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# TRB Webinar: Anticipated Truck Loadings in Pavement Design—Part I

*November 25, 2024*

*12:00 – 1:30 PM*



# PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at [TRBwebinar@nas.edu](mailto:TRBwebinar@nas.edu)

*The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.*



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# Purpose Statement

This webinar will facilitate proactive considerations to changes in pavement loading due to advancements in truck technology. These advancements impact current pavement design methods for durable and resilient pavements in the future.

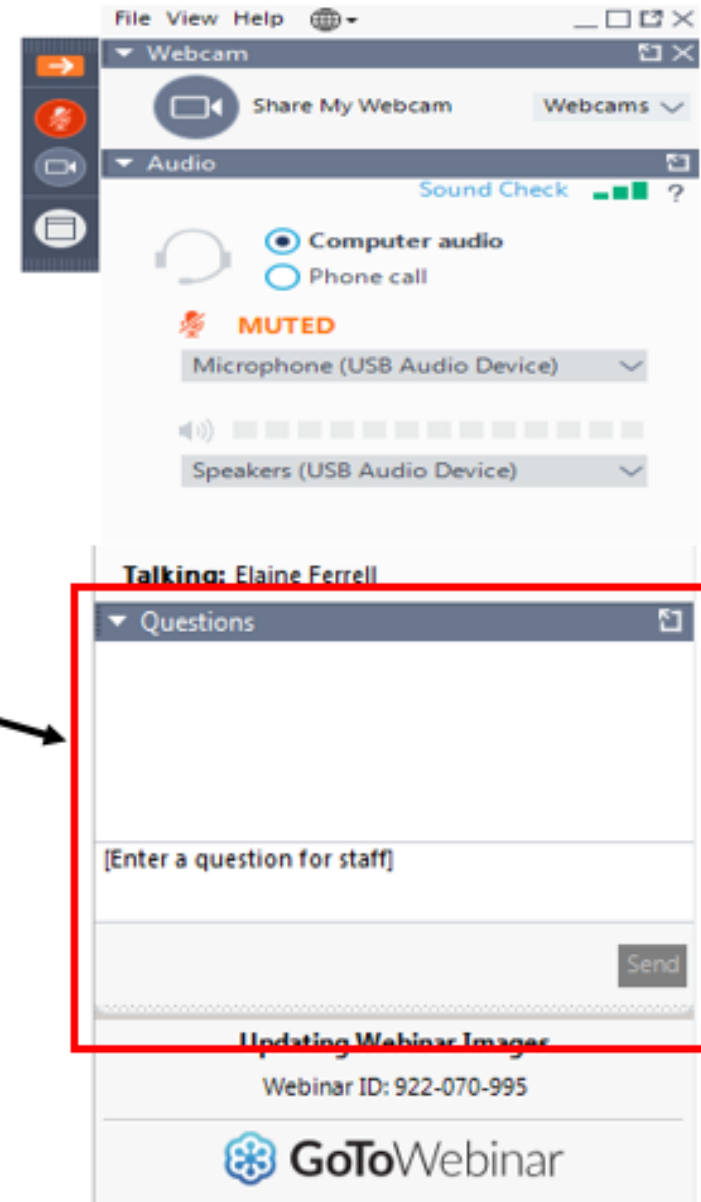
# Learning Objectives

At the end of this webinar, you will be able to:

- (1) Speak to the impacts that emerging truck technologies have on highway pavement loading such as weight and frequency
- (2) Identify considerations in pavement design methods and rehabilitation strategies due to anticipated changes in highway loading

# Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



# Today's presenters



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# Agency Planning for Anticipated Truck Loadings

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# Role of Federal Highway Administration (FHWA)

- The Federal-Aid Highway Act of 1956 (Pub.L. No. 627) first included Federal TSW requirements, and they are codified in Title 23 United States Code (U.S.C.) 127.
- Subsequent acts of Congress have made changes to nationwide TSW requirements and provided specific exemptions or exceptions.
- Regulation and enforcement of Federal TSW standards **help preserve Federal infrastructure investment, improve roadway and bridge safety, and support freight operations.**
- States must ensure that vehicles comply with Federal TSW standards; FHWA is responsible for certifying State compliance with Federal standards.



