

# Equity, Emissions, & Electric MHDVs

Mitigating Air Pollution in Colorado Through Policies and Programs to Accelerate the Electrification of Medium- and Heavy-duty Vehicles:

*Using the I-270 Corridor as a Case Study To Inform Future Projects*

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# EXECUTIVE SUMMARY

The transportation sector in Colorado recently surpassed electricity generation as the largest source of climate-altering greenhouse gas (GHG) emissions in the state - now spanning over 25% of sectoral GHGs.<sup>1</sup> Medium- and heavy-duty vehicles (MHDVs) in particular, are responsible for almost a quarter of total transportation GHG emissions and are a main contributor to dangerous particulate matter (PM) and ozone pollution, which disproportionately impact the health of low-income communities and communities of color living near highways, freight corridors, and industrial facilities.<sup>2,3</sup> The electrification of MHDVs is therefore critical to achieving environmental justice (EJ), equity, public health, and climate goals, but these vehicles face unique electrification challenges beyond those of their light-duty counterparts.

Zero-emission MHDVs are a key strategy outlined in Colorado's [Greenhouse Gas Pollution Reduction Roadmap](#) and in 2021, the Polis Administration, together with the Colorado Department of Transportation (CDOT), Colorado Energy Office (CEO), and Colorado Department of Public Health and Environment (CDPHE) announced "an all-of-the-above strategy to reduce pollution from medium- and heavy-duty transportation" called the [Clean Truck Strategy](#).<sup>4</sup> Using these plans as a baseline, as well as conversations with wide-ranging industry associates from the Southwest Energy Efficiency Project (SWEET), CDOT, CEO, the Denver Regional Council of Governments (DRCOG), Drive Clean Colorado (DCC), Electrification Coalition (EC), Rocky Mountain Institute (RMI), and a large corporation transitioning their fleet to lower emissions, our team developed policy and program recommendations for the state going forward. The objective of these recommendations is to accelerate MHDV electrification, charging infrastructure deployment, and diesel fleet turnover throughout Colorado and along the I-270 corridor in connection with a planned interstate improvement project by CDOT with research already underway to identify approaches to offset the increased emissions of the proposed undertaking.

I-270 in Colorado runs through one of the most polluted zip codes in the United States, directly connecting I-25 with I-70.<sup>5</sup> It is a highly trafficked commercial and industrial (C&I) corridor where diesel MHDVs are heavily utilized for deliveries and freight.<sup>6</sup> Using the I-270 corridor as a case study will provide the state of Colorado with important insights into how to most efficiently mitigate the emissions of similar large transportation projects in the future. It will also provide lessons learned on how to specifically target pollution reductions in disproportionately-impacted communities (DICs) and environmental justice areas, where low-income, Black and Indigenous People of Color (BIPOC) suffer

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<sup>1</sup> Heald, Sara. *Final 2019 CO GHG Inventory Report*. Colorado Department of Public Health & Environment, Dec. 2019, <https://drive.google.com/file/d/1TxvoktxCOLFd6CaUKZzeqsKgEiHMjdt/view>

<sup>2</sup> *Federal Vehicle Standards*. Center For Climate and Energy Solutions (C2ES), <https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/>

<sup>3</sup> *Transportation*. American Lung Association, 9 Dec. 2020, <https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/transportation>

<sup>4</sup> *Colorado GHG Pollution Reduction Roadmap*. Colorado Energy Office, 14 Jan. 2021, [drive.google.com/file/d/1jzLvFcrDyvhhs9ZkT\\_UXkQM\\_0LiYzfa/view](https://drive.google.com/file/d/1jzLvFcrDyvhhs9ZkT_UXkQM_0LiYzfa/view)

<sup>5</sup> Svaldi, Aldo. *Northeast Denver Neighborhood Is Nation's Most Polluted*. The Denver Post, 20 Feb. 2017, [www.denverpost.com/2017/02/16/denver-most-polluted-zip-code/](http://www.denverpost.com/2017/02/16/denver-most-polluted-zip-code/)

<sup>6</sup> *I-270 Corridor Improvements*. Colorado Department of Transportation, 17 Mar. 2021, [www.codot.gov/projects/i270](http://www.codot.gov/projects/i270)

from inequitable public health effects, like those neighborhoods in North Denver adjacent to and along the I-270 corridor, such as Commerce City, Elyria Swansea, and Globeville.

