

ATRI's Decarbonization Research

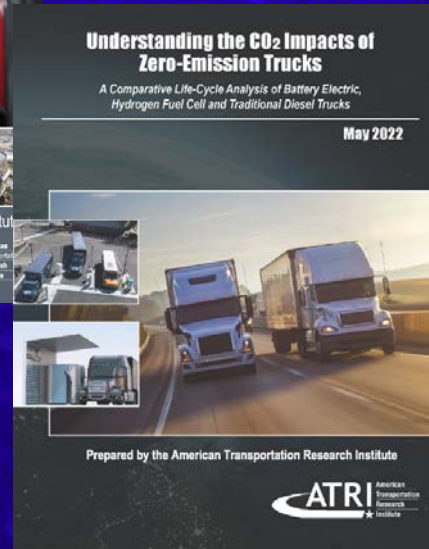
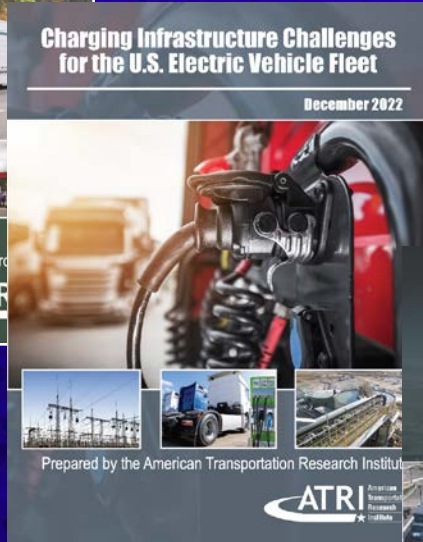
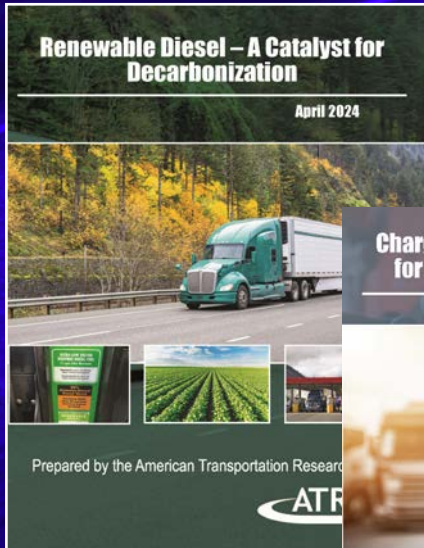
Jeffrey Short

Vice President

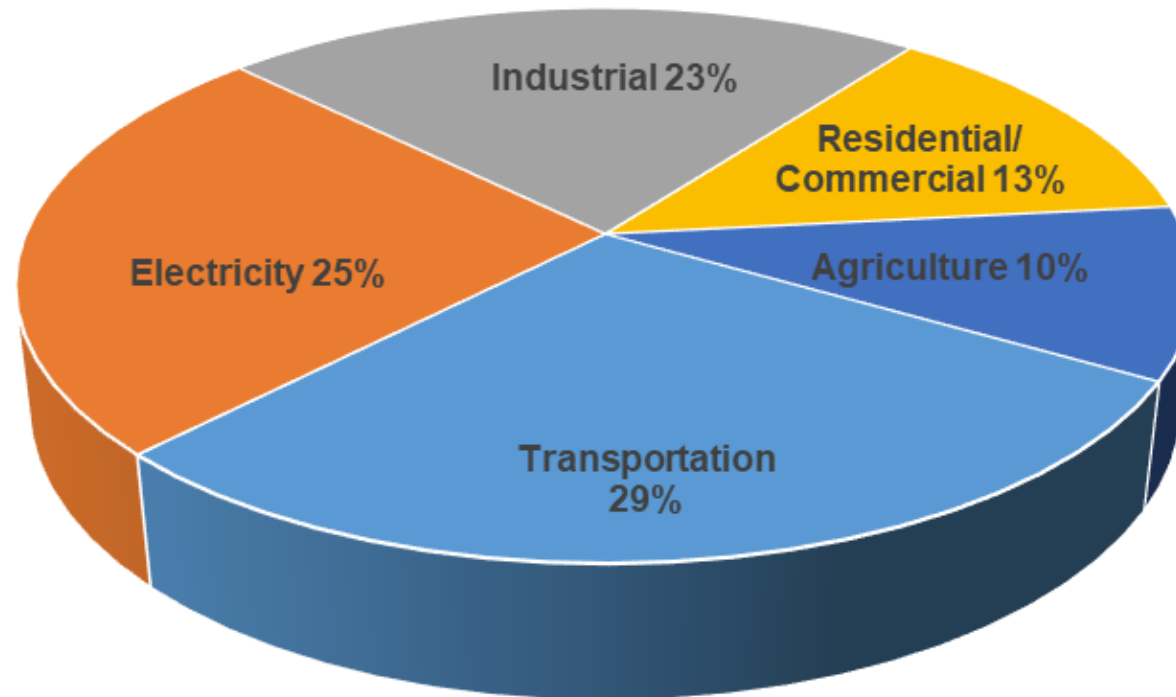
American Transportation
Research Institute (ATRI)

