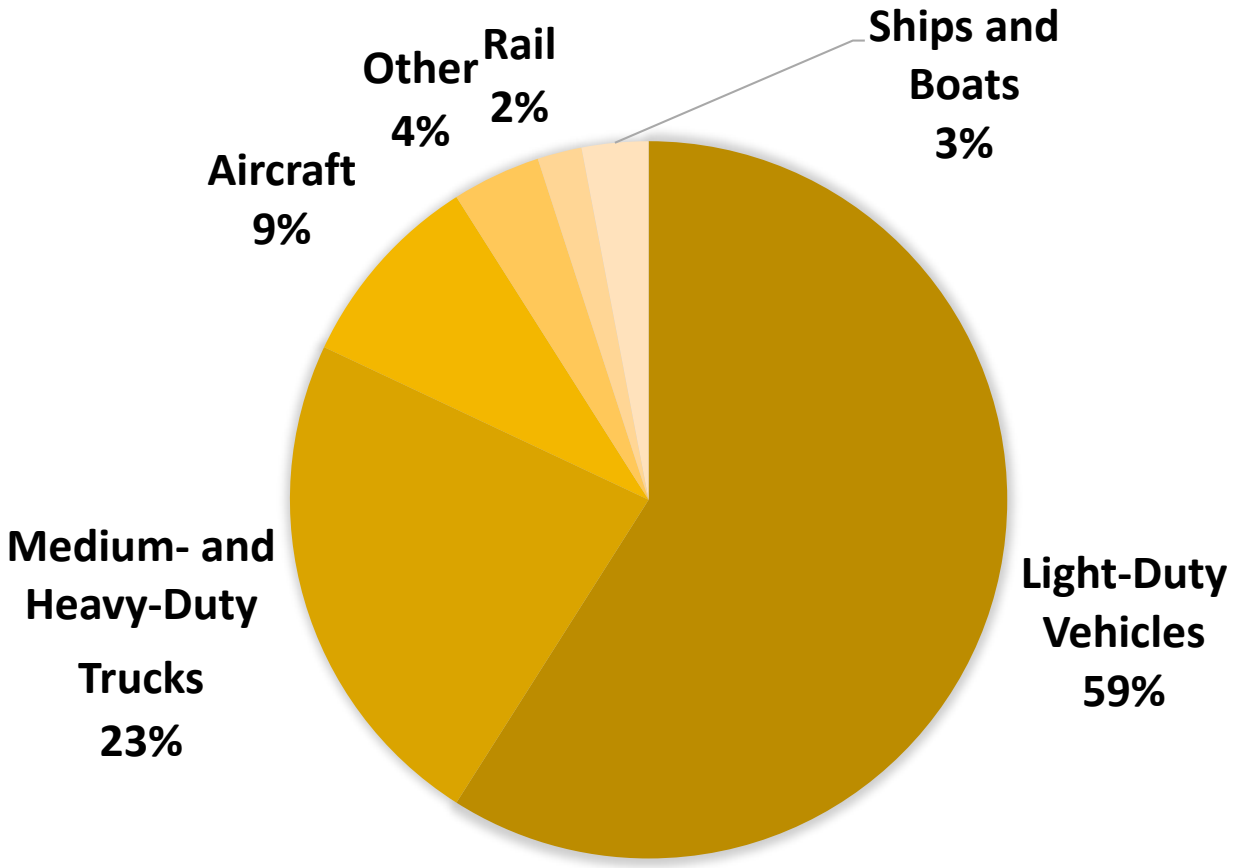
# DECARBONIZE.

Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.

# U.S. GHG Emissions by Source, 2017



# U.S. Transportation Sector GHG Emissions by Source, 2017



# The Transportation System

- Surface transportation
  - Highways
  - Bridges
  - Public transit
  - Bike/pedestrian facilities
- Off-road
- Rail
- Aviation
- Maritime
- Pipeline
- Intermodal connections