In the white paper below, we have provided an overview of the research and analysis our team conducted. Our recommendations for the state of Colorado to accelerate the adoption of zero-emission MHDVs and most efficiently mitigate their associated emissions are as follows:

- 1) Adopt the California Advanced Clean Trucks (ACT) Regulation,
- 2) Adopt the Heavy-Duty Low NOx Omnibus Regulation,
- 3) Establish a Colorado MHDV Voucher Program,
- 4) Expand Xcel's Transportation Electrification Plan (TEP) to Include a Fleet MHDEV (Medium- and Heavy-Duty Electric Vehicle) Make-Ready Charging Infrastructure Program,
- 5) Develop and Deploy Pilot Programs, including: A Denver Zero-Emission Zone (ZEZ), Low-Emission Zone (LEZ), and / or Smart Zone (SZ), Commercial EV Truck-Shares and Shared Charging Depots, and a Denver Airport and Warehousing Electrification Pilot,
- 6) Adopt a Low Carbon Fuel Standard (LCFS) / Clean Fuels Program (CFP),
- 7) Introduce Transport Refrigeration Unit (TRU) Regulations,
- 8) Adopt a Warehouse Indirect Source Rule (ISR),
- 9) Implement a ZEV and Near-ZEV Weight Limit Exemption for MHDVs,
- 10) Offer Standalone Battery Storage Incentives,
- 11) Construct a Natural Berm Along the I-270 Corridor, and
- 12) Create a Statewide Colorado Electric Vehicle Authority (CEVA).

In addition to the [recommendations provided at the conclusion of this white paper](#), the Table below provides an outline of the various state and municipal initiatives detailed throughout the report.

**Table: Overview of policies and programs explored in this paper outside of Colorado**  
**For additional MHDV voucher program details, click [here](#)**

Program / Policy	Funding	Overview	Vehicles Covered	Environmental Justice Component
<a href="#">California: Advanced Clean Trucks (ACT) Regulation</a>	N/A	A rulemaking by the California Air Resources Board (CARB) that places requirements for sales of zero-emission MHDVs on vehicle manufacturers in the state. This regulation can be adopted by other states due to California's EPA Clean Air Act waiver.	All vehicles from class 2b to class 7 and 8 tractors with various sales requirements for each class (see ACT regulation section for further details).	No.