Atlanta, GA

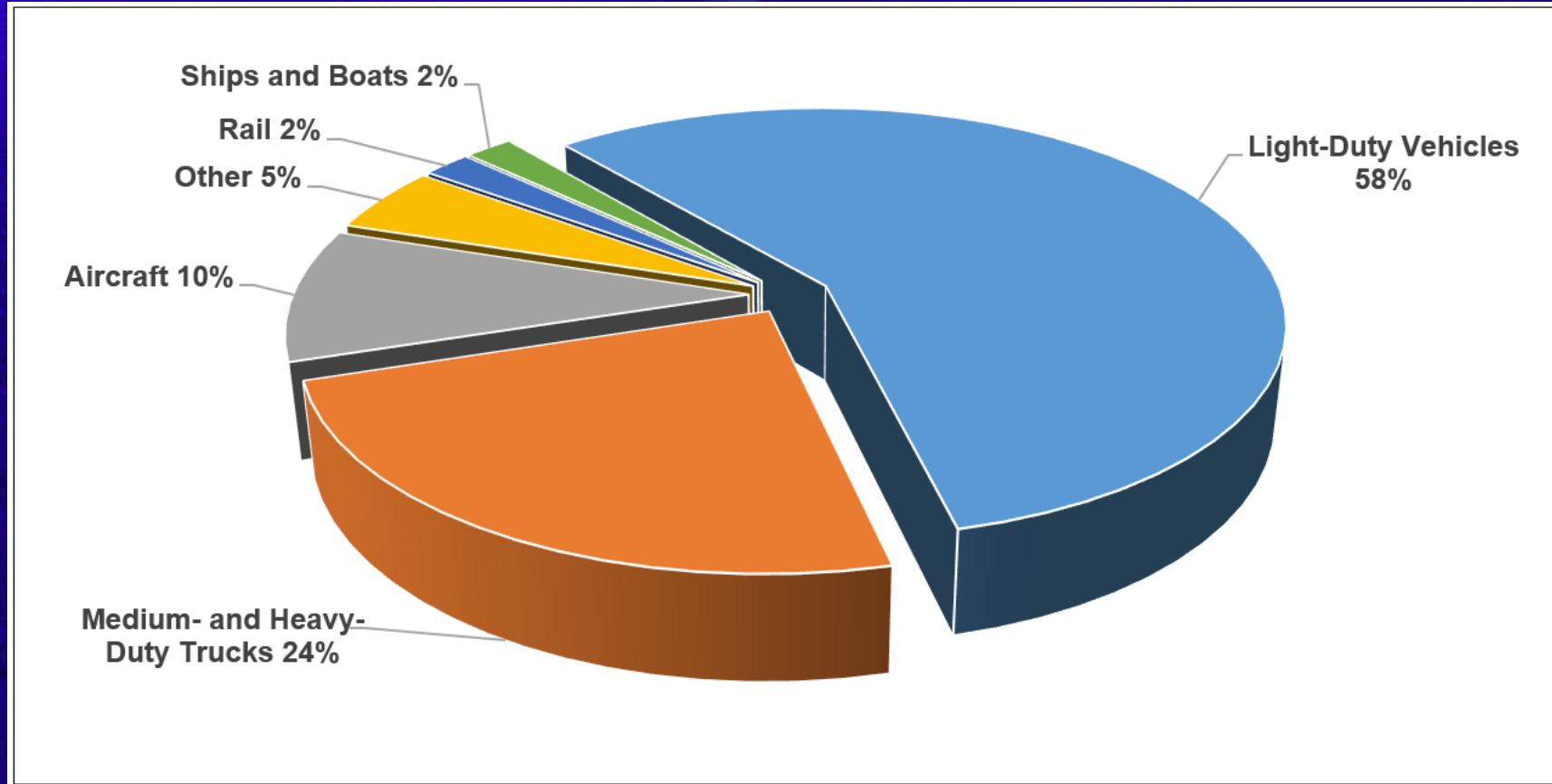
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CO₂ Emissions by Economic Sector