# FHWA: Planning Efforts

- **Research on the Impacts on Infrastructure**
  - 2020-2021: Impacts of Automated Vehicle (AV) on Infrastructure Research Project
  - Conducted through FHWA Infrastructure Research and Development with support from FHWA Safety R&D
- **Research on the Impacts on Truck Size & Weight and movement of Freight**
  - 2016 (MAP-21): USDOT Comprehensive TSW Limits Study
  - 2018–2019: TRB TSW Research Roadmap
  - 2021–Present: FHWA VSW Research Implementation Plan



# Impacts of Automated Vehicle (AV) on Infrastructure

- **Stakeholder feedback – big ticket items!**
  - Desire for national guidance describing how to prepare for AVs
  - Maintaining an infrastructure state of good repair
  - Concern with level of readiness for AV deployment
- **Research findings: highlights for infrastructure**
  - Heavy vehicles equipped with lane-centering technologies may accelerate pavement rutting
  - Early AV deployment may lead to increased congestion
  - Approaches and exits from toll booths can be challenging
  - Pavement marking policies



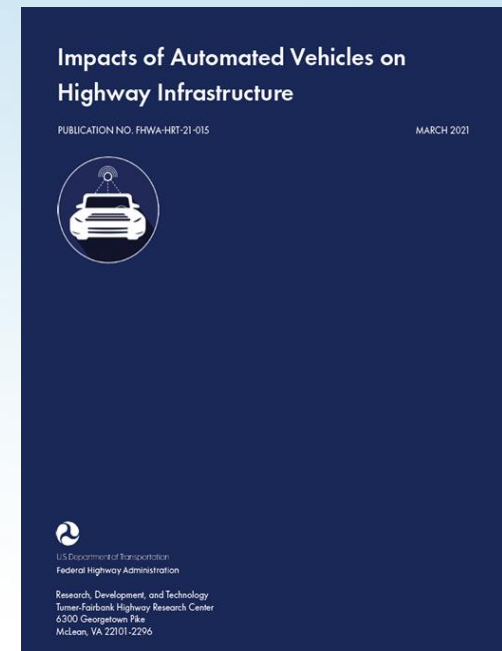
# Deliverables: TechBrief and Final Report

*Impacts of Automated Vehicles on Highway Infrastructure.*  
Report No. FHWA-HRT-21-051. Washington, DC: Federal Highway Administration.  
<https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/21051/index.cfm>.

*Impacts of Automated Vehicles on Highway Infrastructure.* Report No. FHWA-HRT-21-015.  
Washington, DC: FHWA 2021  
<https://www.fhwa.dot.gov/publications/research/operations/21015/index.cfm>



Source: FHWA.



Source: FHWA.

# Research on the Impacts on Truck Size & Weight and Movement of Freight

- TSW research is a broad topic; different USDOT modes/administrations conduct research.
- USDOT has researched TSW topics for decades, periodically producing studies to inform congressional consideration and to advance national interests.
- FHWA is working to advance the Department's TSW research in coordination with the Office of the Secretary for Research and Technology, Federal Motor Carrier Safety Administration (FMCSA), Federal Railroad Administration, National Highway Traffic Safety Administration, and the Maritime Administration.

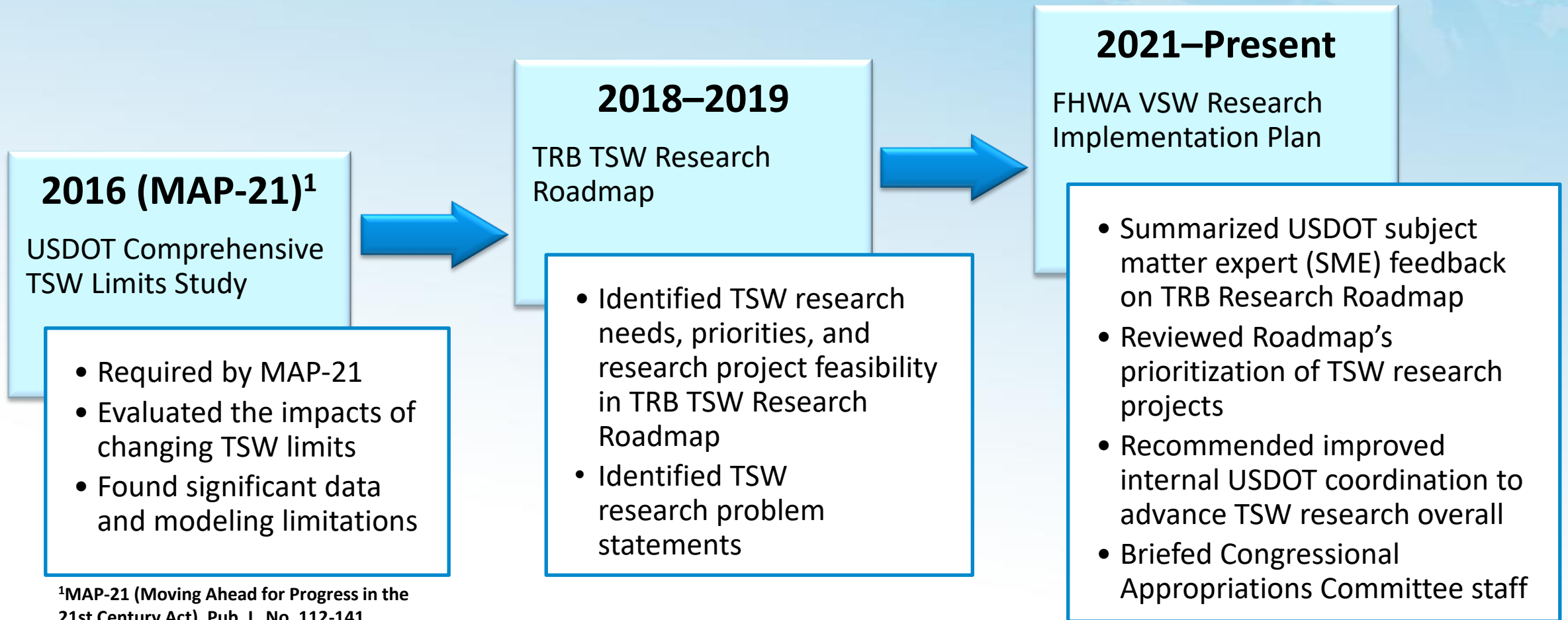
## How does the Federal Highway Administration approach Truck Size and Weight Research?

