



Norman Whitton

Managing Director,
*Electric Interstate
Highway Standards
Association*

Faster

Cheaper

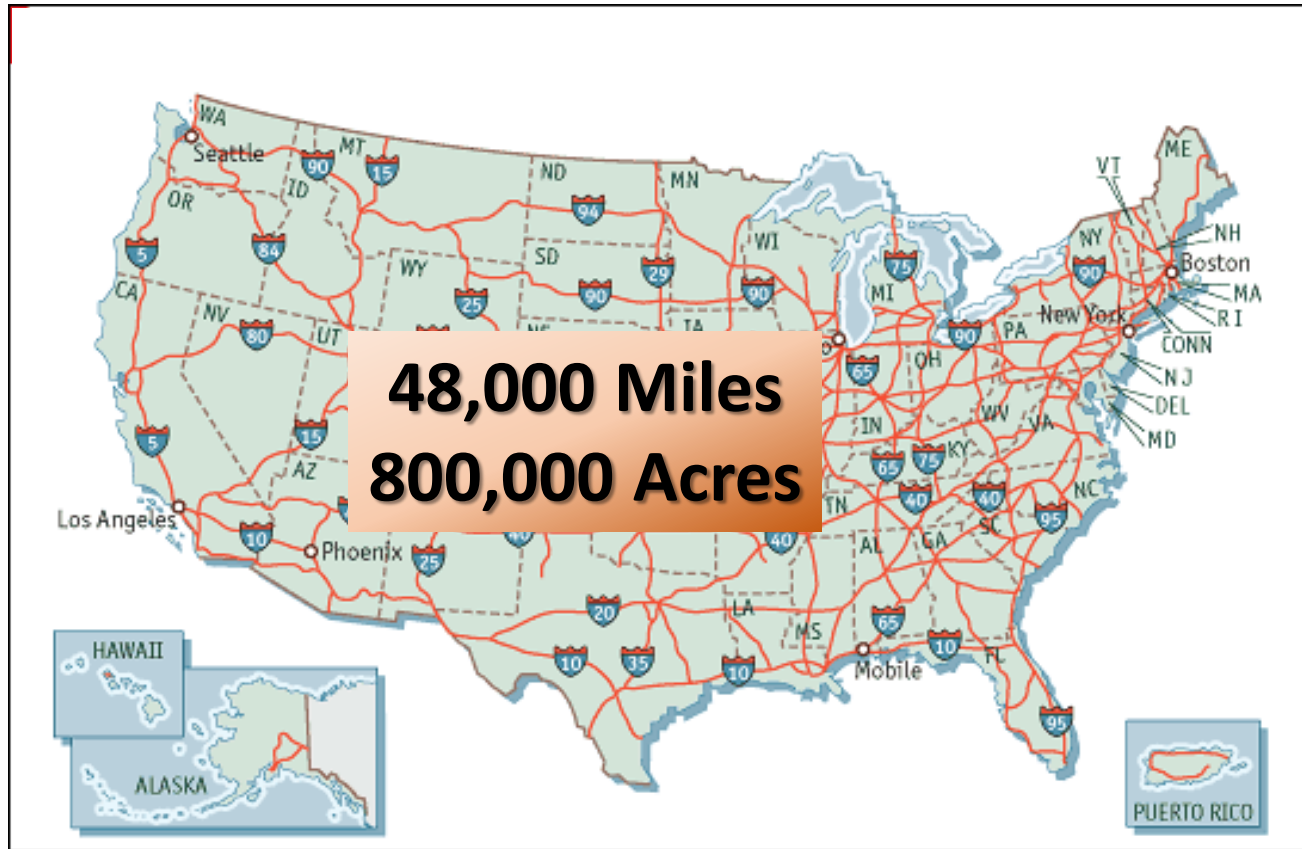
Greener



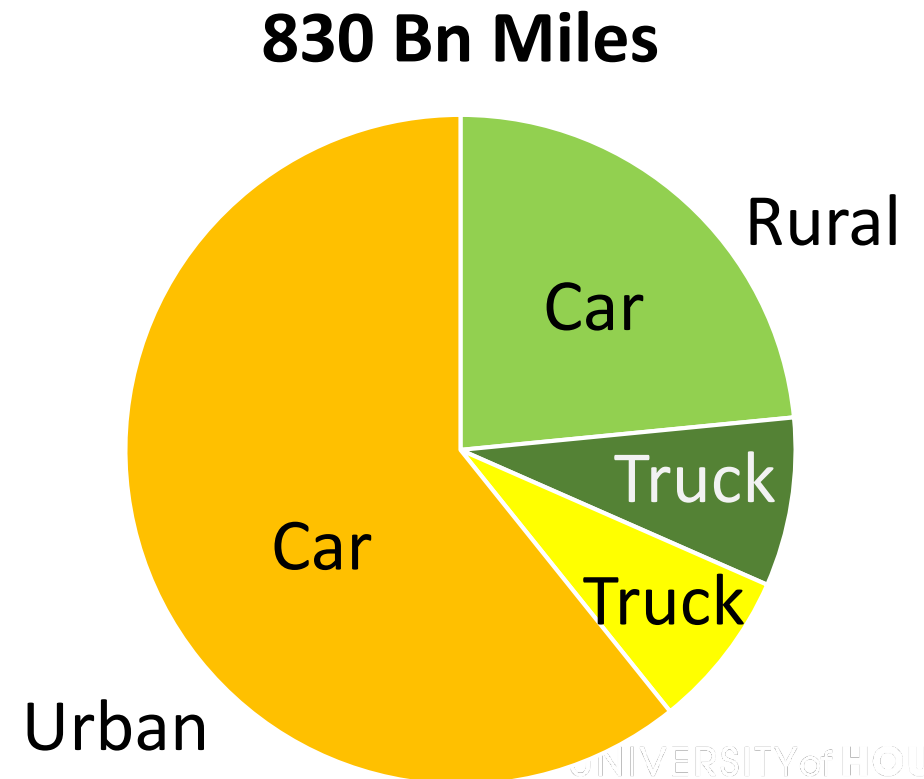
Interstate 2.0

- Interstate Highway System