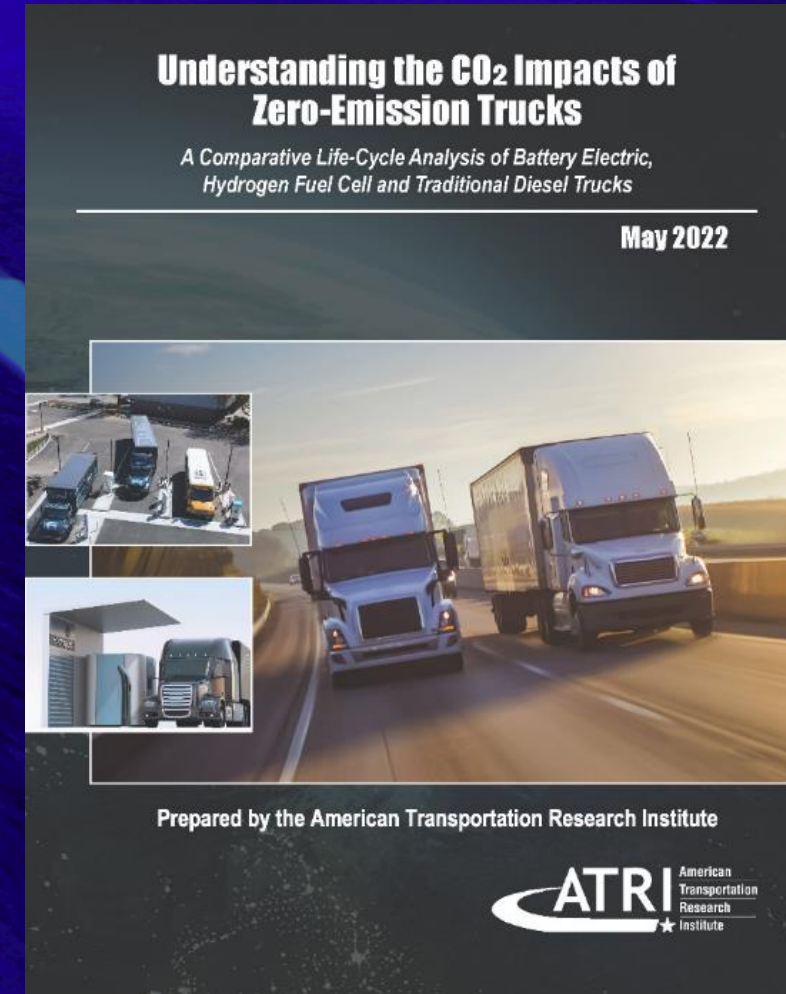


Transportation Sector GHG Emissions by Mode



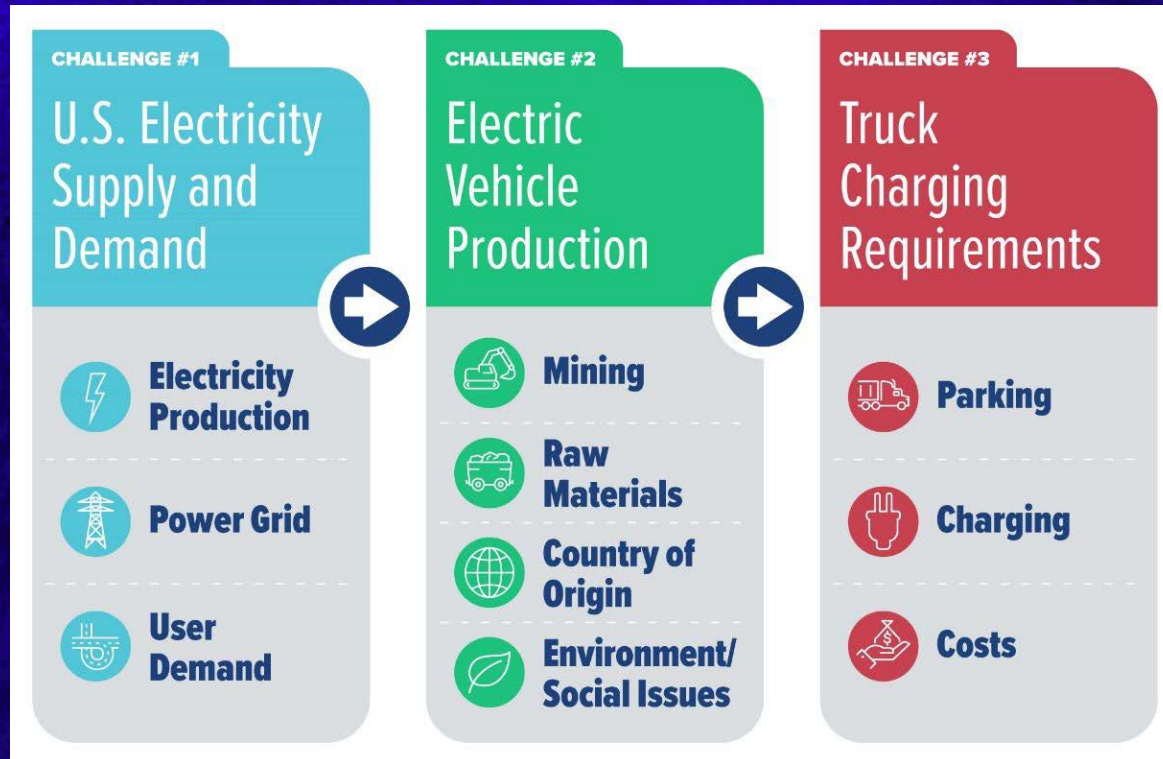
Understanding the CO₂ Impacts of Zero-Emission Trucks

