DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

Developing Markets for Zero-Emission Vehicles in Short-Haul Goods

The purpose of this project is to examine the potential use of Zero-Emission Vehicles (ZEVs) and near-ZEVs for short-haul goods movement in California.

Planning/Policy/ Programming

MAY 2019

Project Title:
Developing Markets for Zero-Emission Vehicles in Short-Haul Goods Movement

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WHAT IS THE NEED?

Through a variety of incentives (e.g., tax benefits, use of high occupancy vehicle lanes), California has made significant progress in growing the share of ZEVs (battery electric, fuel cell) and near-ZEV (plug-in hybrid electric) passenger vehicles. Progress has also been made in introducing alternative fuel vehicles into public sector fleet vehicles (e.g., transit vehicles). However, the use of ZEVs for freight movement remains a challenge. Zero- and low emission technologies are not yet competitive with the internal combustion engine for hauling heavy and long-haul loads. It is expected that this gap in performance of ZEVs will exist for a period of time; however, there are freight transport submarkets where ZEV technologies are feasible. Currently, several promising technologies and fuels are being demonstrated, including electric vehicles for local package delivery, short-haul rail, and electric or hybrid heavy duty trucks. How will these demonstrations help inform more strategic implementation of ZEV technologies for hauling freight?

WHAT WAS OUR GOAL?

This report evaluates the market status and potential freight market penetration of zero emission vehicles (ZEVs) and near ZEVs in the medium and heavy-duty class within the California market. It evaluates alternative technologies, primarily battery electric, fuel cell, and hybrid technologies, and compares them to existing gasoline, diesel, and natural gas vehicles used in comparable applications. Refueling infrastructure requirements and logistics planning are considered along with vehicle technology.

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WHAT DID WE DO?

The report's primary focus is on intra-urban, as opposed to long haul, deployment scenarios. Intra-urban scenarios produce the greatest potential for reduction of pollutant exposure while minimizing problems associated with the reduced range of some developing vehicle technologies. In California, there are currently 2080 hybrid, 300 medium duty and 40 heavy duty electric vehicles in demonstration or revenue service. There are currently plans to deploy several dozen heavy duty fuel cell vehicles in the near future.

WHAT WAS THE OUTCOME?

The literature review finds that while there are substantial existing studies providing direct comparisons between light-duty electric and fossil-fueled vehicles during actual operation, heavy-duty electric vehicles (e.g., class 8) have been less well studied. Fuel cell vehicle studies are also very sparse, and are primarily available in the public transit sector for buses. ZEV vehicles are still comparatively more expensive to purchase, though they have much higher fuel efficiency when compared with traditional diesel technology. Due to range restrictions, these vehicles would also require additional attention to routing and refueling, which at present is considered on a case-by-case basis by each company conducting demonstration projects thus has limited comparability.

WHAT IS THE BENEFIT?

This research will examine the potential for ZEVs or near-ZEV s from both an economic and environmental perspective. This project will focus on heavy duty trucks (HDTs) used in short-haul service, including drayage, and proposes to use the SCAQMD's current test demonstrations as the vehicle and service types for much of this research. ZEV and near-ZEV HDTs have different performance characteristics than conventional diesel HDTs. For a given set of pickups and deliveries, the number of trucks required depends on the range of the vehicle and its load capacity. These in turn determine miles traveled (including associated labor costs) and refueling time costs. ZEV and near-ZEV HDTs currently have a shorter distance range than diesel HDTs, there are fewer refueling stations, and typically refueling takes more time (e.g., to recharge a battery). Therefore, a larger number of vehicles and a greater total amount of vehicle miles traveled (VMT) would be required to operate the same service. Project researchers will estimate differences in vehicle performance and cost requirements across various types of short haul services, and use the results to inform an analysis of the potential markets for ZEVs and near-ZEV HDTs.

LEARN MORE

https://ncst.ucdavis.edu/project/developing-markets-for-zero-emission-vehicles-in-short-haul-goods-movement/

IMAGES

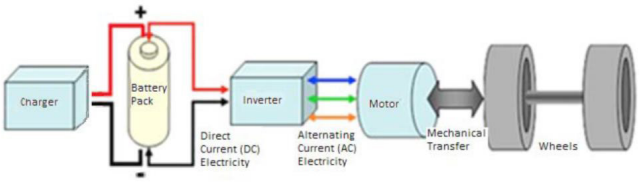

Image 1: Simple overview of battery electric vehicle components, from CARB (CARB, 2015a)

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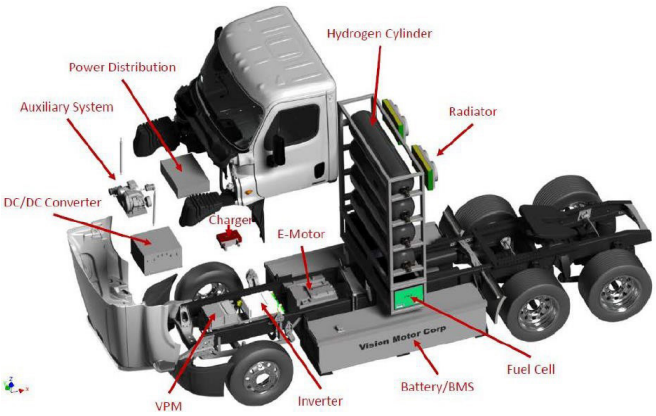

Image 2:Fuel Cell Electric Truck Schematic, taken from CARB who in turn sourced it from Vision Industries Corporation “Building zero-emission hydrogen fuel cell/ electric trucks for the 21st century” presentation (CARB, 2015b)

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