FHWA's TSW research agenda is subject to agency needs and priorities, as well as the availability of staff and general research funding.

FHWA has historically convened the Department's modal stakeholders on congressional directives for TSW studies.

# Past Research Activities

## Timeline for Truck Size and Weight Research



<sup>1</sup>MAP-21 (Moving Ahead for Progress in the 21st Century Act), Pub. L. No. 112-141.

VSW = vehicle size and weight.



# VSW Implementation Plan (1/2)

Following receipt of the TRB Research Roadmap, FHWA undertook drafting of an implementation plan to improve modal coordination of TSW research. The plan addressed three areas:

- USDOT SME-perspectives on the TRB Research Roadmap
- Programmatic considerations for TSW research
- Implementation considerations for TSW research

## What is the U.S. Department of Transportation Truck Size and Weight Research Implementation Plan?

The draft plan summarizes FHWA's assessment of the TRB Research Roadmap with input from other USDOT SMEs. It outlines needs, considerations, and success factors for implementation of TSW research.



# VSW Implementation Plan (2/2)

In *developing* the implementation plan, FHWA considered a number of areas, including:

- Identifying funding needs/resources
- Defining a TSW research agenda focused on near-term feasibility
- Establishing robust knowledge management practices
- Coordinating these elements across USDOT modes

In *advancing* the draft implementation plan, FHWA is currently focused on:

- Establishing robust data collection and management practices
- Coordinating these elements across USDOT modes





# Recent Truck Size and Weight-Related Activities

- Continuing coordination via USDOT internal TSW Working Group
- Publishing periodic *USDOT Vehicle Size and Weight Research Updates Brief*; 2023 and 2024

USDOT Vehicle Size and Weight Research Updates Brief  
For Internal USDOT Reference Only  
Spring 2024

*Not for public distribution*

**Overview**  
This Vehicle Size and Weight (VSW) Research Updates Brief provides U.S. Department of Transportation (USDOT) VSW experts with recurring updates about VSW-related projects, research, news, and events. VSW research topics refer to safety, pavement, bridges, mode choice, enforcement, economics, data, technology, regulations, guidance, and other related topics.

**Research**

- Transportation Pooled Fund (TPF)**
  - [Improving Traffic Detection Through New Innovative I-LST Technology Demonstration Pilot \(in progress\)](#) – FHWA lead organization.
- Transportation Research Record: Journal of Transportation Research Board**
  - [Necessary Infrastructure Accommodations for Automated Trucks and Truck Platoons \(in progress\)](#)
  - [Asset Management of Bridges Using Uncrewed Aerial Vehicles and Machine Learning Models \(in progress\)](#)
- USDOT National University Transportation Center for Safety**
  - [Estimating the Effects of Vehicle Automation and Vehicle Weight and Size on Crash Frequency and Severity: Phase 1 \(in progress\)](#)
- National Center for Sustainable Transportation**
  - [Effects of High Early Strength Concrete Thermal Contraction, Shrinkage and Creep on Pavement Performance \(in progress\)](#)
  - [Development of Predictive Performance Models and Calibration of Mechanistic Empirical Design Method for Optimized Transportation Infrastructure Management, Considering Life-Cycle Costs and Environmental Impacts \(in progress\)](#)
- University of California Institute of Transportation (ITS)**
  - [Assessing Safety, Risk, and Labor Issues Related to Heavy-Duty Automated Vehicles \(In Progress\)](#)