- Life-cycle CO₂ 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 CO₂ emissions across from the full vehicle life-cycle:
 - ◆ Vehicle production
 - ◆ Energy production and consumption
 - ◆ Vehicle disposal/recycling



Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet

- Analysis of three distinct challenges for EVs – with a focus on trucking



Charging Infrastructure Challenges for the U.S. Electric Vehicle Fleet

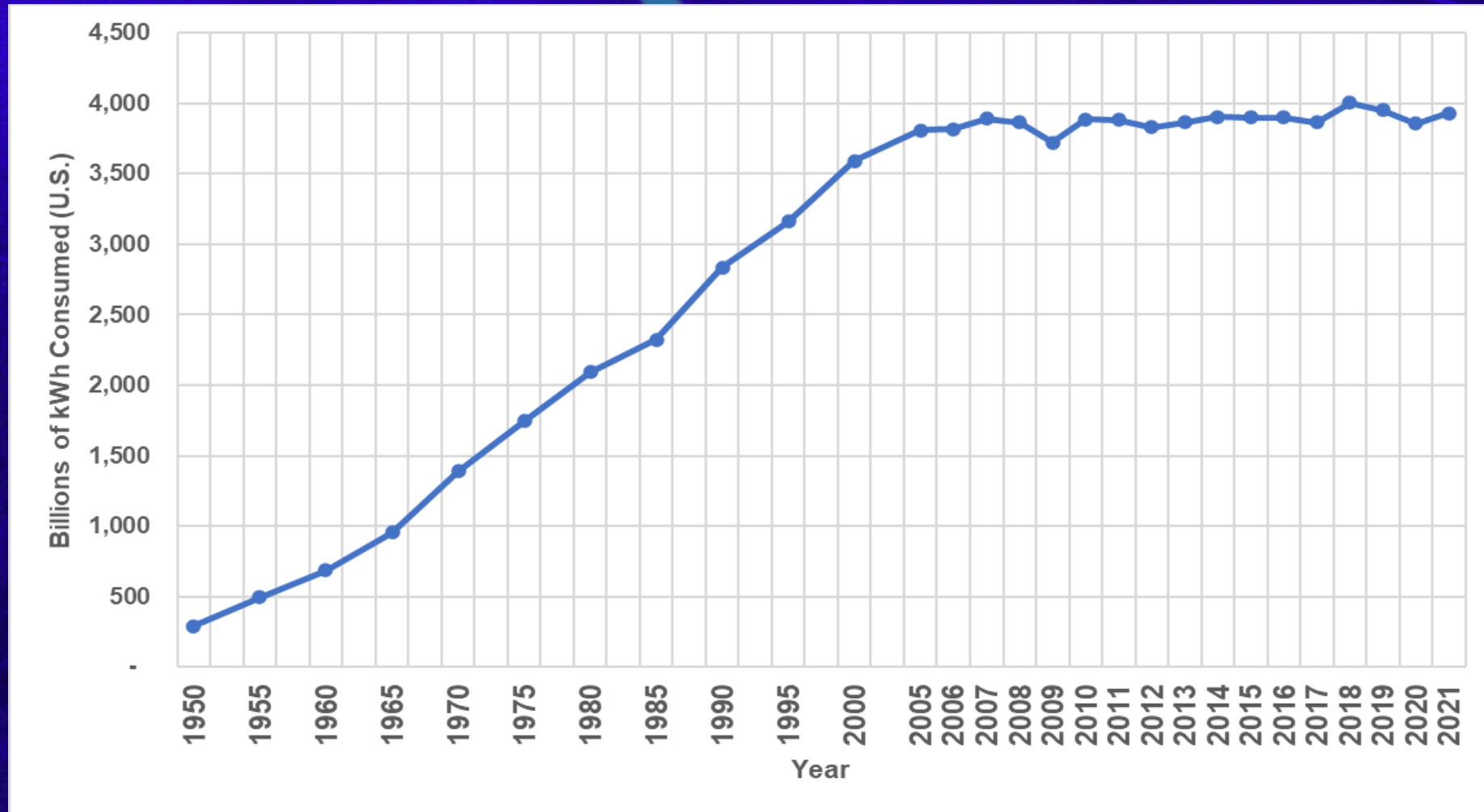
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U.S. Electricity Supply and Demand