- New Vehicle Technology Adoption
- Challenges and Improvement Opportunities
- Integrated Roadway Concept
- Technology Innovation Needed

Interstate Highway System



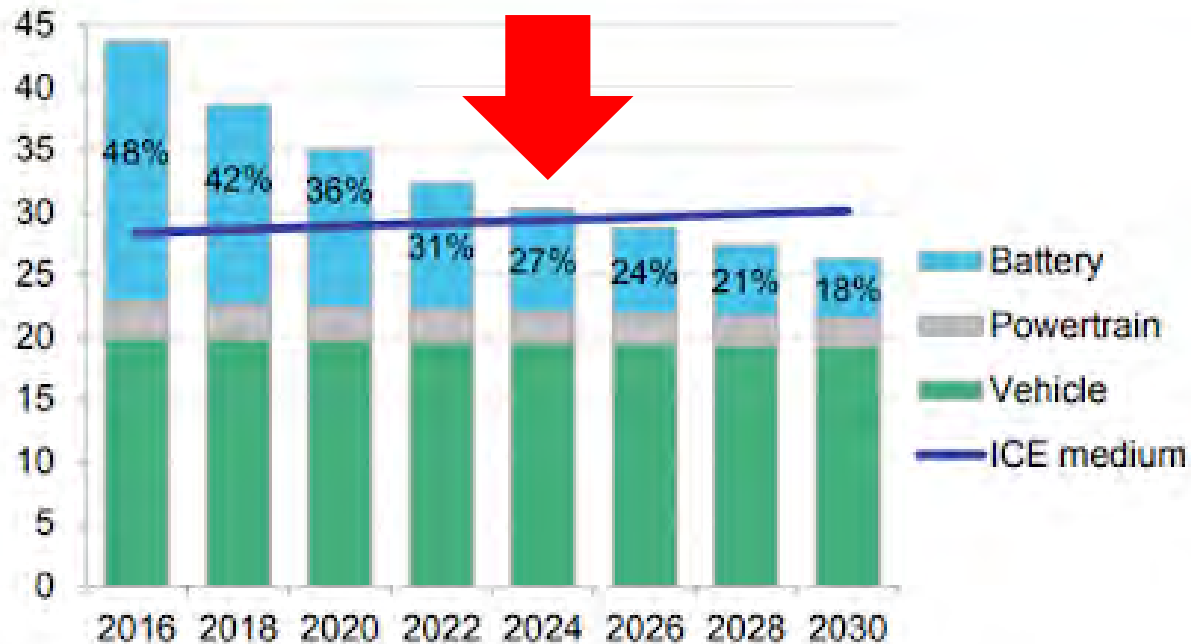
43% of US Truck Miles
24% of US Car/Pickup Miles