Moving people

Moving goods

# Funding vs. Financing

## Funding

No repayment required

- Formula funds
- Competitive project funding

## Financing

Requires repayment

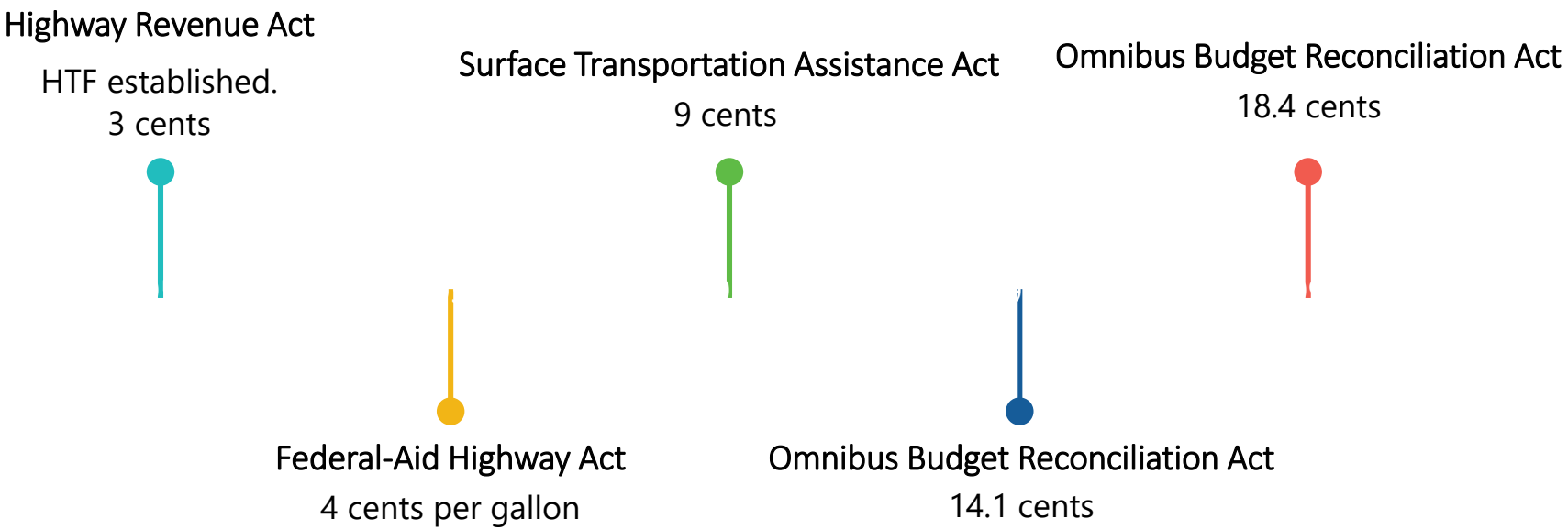
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- State Infrastructure Bank (SIB)
- P3 – tolls, concessions
- TIF – Tax increment financing/value capture

# Selected Revenue Sources for Highway Funding (2012)

| Revenue Type | Federal | State | Local | Percent of Total Revenue |
|---|---|---|---|---|
| Motor fuel taxes | 66% | 31% | 2% | 29% |
| General fund appropriations | 14% | 6% | 47% | 20% |

