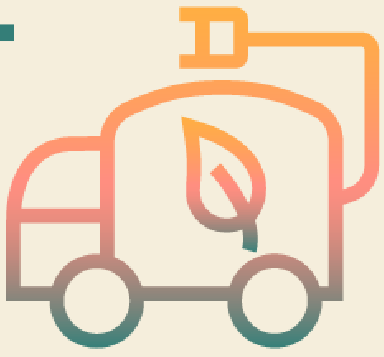
ENERGY-EFFICIENT TRUCKS



OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

U.S. trucks consume about 50 billion gallons of diesel fuel each year. Trucks consume a disproportionate quantity of fuel relative distances travelled. Increasing fuel efficiency for both new and existing trucks can lead to significant emission reductions. Numerous fuel-saving technologies are available at compelling paybacks.

TECHNOLOGY AND MARKET READINESS

Fuel efficient medium duty (MD) and heavy duty (HD) trucks are available and already a strong presence in the market. Vehicle technologies and improved connectivity and routing can all be subsets that contribute to reductions within this solution category. Because of the compelling economics and prevalence of a range of truck applications within the economy, market forces encourage technological innovation.

LOCAL EXPERIENCE AND DATA AVAILABILITY

There are around 4 million registered MD and HD trucks in Georgia [1]. Logistics account for 18% of the state's gross state product (GSP), supporting 5,000 companies, employing 110,000 Georgians and generating over $50 billion in sales annually [2]. The National Highway Traffic Safety Administration (NHTSA) and the EPA periodically publish information on fuel efficiency and emissions for MD and HD vehicles, as well as draft regulatory policy setting efficiency and emission standards [3].

TECHNICALLY ACHIEVABLE CO2 POTENTIAL

Improving freight movement efficiency and reducing congestion, particularly in bottleneck congestion sites, will yield significant fuel savings and emissions reductions. According to the Georgia Department of Transportation (GDOT), long-haul trucks emit around 1,345.4 gCO2/mile [3]. By reducing idle time and increasing route and operating efficiency via infrastructure and technological improvements, this number can be reduced substantially. Significant opportunities exist in converting MD vehicles to alternative fuels such as compressed natural gas (CNG) and hybrid-electric powertrains (Quiros et al., 2017) showing emissions reductions in excess of 20%. Additional opportunities exist to substitute MD diesel trucks with electric or hybrid-electric vehicles, as many are centrally garaged, rarely require operation outside of a defined area, and have routes (i.e., predictable, start-stop, urban) that can exploit the CO2 reducing benefits of hybridized or electrified powertrains.

COST COMPETITIVENESS

Fuel efficient vehicles can incur higher upfront costs, but paybacks can be attractive (Gelmini and Savaresi, 2018). MD applications may exploit technologies that have been developed for LDVs and are now competitive at scale for selected use cases. Relative to the price tag of other emissions reductions solutions, the cost is relatively minimal and fuel-saving technologies in freight result in concurrent economic benefits and emissions reductions.

BEYOND CARBON ATTRIBUTES

Co-benefits: The solution offers benefits to the environment and public health from improvements in air quality [5]. Other benefits include the creation of jobs for the manufacturing and engineering of fuel-efficient trucks (One study estimated that widespread national deployment of more-efficient trucks would create 63,000 additional jobs by 2020, and 124,000 jobs by 2030) [6]. Additionally, there are benefits for truck drivers and owners from reduced spending on fuel from improved fuel efficiency [7].

Co-costs: These include higher initial upfront investments, early depreciation and sunk costs associated with incumbent assets, and other market barriers for adoption.

References:

Quiros, D. C., Smith, J., Thiruvengadam, A., Huai, T., & Hu, S. (2017). Greenhouse gas emissions from heavy-duty natural gas, hybrid, and conventional diesel on-road trucks during freight transport. Atmospheric Environment, 168, 36-45.

S. Gelmini and S. Savaresi, "Comparison of consumption and CO2emissions between diesel and fully-electric powertrains for a heavy-duty truck," 2018 21st International Conference on Intelligent Transportation Systems (ITSC), Maui, HI, 2018, pp. 1161-1166.

Endnotes:

1. https://www.fhwa.dot.gov/policyinformation/statistics/2017/mv9.cfm
2. http://www.dot.ga.gov/InvestSmart/Freight
3. https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812146-commercialmdhd-truckfuelefficiencytechstudy-v2.pdf
4. https://45tkhs2ch4042kf51f1akcju-wpengine.netdna-ssl.com/wp-content/uploads/2013/08/Ga-Freight-Logistics-Report.pdf
5. https://www.ase.org/blog/air-pollution-deadly-making-vehicles-more-efficient-big-part-solution
6. https://www.ucsusa.org/sites/default/files/2019-09/The-Economic-Costs-and-Benfits-of-Improving-the-Fuel-Economy-of-Heavy-Duty-Vehicles.pdf
   https://www.ucsusa.org/resources/delivering-jobs
7. https://www.ucsusa.org/resources/brief-history-us-fuel-efficiency

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