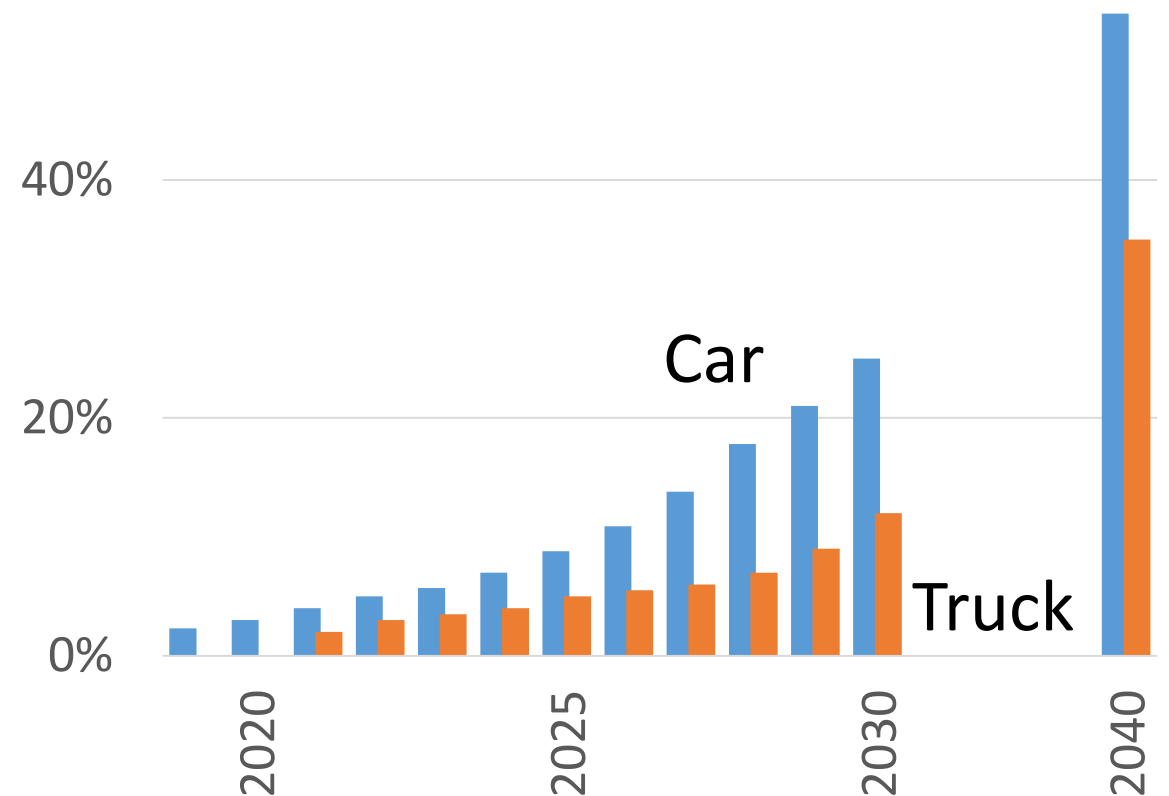
*Slide data provided by Bloomberg New Energy Finance, the US Department of Transportation and The American Trucking Association