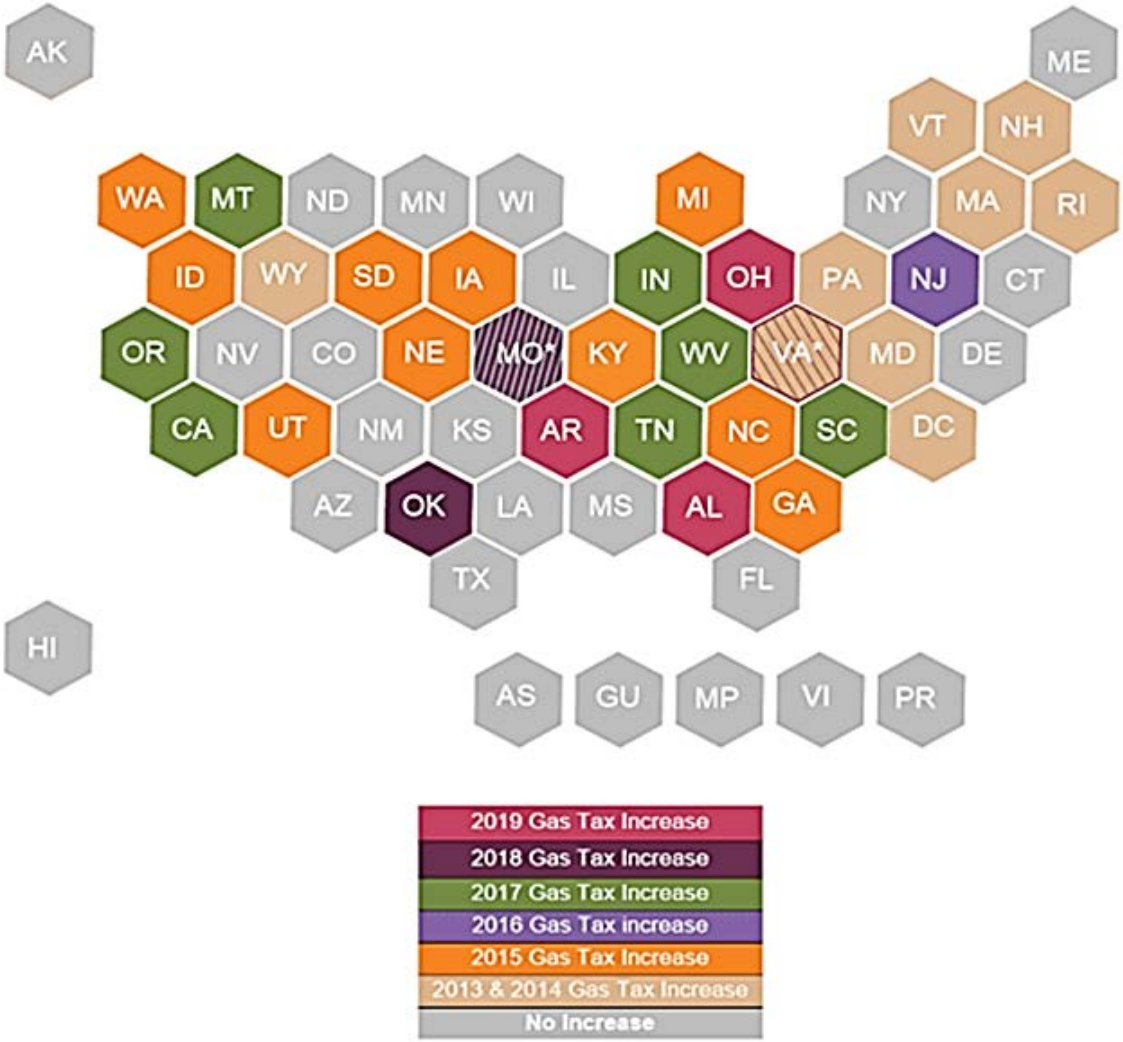
Source: BATIC Institute at AASHTO

# Highway Trust Fund

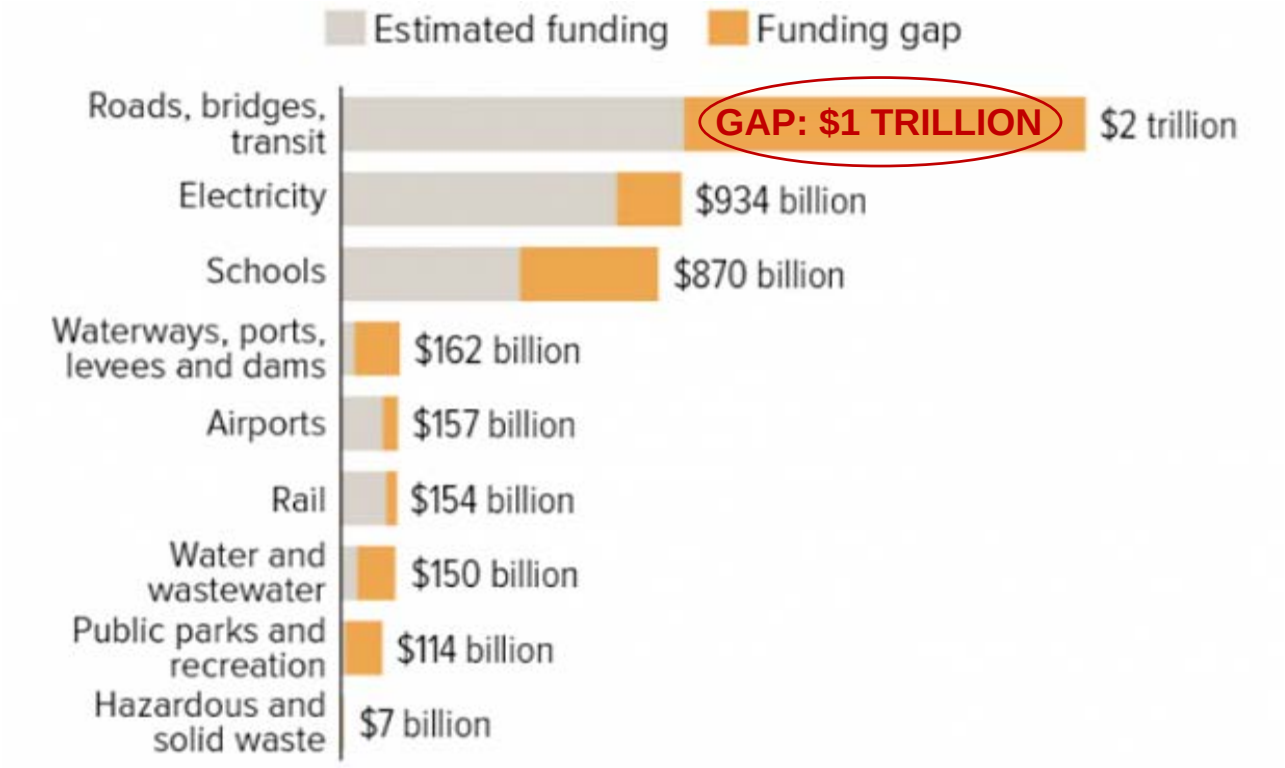



**18.4 cents indexed to construction inflation would be 32.6 cents today and would have resulted in an additional $22 billion/year in the Highway Trust Fund**