**USDOT Project Spotlight**

**FMCSA Crash Causal Factors Program**

The Federal Motor Carrier Safety Administration (FMCSA) is developing the [Crash Causal Factors Program \(CCFP\)](#) to collect and analyze crash data involving commercial motor vehicles (CMVs). The CCFP intends to identify key factors that contribute to crashes involving CMVs, inform countermeasures to prevent these crashes from happening, and establish a foundation for continued data collection, sharing, and analysis. Phase 1 of the CCFP, which focuses on fatalities involving Class 7&8 commercial vehicles, expands on the [Large Truck Crash Causation Study \(LATCCS\)](#) (2001-2003) and incorporates lessons learned through a focused scope, increased sample size, new data elements for collection, and collaboration with state and local jurisdictions. Since 2020, fatal crashes involving CMVs have increased in the United States. This program is an effort to reverse this trend and pursue a long-term goal of zero roadway fatalities. The CCFP also aligns with the safety research recommendations from the [TRB Truck Size and Weight Research Roadmap](#). FMCSA is targeting 2029 to publish a final report for the Phase 1 study.

**Project Contact:**  
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U.S. Department of Transportation

Source: FHWA.

# Ongoing Research (1/2)

- Building out data requirements to allow for future crosscutting research, as recommended by the TRB Roadmap Problem Statement C.1
- Initiating follow-on research from data requirements effort (C.1) for both short and long terms
- Defining a TSW research agenda that builds off resulting data foundation

## **Problem Statement C.1: Build truck traffic, weight, and configuration database from nationwide WIM data and other sources**

Establishing baseline datasets of traffic volumes, axle/gross weights, and configuration types necessary for estimating the impacts of changes in truck size limits and developing models of the relation of loads to bridge and pavement costs.

Using vehicle data the States are now collecting, this research could develop procedures for data collection, formatting, quality control, and methods to produce a consistent base-year dataset of truck traffic volumes, weight spectra, safety data, and enforcement data for the U.S. road system. The research could also provide the truck weight data needed for infrastructure impact modeling research projects in the roadmap.

# Ongoing Research (2/2)

FHWA is working with DOT modal partners to advance *short-term* TSW research, including:

- Advancing the highest priority core research recommendation in the TRB Research Roadmap to compile TSW data that can inform further crosscutting research across all research categories. (TRB Roadmap Problem Statement C.1)
- Developing the Crash Causal Factors Program to collect and analyze crash data involving commercial motor vehicles. This effort directly supports the safety recommendations from the TRB Research Roadmap. (FMCSA)
- Expanding the use of WIM data such as through the pooled-fund pilot: Improving Traffic Detection Through Inductive Loop Signature Technology (FHWA, FMCSA, State DOTs)





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# **BET Trucks: What are the Realities?**

**Dan Murray  
Senior Vice President**

# ATRI

**ATRI is TRUCKING's not-for-profit research organization, whose mission is to provide the data and analysis to improve the industry's safety and productivity**

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**[www.TruckingResearch.org](http://www.TruckingResearch.org)**



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# 2024 Top Industry Issues

1. **Economy (1)**
2. **Truck Parking (2)**
3. **Lawsuit Abuse Reform (6)**
4. **Insurance Cost/Availability (#9 in 2021)**
5. **Driver Compensation (5)**
6. **Battery Electric Vehicles (10)**
7. **CSA (#8 in 2022)**
8. **Detention/Delay at Customer Facilities (9)**
9. **Driver Shortage (4)**
10. **Driver Distraction (7)**

## CRITICAL ISSUES IN THE TRUCKING INDUSTRY – 2024



Prepared by  
The American Transportation Research Institute  
October 2024

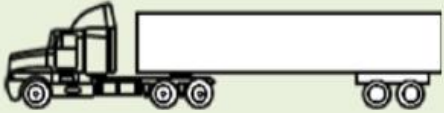
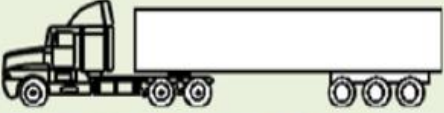

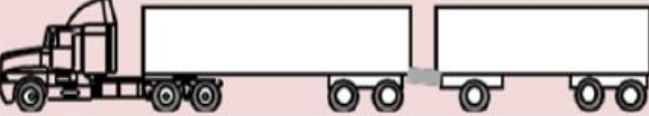




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# 2024 Top Industry Issues

Rank	Truck Drivers	Motor Carriers
1	Truck Parking	Economy
2	Driver Compensation	Lawsuit Abuse Reform
3	Economy	Driver Shortage
4	Detention/Delay at Customer Facilities	Insurance Cost/Availability
5	Speed Limiters	Driver Retention
6	Broker Issues	CSA
7	ELD Mandate	Truck Parking
8	Fuel Prices	Battery Electric Vehicles
9	Autonomous Trucks	Driver Distraction
10	Driver Training Standards	Diesel Technician Shortage