Battery Electric Vehicle Adoption

EV Car Capital Cost

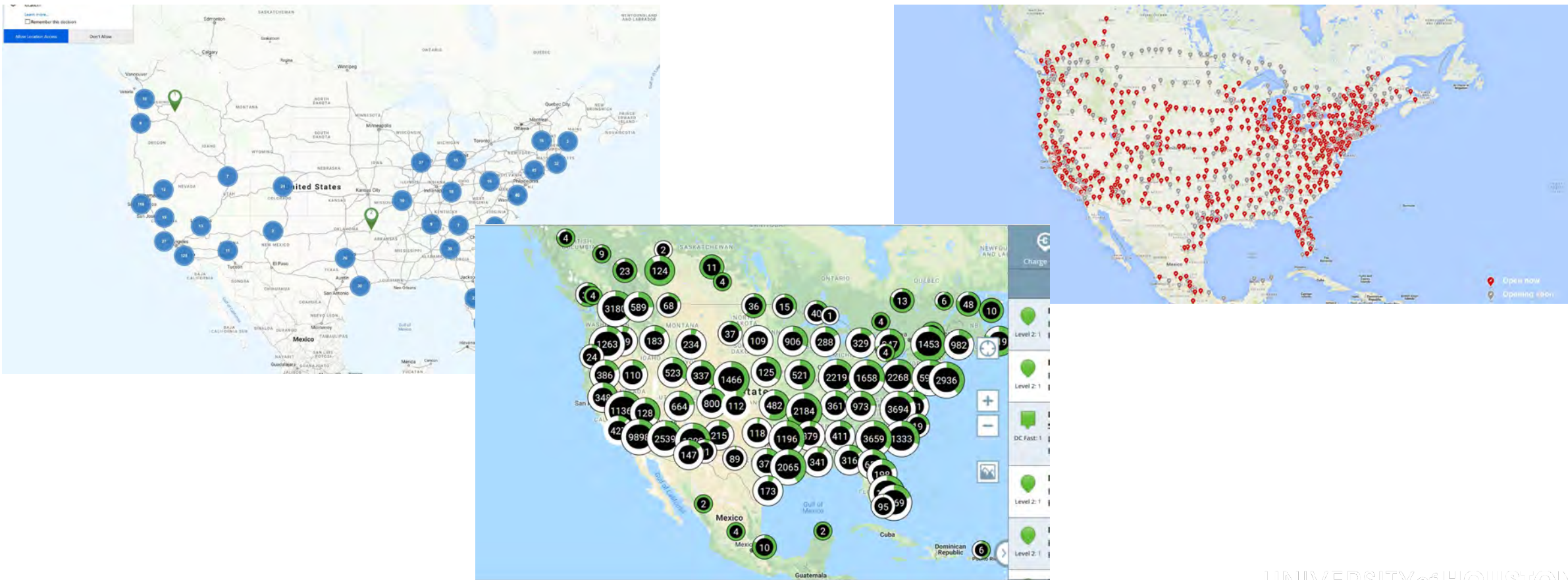


US New Vehicle Sales



*Slide data provided by Bloomberg New Energy Finance, the US Department of Transportation and The American Trucking Association

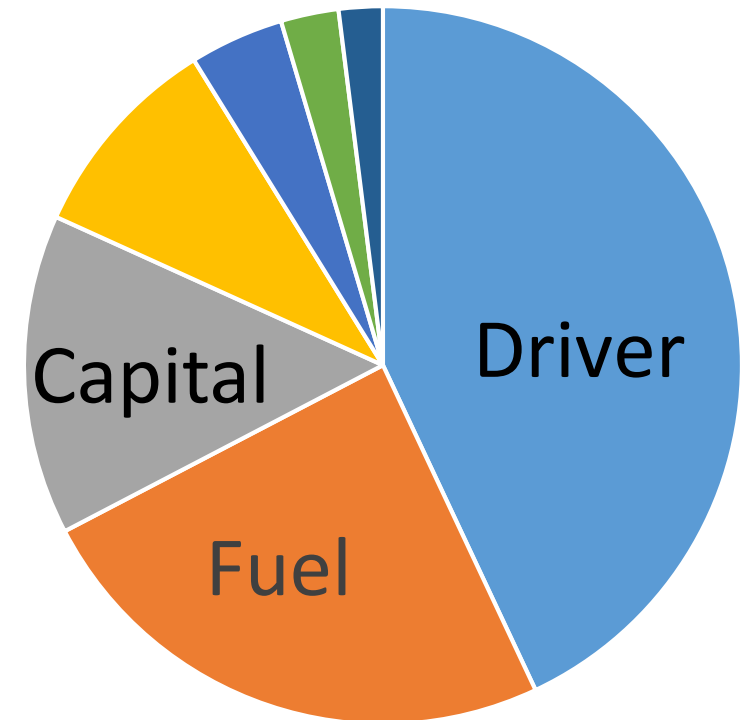
Charging Networks



*Slide data provided by Bloomberg New Energy Finance, the US Department of Transportation and The American Trucking Association