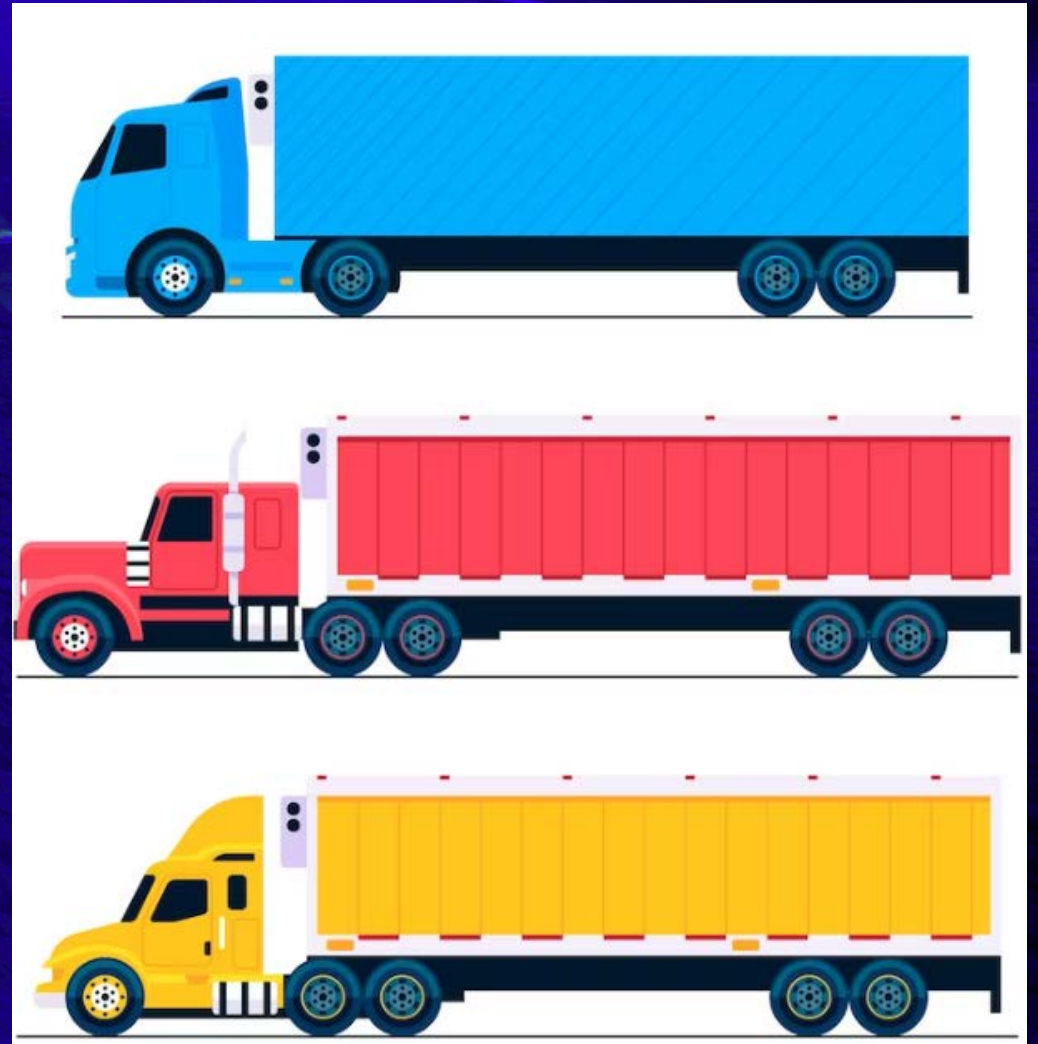
Electrification of the U.S. Vehicle Fleet



- ◆ 253 million cars/light duty trucks in the U.S.
 - will require
 - 1,039.9 billion kWh
 - 26.3% of total U.S. consumption

Electrification of the U.S. Vehicle Fleet

- ◆ 12 million medium- and heavy-duty trucks in the U.S.
 - will require
 - 553.5 billion kWh
 - 14% of U.S. consumption
 - » 10.6% for the 2.95 million combination trucks



