Battery-electric trucks: The most affordable path to decarbonizing tractor-trailers

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Hussein Basma and Ray Minjares
Tractors represent 30% of the total population of class 4-8 regulated vehicles.

The share of long-haul trucks is around 62% of the tractor population.

Under the Regulatory baseline scenario:

- Tractors will produce 67% of the GHG emissions of class 4-8 vehicles through 2050.

- 49% of Class 4-8 emissions originate from combination long-haul trucks.
Use case and assumptions

- Four powertrain technologies:
  - Diesel
  - Battery-electric
  - Hydrogen fuel-cell
  - Hydrogen combustion engine
- Daily mileage: 500 miles
- On-route charging: 350 kW until 2027 – 1 MW afterward.
- Renewable electrolysis green hydrogen
- Holding period: 5 years
Geographic scope

- Ensuring comprehensive geographic coverage over the United States mainland.

- Focusing on states with the highest long-haul trucking activity in every region.

- Ensuring a comprehensive coverage of commercial electricity rates in the United States.
Key findings
Battery-electric long-haul trucks are expected to record the lowest TCO by 2030 in most states.
TCO breakdown for trucks operating in California

![TCO evolution chart](chart.png)

- Diesel
- Fuel cell
- Battery-electric
- H2 ICE

![Model year 2030 cost breakdown](bar_chart.png)

- MSRP
- Fuel/Energy
- Maintenance
- Labor
- Insurance
- Tax
Battery-electric trucks are expected to achieve a lower TCO than fuel-cell trucks.
Battery-electric trucks can still achieve a better TCO at high daily mileages, given that their day-to-day mileage variability is low.

**Average daily mileage vs mileage variability**

**High average daily mileage:**
- Bigger battery (-)
- More miles (+)

**High daily mileage variability:**
- Bigger battery (-)

![Diagram](image.png)

**Model year 2040**

**Graph details:**
- X-axis: Daily mileage variability (%)
- Y-axis: Average daily mileage (miles)
- Key points:
  - 1000 miles
  - 900 miles
  - 750 miles
  - 600 miles
  - 500 miles

**Legend:**
- Battery-electric trucks are cheaper
- Diesel trucks are cheaper

**ICCT**: The International Council on Clean Transportation
Q&A

ray@theicct.org
h.basma@theicct.org