# State Gas Tax Increases Since 2013



# Infrastructure Needs, Funded and Unfunded, 2016-2025




Source: Center on Budget and Policy Priorities, data from American Society of Civil Engineers

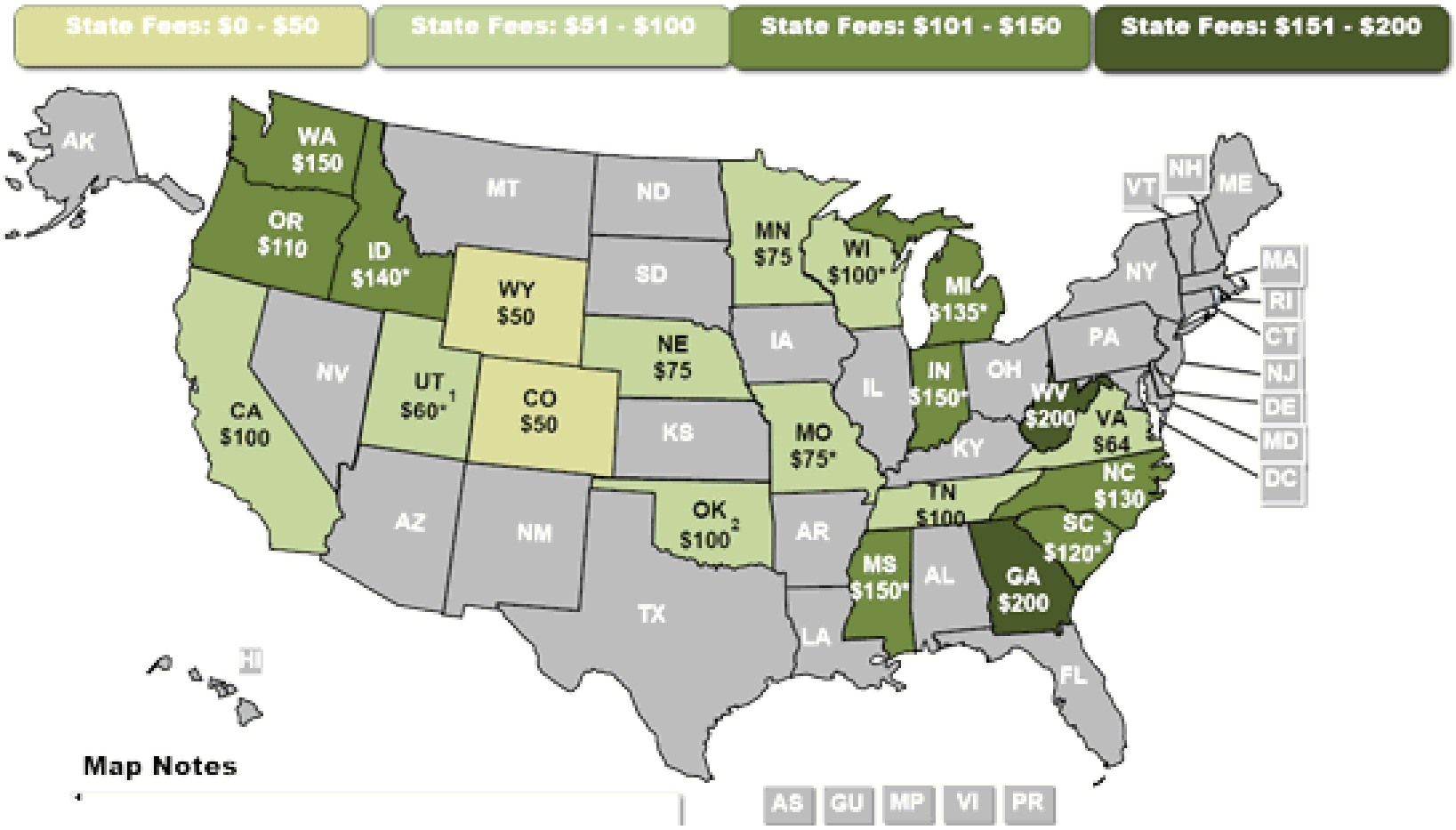
# Transfers to Highway Trust Fund

| Fiscal Year | To Highway Account ($ billions) |
|---|---|
| 2008 | $8.0 |
| 2009 | 7.0 |
| 2010 | 14.7 |
| 2011 | - |
| 2012 | 2.4 |
| 2013 1/ | 5.9 |
| 2014 1/ | 18.4 |
| 2015 | 6.1 |
| 2016 | 52.0 |
| 2017 2/ | 0.1 |
| 2018 2/ | 0.1 |
| **Total** | **$114.7** |