<a href="#"><u>California: Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program (HVIP)</u></a>	<b>\$167 million total available in funding for FY20-21.</b> Since its inception in 2009, over \$589 million has been allocated to HVIP. The program is administered by CALSTART and funded by California Climate Investments, a statewide initiative funded by cap-and-trade proceeds.	Voucher program available at the point-of-sale for medium- and heavy-duty trucks and buses. Vouchers are distributed directly to manufacturers and submitted by dealers with no application necessary for businesses or fleets. There is no scrappage requirement for older diesel vehicles.	Heavy- and medium-duty buses, refuse trucks, step and panel vans, straight trucks, tractors, and electric power take-offs (ePTOs). Vehicles covered by vouchers are battery electric, hydrogen fuel cell, and ePTO.	10% increase on vouchers for vehicles located in designated disadvantaged communities and additional “plus-ups” for public transit agencies (+15%) and school districts (+65%).
<a href="#"><u>California: Santa Monica Zero Emission Delivery Zone (ZEDZ) Pilot</u></a>	<b>Funded by a grant from the California Governor’s Office of Business and Economic Development.</b> \$10,000 of the funding is being utilized by the city to assist with staff costs and signage. The remaining funds are being used by the Los Angeles Cleantech Incubator (LACI) for staffing needs and project coordination.	Large-scale project to promote last-mile zero-emission deliveries in downtown Santa Monica. Demonstration of new technologies and partnerships with mobility start-ups and regional stakeholders is a large part of the program.	Heavy-, medium-, and light-duty electric delivery vehicles. Commercial EV car- and truck-shares. Micromobility, such as e-scooters, e-bikes, and plug-in three wheelers. Remote-controlled delivery robots.	No.
<a href="#"><u>Massachusetts: MOR-EV Trucks</u></a>	<b>\$10 million total available in funding.</b> Funding comes from the Regional Greenhouse Gas Initiative (RGGI) and the Massachusetts DOE directs the funds for the program.	A rebate program for all-electric or fuel cell zero-emission MHDVs owned by private and public entities. Reporting requirement on vehicle miles traveled after purchase.	Class 2b-8 trucks. Rebates cover battery electric, hybrid electric, or fuel cell truck replacements.	Vehicles housed or operating in environmental justice communities more than 50% of the time receive an additional 10% rebate.
<a href="#"><u>New Jersey: Zero Emission Incentive Program (NJ ZIP)</u></a>	<b>\$24.25 million total available in funding (recently increased from \$15 million).</b> Funding comes from the Volkswagen Environmental Mitigation Trust (VW Trust) and RGGI.	An application-based voucher program for NJ-based companies to upgrade their fleets of medium-duty vehicles to electric or low-carbon fuel models.	Medium-duty trucks and buses class 2b-6 are eligible for vouchers.	Only covers vehicles operating in eligible “overburdened” communities of greater Camden, Newark, and New Brunswick. Also provides extra voucher funding for bonus criteria. See

				the full list of bonus criteria in the New Jersey ZIP section.
<a href="#">New York: Clean Truck Voucher Incentive Program (NYTVIP)</a>	<b>\$54 million total available in funding.</b> Funds come from the Congestion Mitigation and Air Quality (CMAQ) Improvement Program and the VW Trust. The New York Public Service Commission (PSC) has also made \$15 million available for MHDV make-ready fleet charging infrastructure.	An application-based voucher program for NY-based companies to upgrade their fleets of medium- and heavy-duty vehicles to electric or low-carbon fuel models. Semi-annual reporting on usage of new vehicles is required. 2009 and earlier MHD diesel vehicles are required to be scrapped.	MHDVs classes 3-8 with additional requirements for class 3. Vehicles covered by vouchers are: Battery electric, hydrogen fuel cell electric, plug-in hybrid electric, conventional hybrid electric, compressed natural gas, and propane.	To qualify for NYTVIP Table 4, 'Voucher Amounts and Caps for Other Vehicle Types,' "BEVs must operate and be domiciled in a non attainment (or maintenance) county" per the map provided by the program to qualify for voucher funding.
<a href="#">New York City: Clean Trucks Program (NYCCTP)</a>	<b>\$9.8 million total available in funding as of June 2020.</b> Funding comes from the VW Trust and is overseen by the New York City Department of Transportation.	An application-based voucher program for NYC-based companies to upgrade their fleets of medium- and heavy-duty vehicles to electric or low-carbon fuel models, but more heavily incentivizes electric models compared to the NY state program.	Trucks classes 4-8 are eligible for vouchers. Vehicles covered are: Battery electric, plug-in hybrid electric, hybrid diesel electric, compressed natural gas, and new diesel (with restrictions).	Only available to fleets operating in and within 0.5 mile of designated Industrial Business Zones (IBZs), which were established to promote economic vitality in the NYC area.
<a href="#">Electrification Coalition Programs: Climate Mayors EV Purchasing Collaborative</a>	Funding pooled from different cities' budgets.	Climate Mayors EV Purchasing Collaborative is a coalition of mayors from 450 cities in 48 states that use the power of cooperative purchasing with private EV and charging companies to lower purchase prices for government fleets through competitive bidding.	Any government fleet vehicles, including associated charging infrastructure.	Not directly apparent, but cities with smaller budgets or in economically disadvantaged areas could benefit greatly from reduced group purchase costs.
<a href="#">State Exemptions / Tax Credits</a>	No funding required.	State tax credits and exemptions for zero-emission and alternative fuel MHDVs.	MHD zero-emission, low-emission, and alternative fuel vehicles and powertrains.	No.