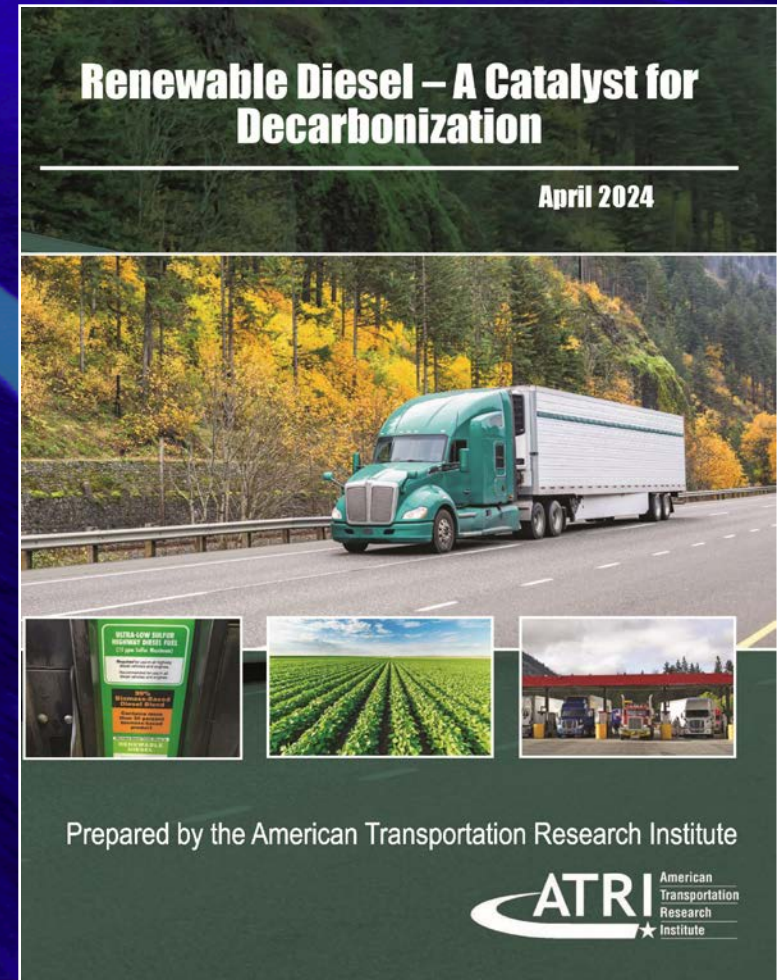
Electrification of the U.S. Vehicle Fleet

- Total of both Cars and Trucks
 - ◆ 1,593.8 billion kWh
 - ◆ 40.3% of U.S. consumption



Renewable Diesel (RD) A Catalyst for Decarbonization

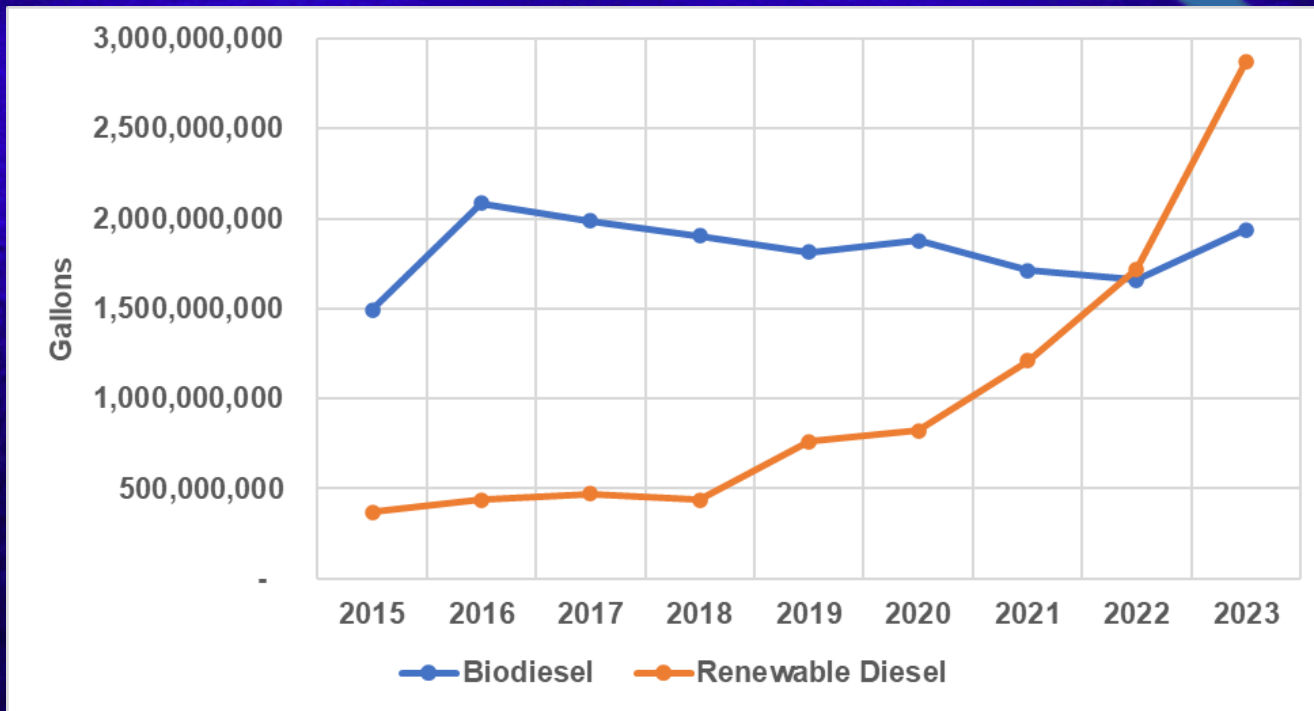
- RD emissions are more than half that of battery electric vehicle (BEV) trucks
- BEV trucks have substantial operational constraints related to range and weight
- A BEV transition is 5.8 times more expensive than an RD transition – costing \$987 million more for the same environmental result