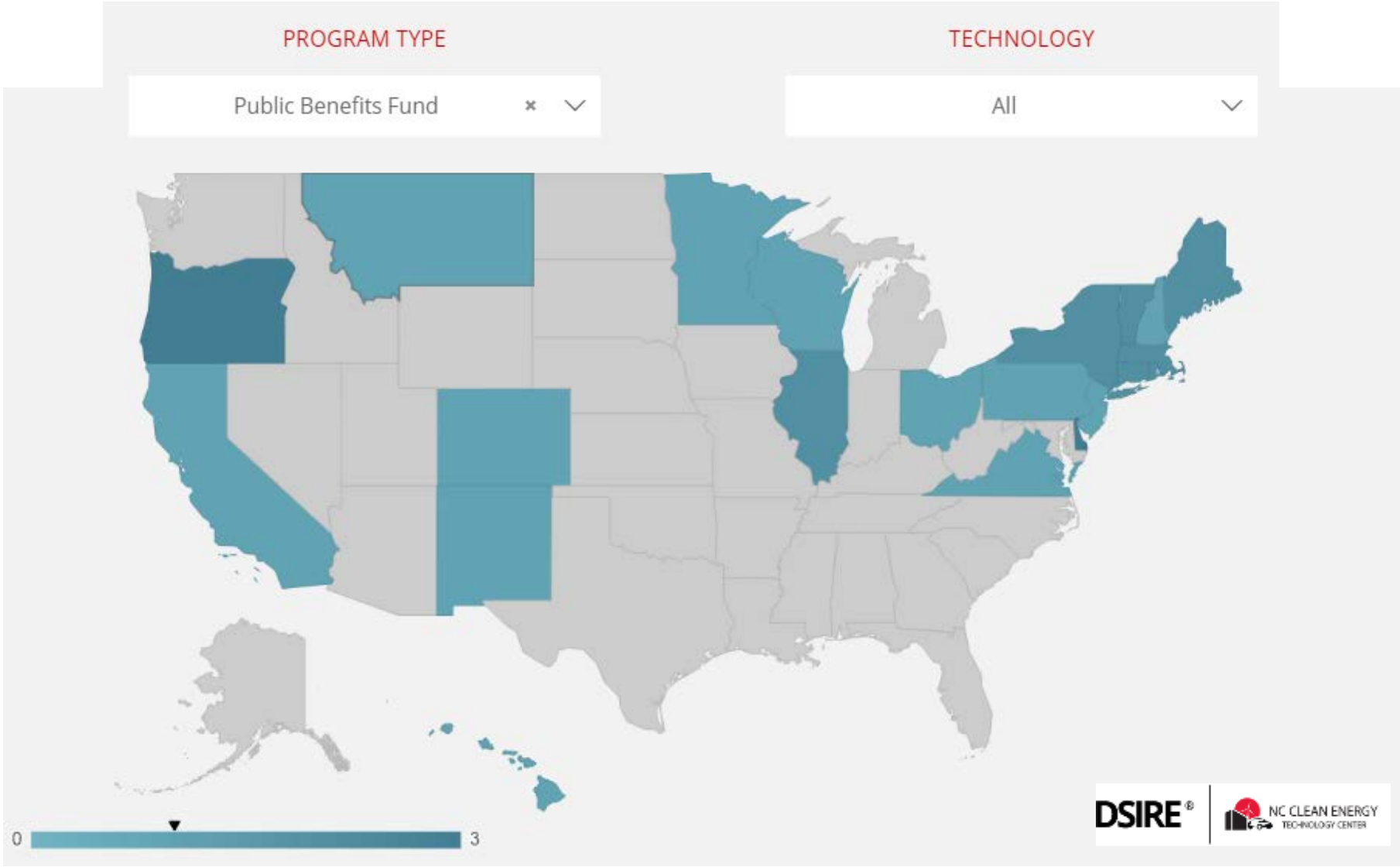
Source: FHWA

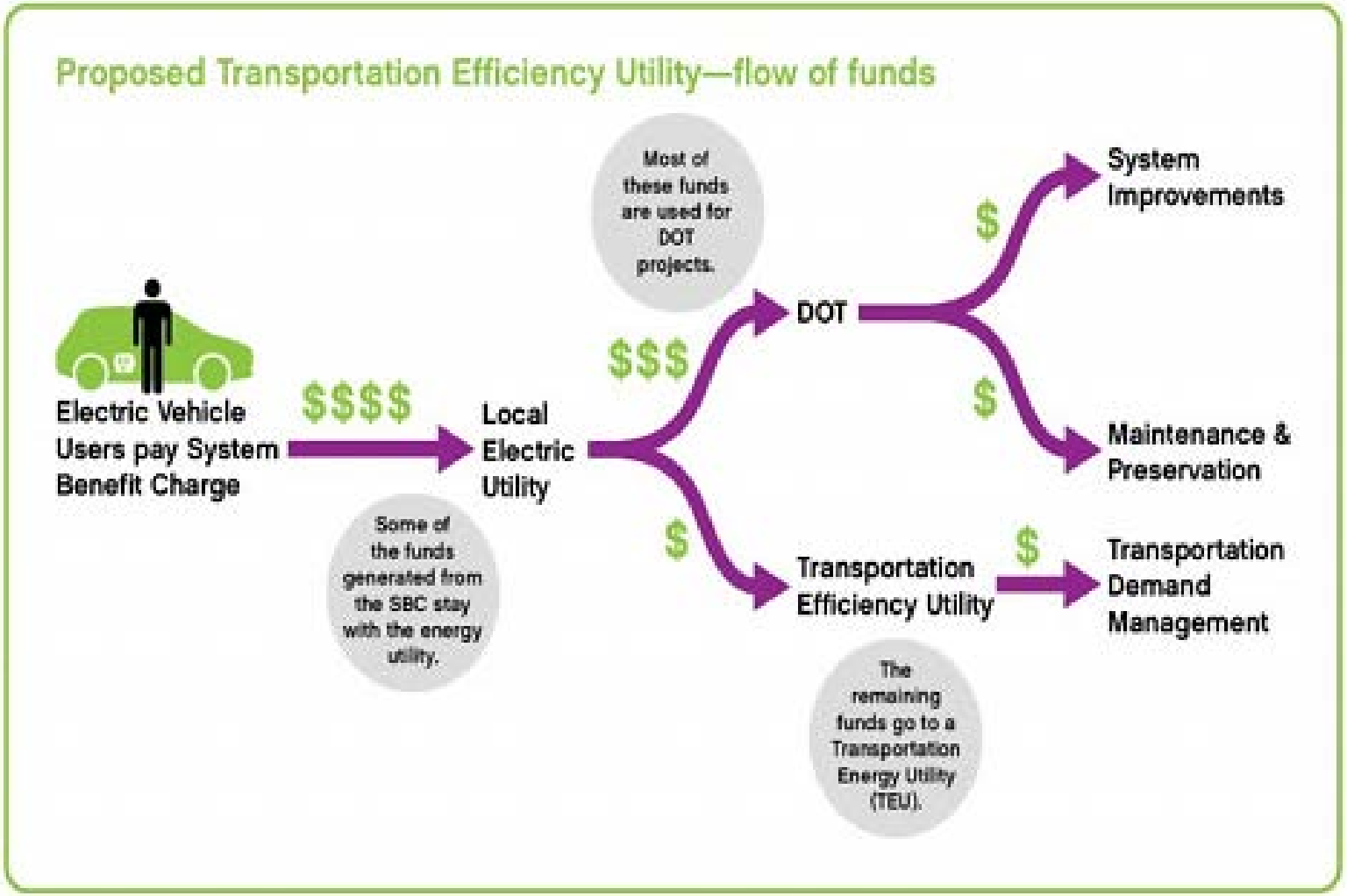
| Plug-In Vehicle Sales by Year - 2010* thru May 2019 | |
|---|---|
| **Year** | **Total** |
| 2010 | 345 |
| 2011 | 17,735 |
| 2012 | 52,835 |
| 2013 | 96,702 |
| 2014 | 118,773 |
| 2015 | 114,022 |
| 2016 | 157,112 |
| 2017 | 194,479 |
| 2018 | 361,307 |
| CYTD 2019 | 110,886 |
| | |
| **Total** | **1,224,196** |

# New EV Fees




Source: NCSL

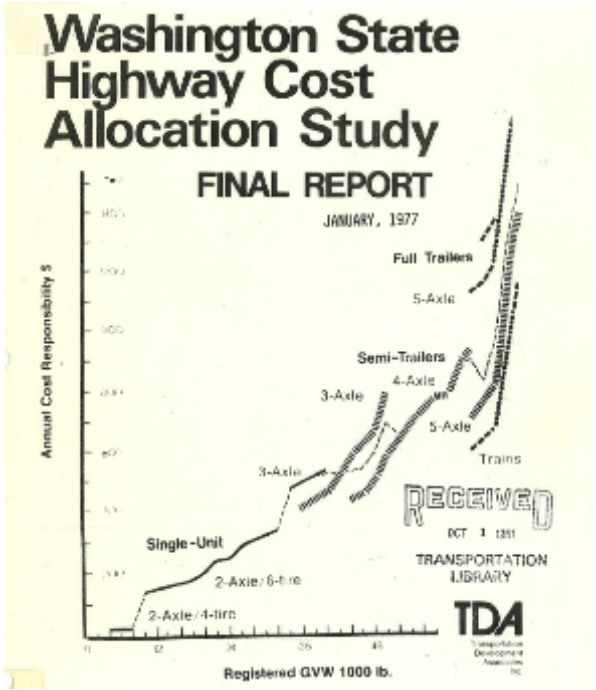

PROGRAM TYPE
Public Benefits Fund
TECHNOLOGY
All
0
3
DSIRE®
NC CLEAN ENERGY TECHNOLOGY CENTER


Proposed Transportation Efficiency Utility—flow of funds
Most of these funds are used for DOT projects.
System Improvements
DOT
$
$$$
$
Electric Vehicle Users pay System Benefit Charge
$$$$
Local Electric Utility
Maintenance & Preservation
$
$
Some of the funds generated from the SBC stay with the energy utility.
Transportation Efficiency Utility
Transportation Demand Management
The remaining funds go to a Transportation Energy Utility (TEU).