Truck Configurations	Generic Renderings (not to scale)
5-axle tractor 53' semitrailer [80k and 88k lbs.]	<p style="text-align: center;">Confirmed Configurations for Study</p>  
Twin 33'	<p style="text-align: center;">Other Configurations for Consideration in Study</p> 
Rocky Mountain Doubles	
Tumpike Doubles	
Triples	
Other	

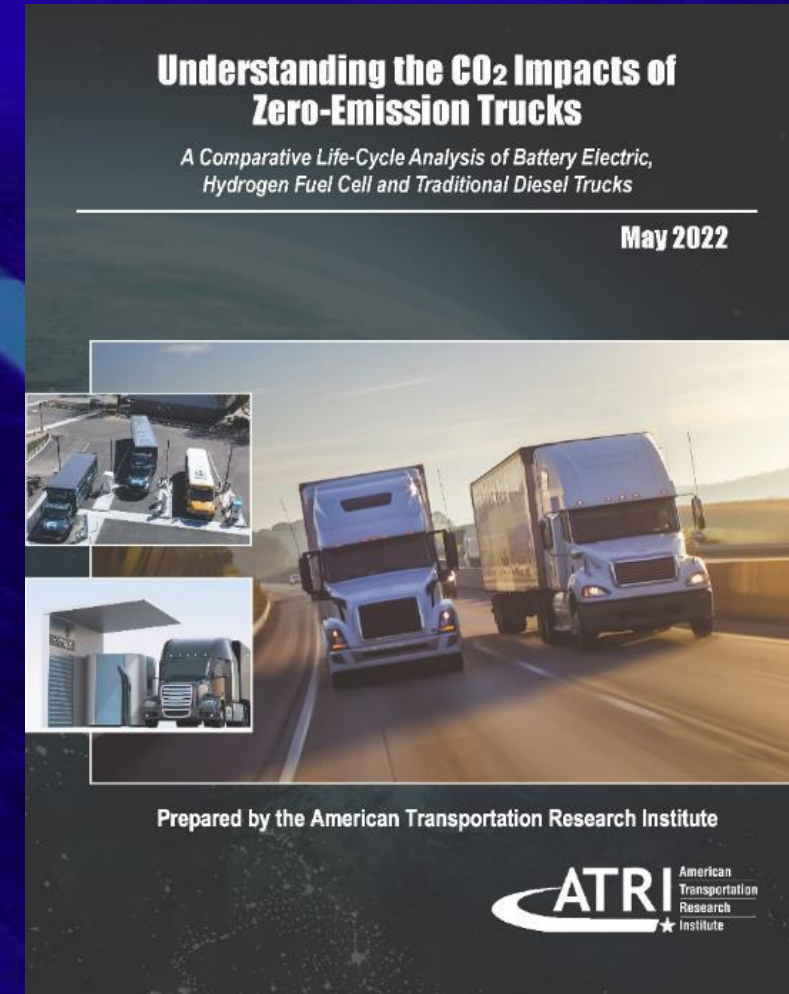
# Future of Truck Platooning?