Renewable Diesel Basics

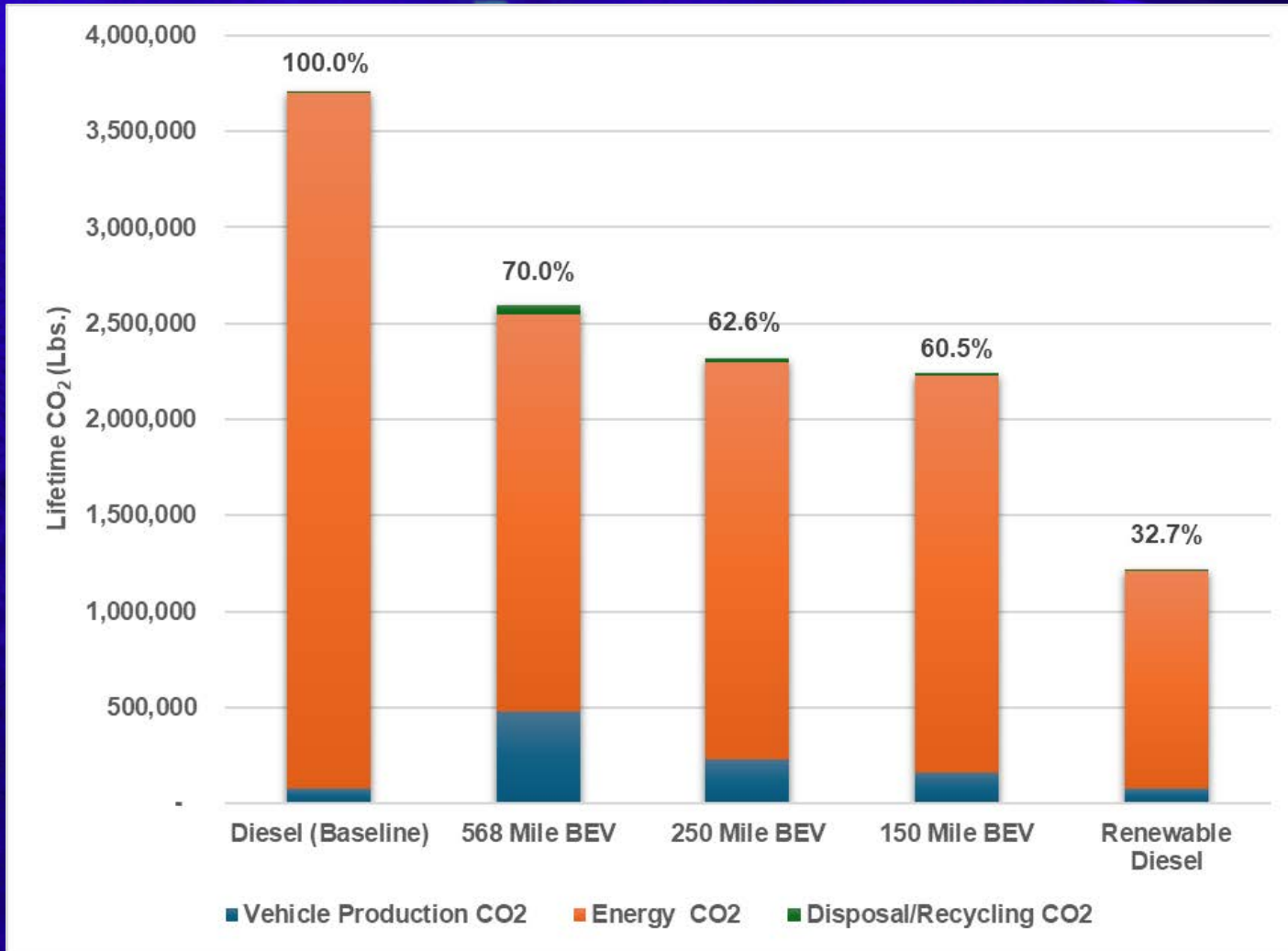
- RD is a fuel that is produced to be “chemically identical” to petroleum diesel
 - ◆ Mixed into petroleum diesel or used as a standalone, drop-in fuel
 - ◆ RD is different from biodiesel
- RD is made from numerous feedstocks:
 - ◆ Used cooking oil
 - ◆ Soybean, corn and canola oil
 - ◆ Tallow
- RD is not a fossil fuel