Source: VEIC

# 2 Drivers of Road Costs

# Road Cost Allocation Studies




**1997 Federal Highway Cost Allocation Study Final Report**

**U.S. Department of Transportation**
**Federal Highway Administration**

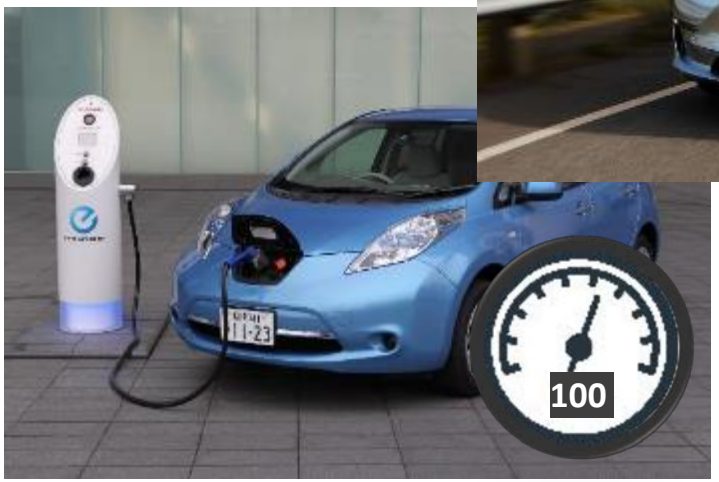
2017-2019 OREGON HIGHWAY COST ALLOCATION STUDY

# Primary Causes of Road Costs

- Width of vehicles
- Weight of vehicles
- Miles driven (VMT)
- Time and location of travel

# Weight and Width

# Miles Driven (VMT)




# Time and Location of Travel

# 3 Options for Roadway Taxing

# Options for Roadway Taxing

- **Fixed annual fee ($/year)**
  - Adjusted by width and weight
  - Based on battery size
- **Vehicle miles traveled (VMT) fee** ($/mile)
  - Linked to weight and width
- Direct **existing electricity tax** paid by EVs to roadway fund (% adder to fuel)
- **Tax electricity use** by EVs ($/kWh)

# Fuel Tax Tracks Weight, Width, and Miles Traveled


# Fixed Annual Fee
## Example: Washington $175/year

- Does not track weight, width, or miles traveled.
- Could be adjusted to vary by weight and width.

# Annual Fee per kWh of Battery Example: $3/kWh/year

- Plug-in Prius
- 10 kwh; 30 mile range
- $30/year (+ gas tax)

- 2012 Leaf
- 24 kwh; 100 mile range
- $72/year

- 2019 Tesla 3 LR
- 75 kwh; 270-mile range
- $225/year

# Vehicle Miles Traveled Fee
## Example: Oregon $0.018/mile

- Does not track weight or width
- Intrusive to some
- How to address interstate mileage??