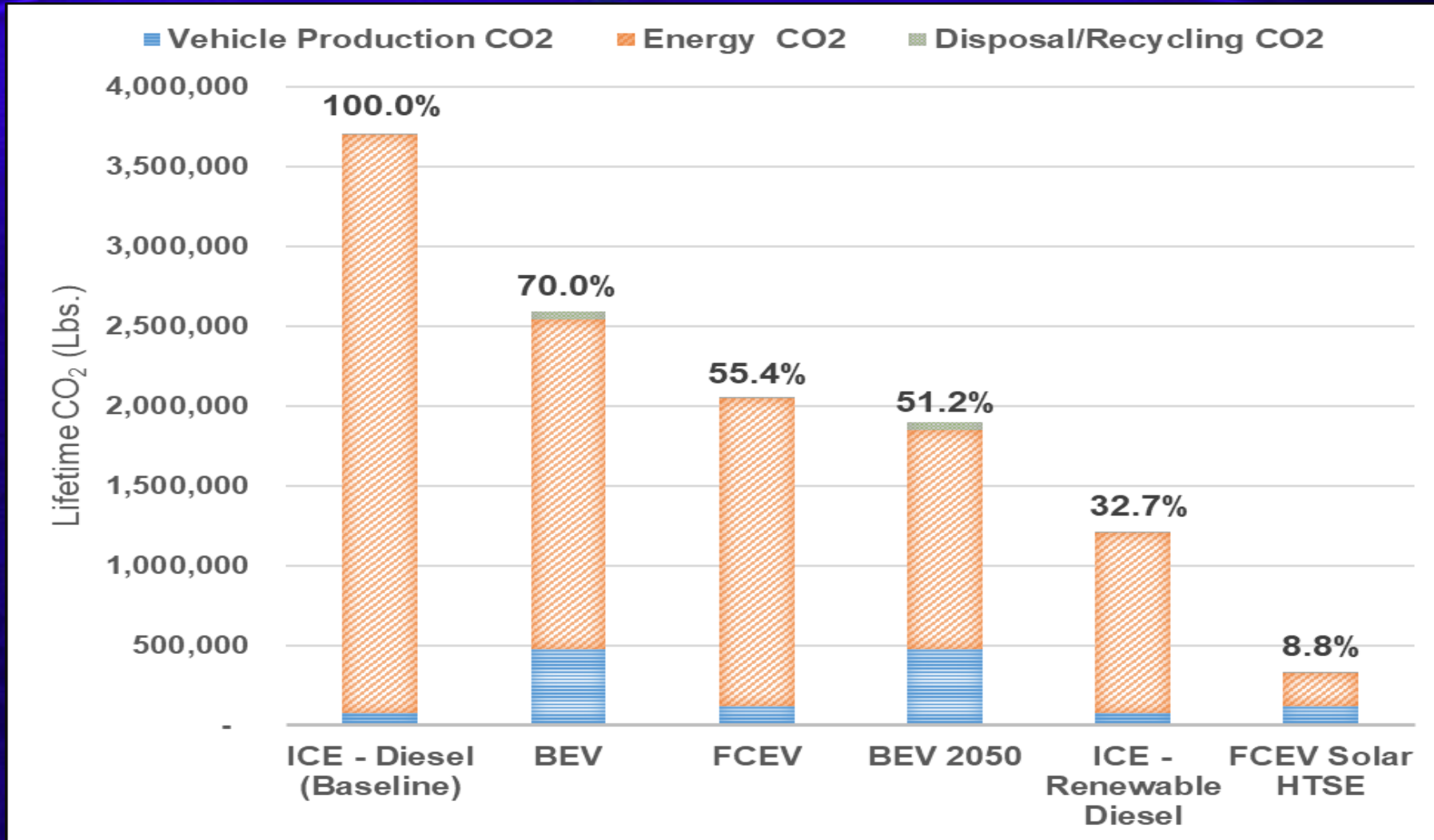
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# Understanding the CO<sub>2</sub> Impacts of Zero-Emission Trucks

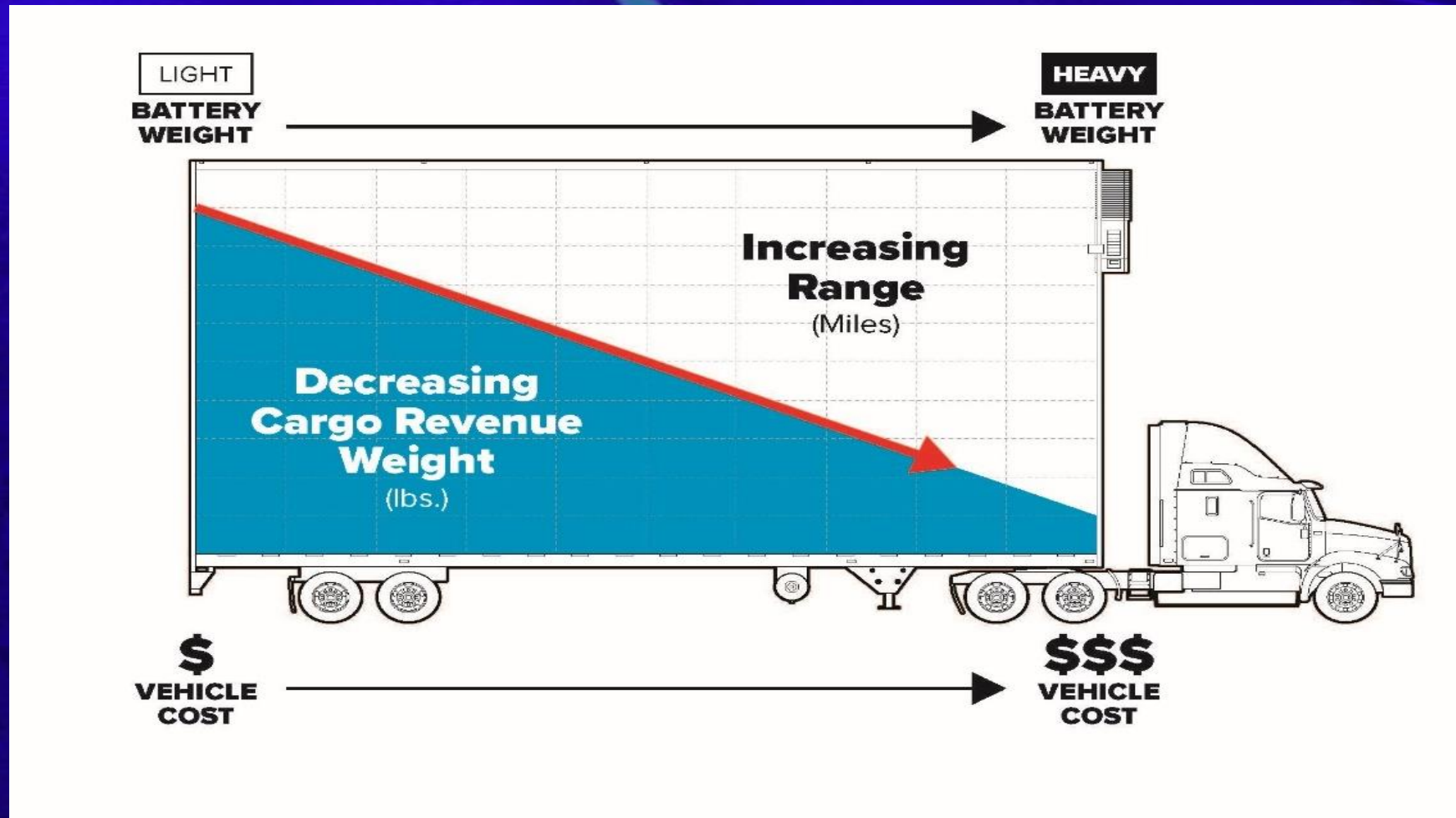
- **Life-cycle CO<sub>2</sub> emissions study for:**
  - ◆ **Internal combustion engine (ICE) trucks powered by diesel**
  - ◆ **Battery electric vehicle (BEV) trucks powered by electricity**
  - ◆ **Fuel cell electric vehicle (FCEV) trucks powered by hydrogen**
- **Compares CO<sub>2</sub> emissions across from the full vehicle life-cycle:**
  - ◆ **Vehicle production**
  - ◆ **Energy production and consumption**
  - ◆ **Vehicle disposal/recycling**