Annual Consumption of RD is Growing

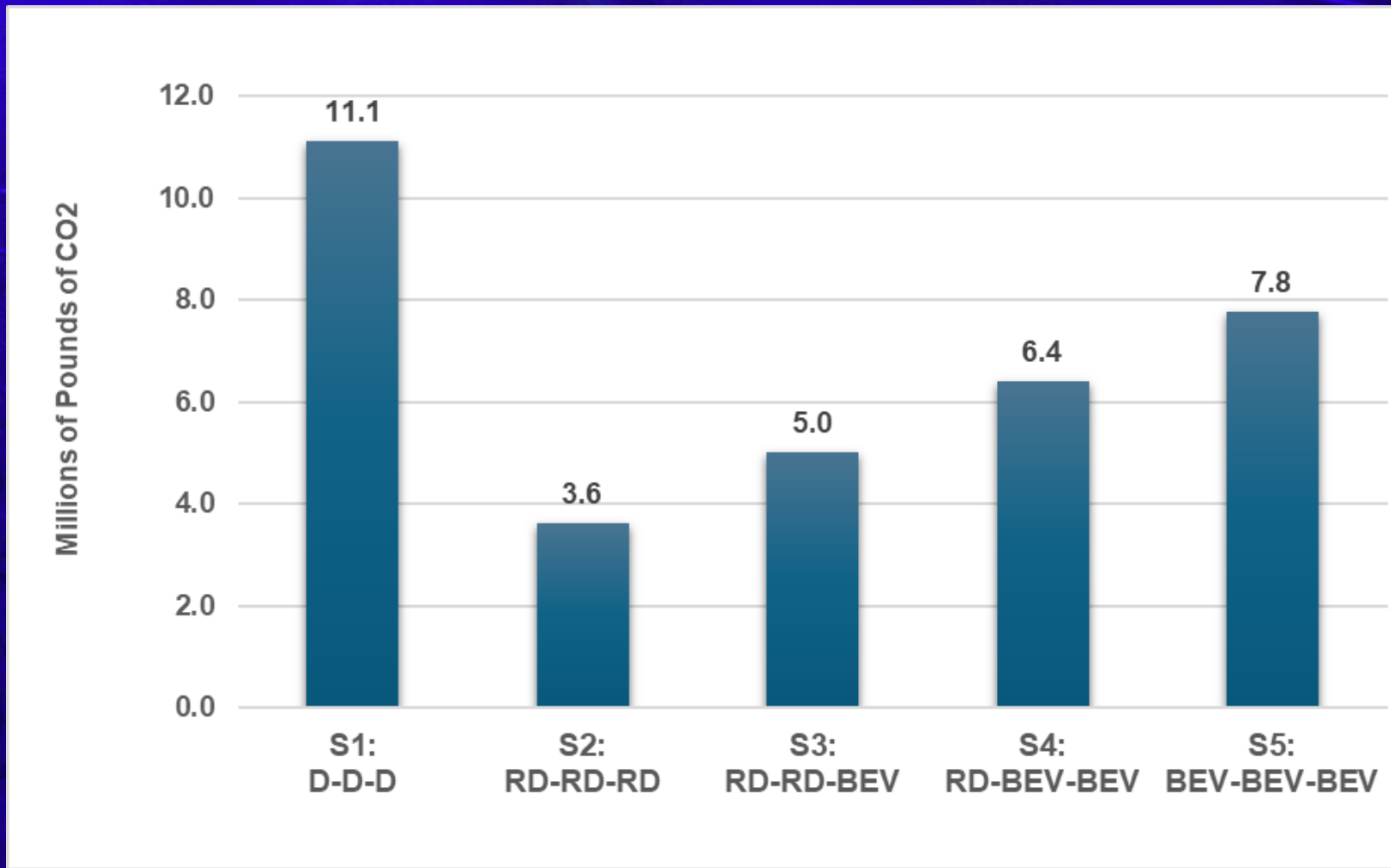


- RD consumption in the U.S. surpassed biodiesel in 2022.
- Enough RD was consumed in 2023 to power 296,000 tractor-trailers for an entire year.

Environmental Benefits



Environmental Benefits



RD Lowers CO₂ without Infrastructure Challenges

- RD transition has no new operational limitations
 - ◆ Unlike BEV, no range and weight challenges
- RD adoption will not require:
 - ◆ New electric power sources/plants
 - ◆ New transmission lines/distribution lines
 - ◆ Truck chargers
- No expensive new trucks:
 - ◆ New RD Truck (\$160,000) vs New BEV Truck (\$457,000)

BEV Transition is 5.8 Times more Expensive

Transition Costs in Billions of Dollars over 15 Years				
	Vehicle Change	Infrastructure Change	RD Subsidy/Facility (at \$2 /gallon)	Total
BEV Costs	\$594.30	\$596.00	-	\$1,190.30
ICE RD Costs	-	-	\$203.72	\$203.72

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Reports available for download at:
www.TruckingResearch.org