# VMT Linked to Weight and Width

5’ wide; 3,000 lb

$0.01/mile

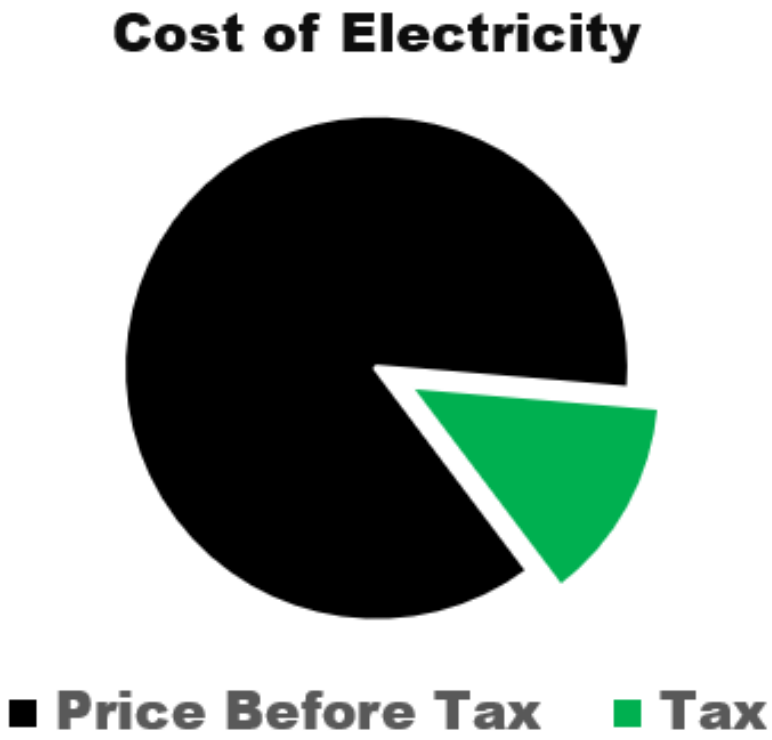
6’ wide; 4,000 lb

$0.015/mile

7’ wide;  6,000 lb

$0.02/mile

# Direct Existing Electricity Tax to Motor Vehicle Fund




- Easy to estimate
- About one-third of typical gasoline tax on a per-mile basis
- ICE vehicles do NOT pay for general gov't

# Directly Tax Electricity Use by EVs


- Tax level of $0.01 – $0.02/mile = $0.03 - $0.06/kWh
- Up to a 50% surcharge
- Invites evasion without smart charging
- Need off-peak discount > tax

# Dumb vs. Smart Electric Rates

**Dumb Rate**

All Hours: $0.12/kWh

**Smart Rate**

Off-Peak: $0.05/kWh

Mid-Peak: $0.10/kWh

On-Peak: $0.15/kWh

Critical: $0.75/kWh

# Comparing Alternatives

| Option | Drivers: Width, Weight, Miles | Administrative Efficiency | Emissions Efficiency | Interstate Cost Recovery |
|---|---|---|---|---|
| Gas and diesel tax | High | High | Low | High |
| Annual fixed fee | Low | High | Low | Low |
| Annual fee adjusted by width and weight | Medium | High | Medium | Low |
| Annual fee based on battery capacity | Medium | High | Medium | Low |
| VMT uniform per mile driven | Low | Medium | Low | Low |
| VMT adjusted by width and weight | High | Medium | Medium | Low |
| Electricity tax—dumb charging and rates | High | Low | Medium | High |
| Electricity tax—smart charging and rates | High | Medium | High | High |

# Final Thoughts

- The United States has experienced transportation funding shortfalls for decades; EVs are not one of the primary causes of those shortfalls.
- Fair cost recovery should take into account weight, width and miles driven.
- Smart chargers, smart rate design and smart tax design can work together to provide an effective, efficient and equitable solution.
- Transportation system and electric system planning needs to be coordinated.

# Questions?

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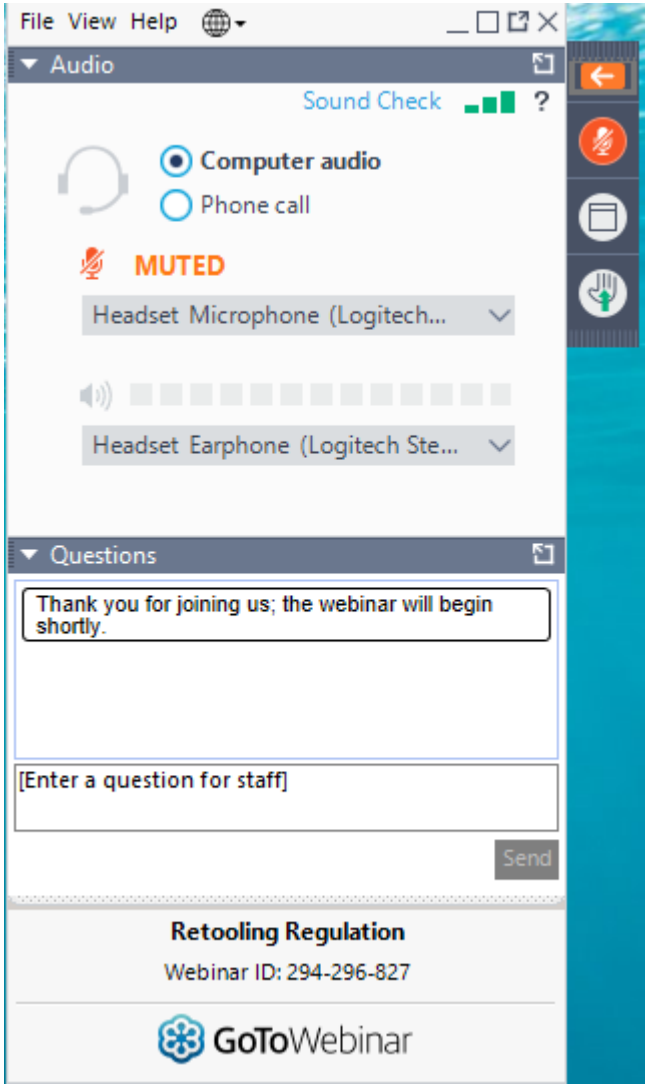

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