Autonomous Vehicle Adoption

\$1.82/mi - 2018



Highway Trucks – Soon

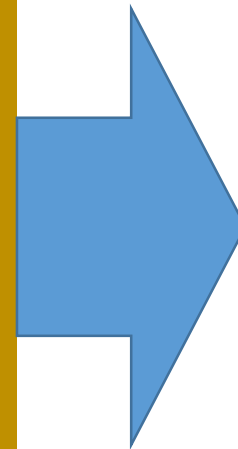
Urban Cars - Later

Adoption Challenges – 10+ Yrs

- **Availability and cost of batteries**
 - **Few EV truck models**
 - **High vehicle capex**
 - **Grid power capacity for high-speed charging – requires even more batteries**
- **Payload penalty for weight-limited truck service**
- **Public acceptance of EV and autonomous vehicles**

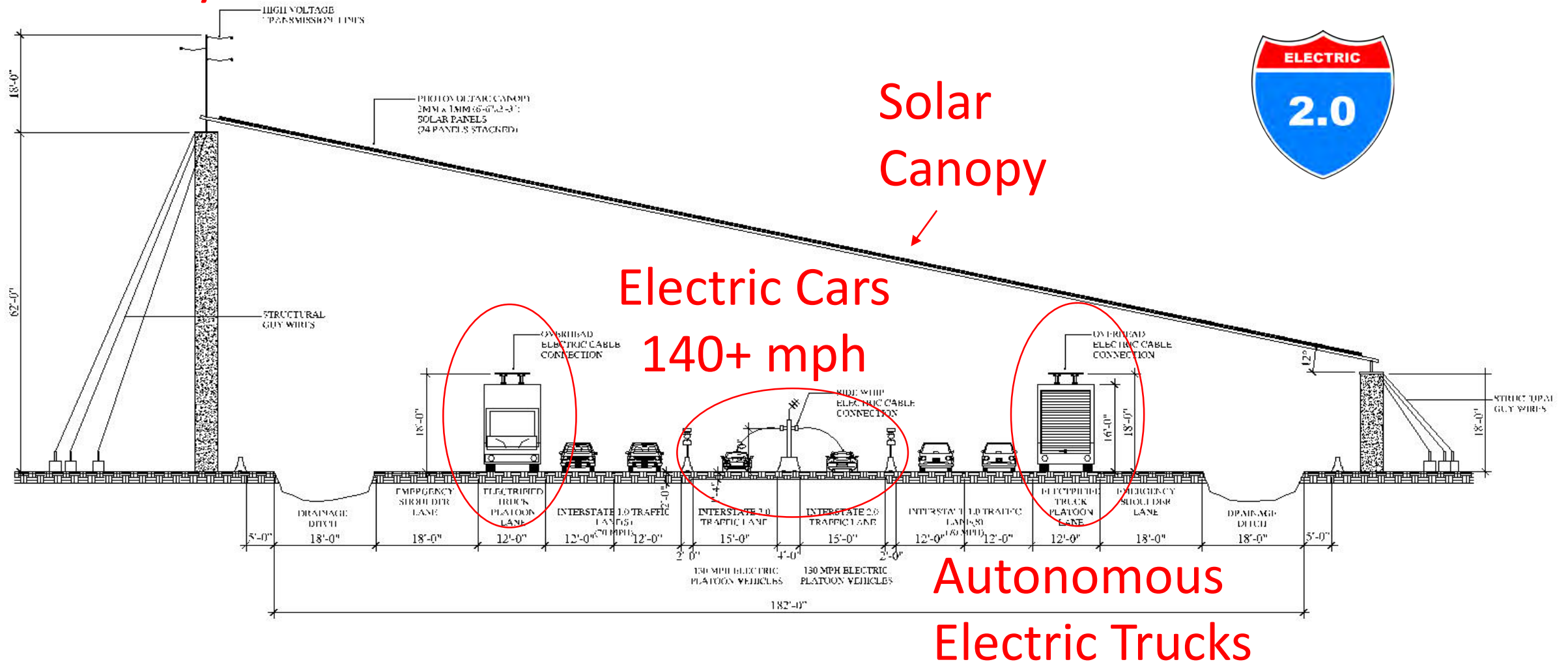
Improvement Opportunities – 20+ Yrs

- Duplicated and costly batteries
- Lost payload due to battery weight
- Time wasted charging
- Human-limited driving capability (speed, spacing)
- 800,000 acres underutilized land
- Failed fuel tax revenue model



- Deliver power to vehicles directly on roadway
- Integrate AV for high-speed platooning
- Produce and sell electricity using solar PV on right of way