# Key Findings



# BEV Truck Conundrum



# Realities

- Trucks capped at 80K lb (+ 2500)
- Vehicle costs – new Class 8 BEV trucks cost over \$400,000
- No refueling infrastructure
- Cold weather implications
- Material sourced from outside U.S.
  - ◆ Lithium, graphite, cobalt, manganese and nickel



# Long-Haul Truck Charging Requirements

- **Initial equipment, installation costs**
  - ◆ \$35 billion
- **Trucks will need more chargers than existing parking spaces**
- **Hours-of-Service limitations**
- **Interstate rest areas**
  - ◆ No commercial activity/ charging at 40,000 spaces



# Questions?

**Dan Murray**

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# Today's presenters



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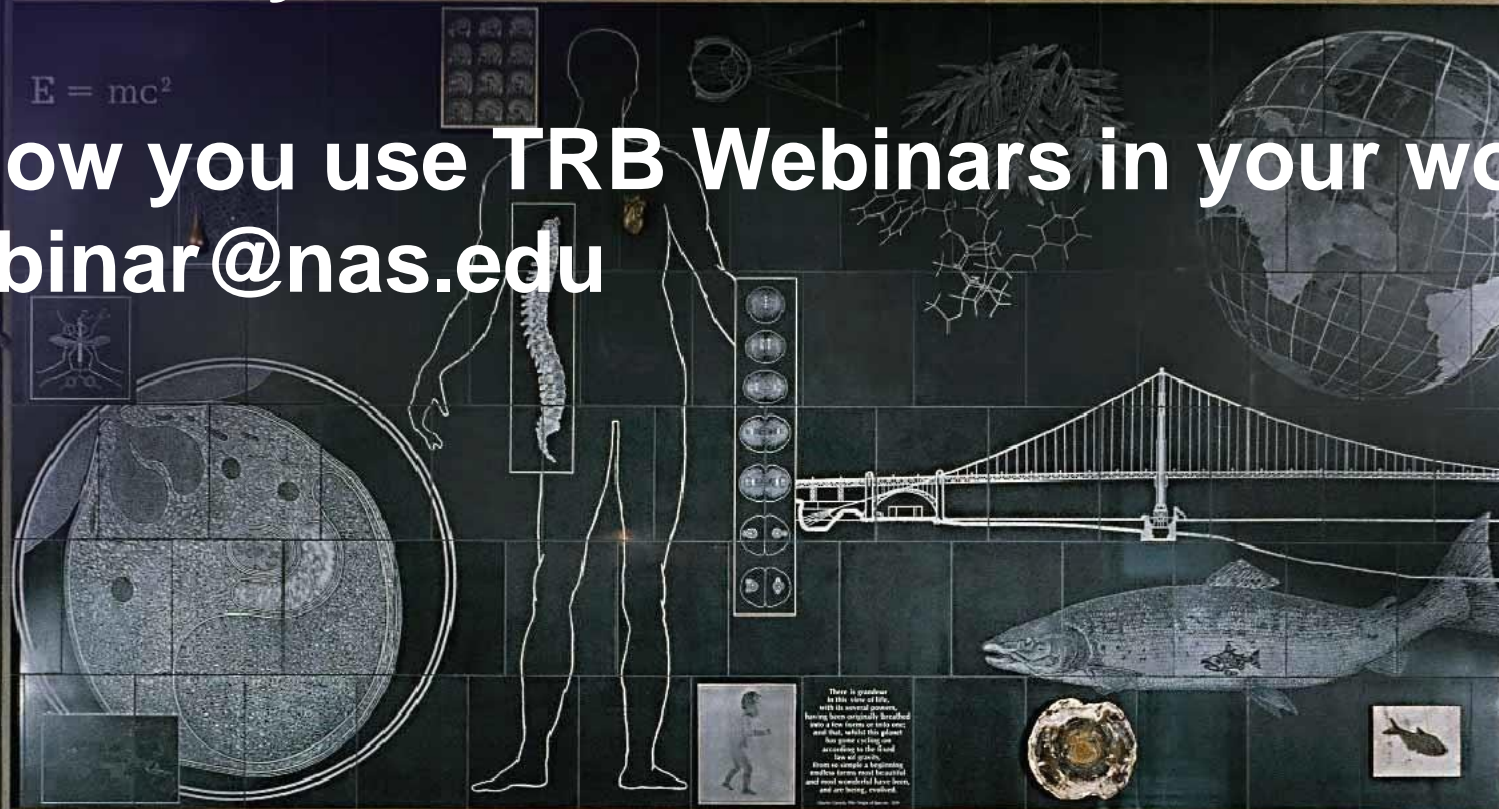
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**December 12, 2024**