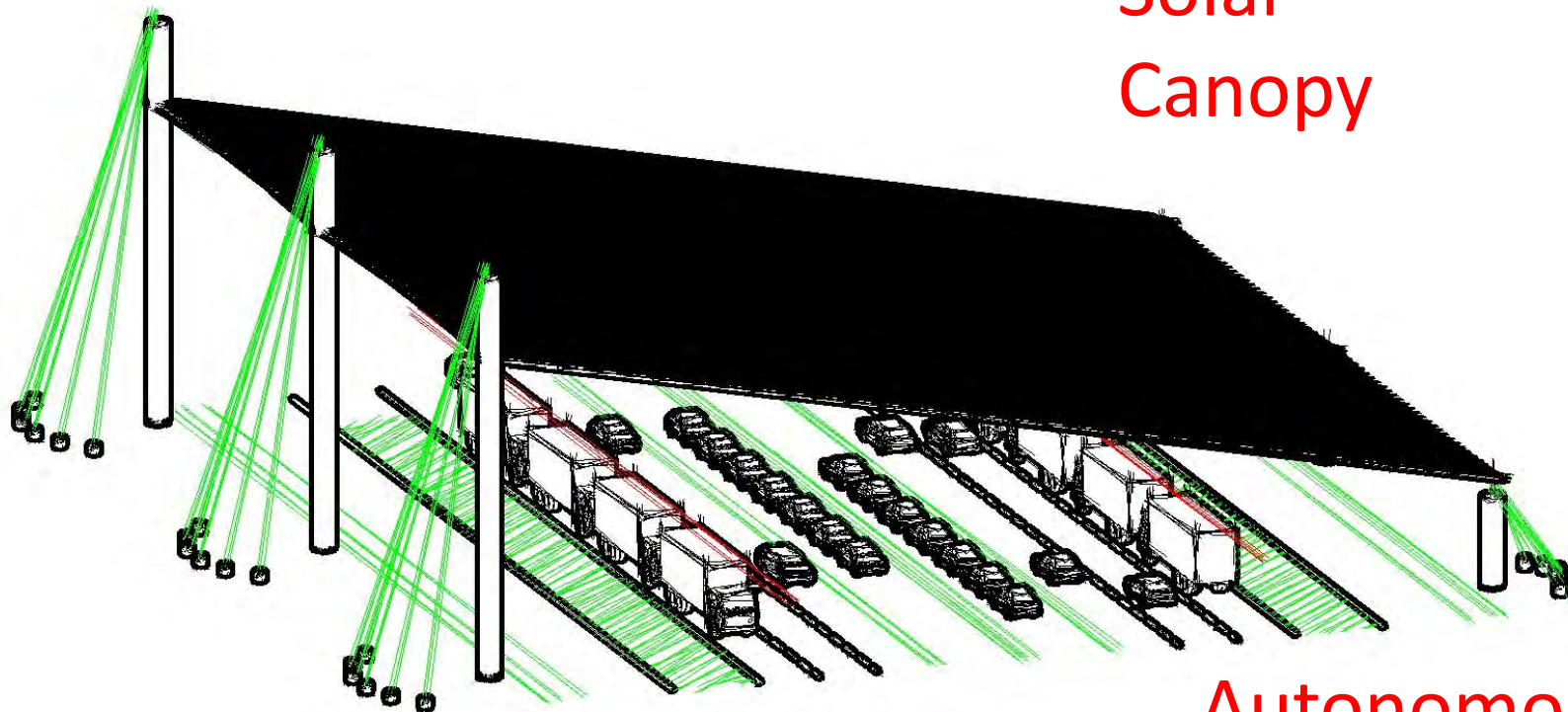
Electricity Transmission



*Slide data provided by Bloomberg New Energy Finance, the US Department of Transportation and The American Trucking Association

Electricity Transmission

Solar
Canopy



Electric Cars
140+ mph

Autonomous
Electric Trucks



2018
Siemens
Test Track
in Germany

Innovation Needed

Power Delivery	Dual U catenary “Drone” pantograph	Stiff, long-lasting Light, easily engaged
Solar	Canopy Energy Efficiency	Light, strong structure 30+% (perovskite)
Autonomy	Faster Closer spacing	Connected vehicles Processing/Algorithms
Business Model	Public/private Standards	Energy & Vehicle Companies State and Federal Govt