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Retention to Support Transit Workers'  
Mental Health

**July 15-17, 2025**, in Washington, D.C.

TRB Conference on Transit Safety and  
Security

[https://www.nationalacademies.org/trb/  
events](https://www.nationalacademies.org/trb/events)

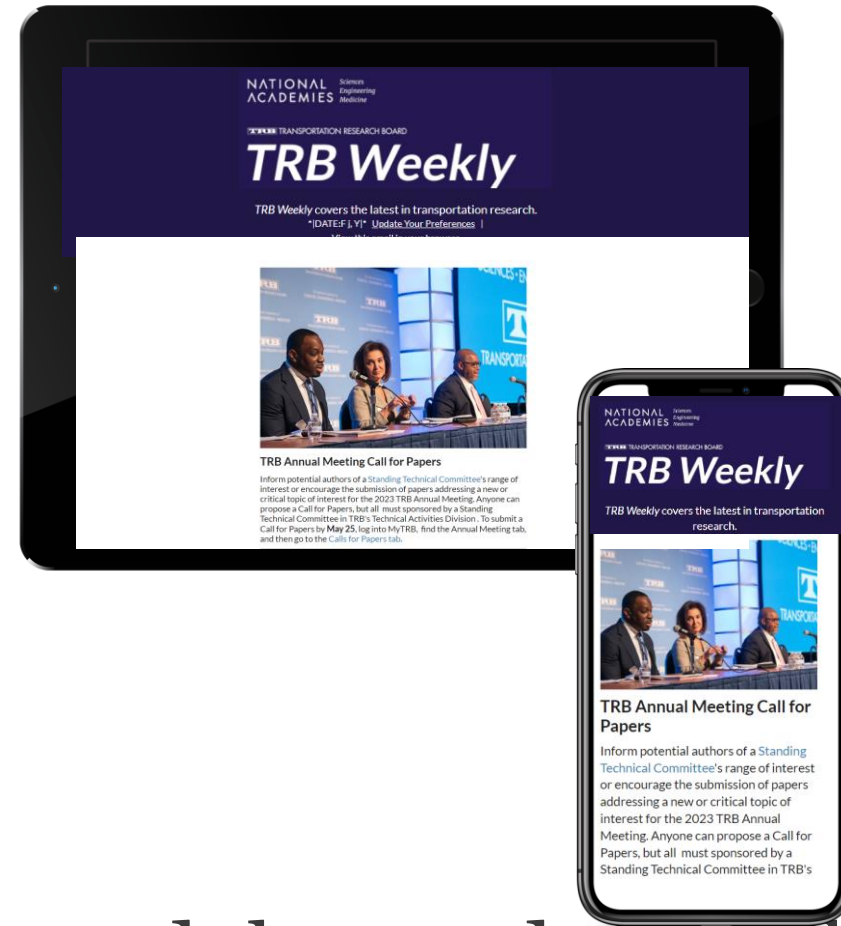


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