# CHALLENGE / PROBLEM STATEMENT

Climate-altering GHGs' rising concentration in the Earth's atmosphere can be directly attributed to the production and consumption of fossil fuels that power a majority of our energy use. These emissions cause huge ramifications - they negatively impact human health, the health of our environment, and have been shown to result in the warming of our planet's climate.<sup>7</sup> As the Earth heats and GHG emissions fill our atmosphere, there have been and will continue to be drastic impacts on all of our life systems, from water, to land, food, weather, air, and every living being on this planet. Per the President of Western Resource Advocates, "here in Colorado we (already) see the effects of climate change every day, from more frequent and intense wildfires, to severe flooding, to unhealthy air quality and prolonged drought."<sup>8</sup> In the state of Colorado, and across the U.S., the transportation sector is now the largest single source of GHG emissions.<sup>9</sup>

Transportation pollution also disproportionately impacts minority, low-income, and BIPOC communities, who typically have less financial capital and resources to repair damages caused by climate change or to purchase safeguards against environmental impacts and emissions. According to the American Lung Association's State of the Air report, people of color are "three times more likely to live in a county that failed all three air quality grades: ozone pollution, 'short term' particle pollution, and 'year round' particle pollution," and tend to live near transportation corridors and polluting facilities, such as petroleum refineries, chemical manufacturers, and power plants.<sup>10</sup> Further, due to historically discriminatory land use policies, BIPOC and low-income communities also live closer to congested highways, ports, warehousing districts, and freight hubs. These communities are perpetually exposed to high levels of air pollution from diesel vehicles, and the most heavily-trafficked neighborhoods have over 1,000 diesel trucks driving through every hour.<sup>11</sup> Consequently, lower-income, minority, and EJ community residents suffer from higher rates of asthma and elevated cancer risks, and initial research from Harvard "suggests that counties with higher long-term levels of air pollution also suffer higher COVID-19 death rates."<sup>12</sup> Additionally, the World Health Organization acknowledges that consistent background noise levels, such as noise emanating from medium- and heavy-duty trucks in freight corridors, can increase rates of hearing loss and cardiovascular disease.<sup>13</sup> Noise pollution from trucks also produces anxious and detrimental responses in wildlife.<sup>14</sup>

<sup>7</sup> IPCC, 2018. *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, 2018, [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15\\_Full\\_Report\\_Low\\_Res.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf)

<sup>8</sup> Colorado Leaders Applaud Passage of HB 19-1261. Conservation Colorado, 2 May 2019, [conservationco.org/2019/05/02/press-colorado-leaders-applaud-passage-of-hb-19-1261/](https://conservationco.org/2019/05/02/press-colorado-leaders-applaud-passage-of-hb-19-1261/)

<sup>9</sup> Inventory of U.S. Greenhouse Gas Emissions and Sinks. U.S. Environmental Protection Agency, <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

<sup>10</sup> Asmelash, Leah. *People of color are three times as likely to live in most polluted places, new report says*. CNN, 22 Apr. 2021, [www.cnn.com/2021/04/21/us/air-quality-pollution-racism-trnd-wellness/](https://www.cnn.com/2021/04/21/us/air-quality-pollution-racism-trnd-wellness/)

<sup>11</sup> Portillo, Patricio. *California Makes History with Clean Trucks Rule*. NRDC, 25 June 2020, <https://www.nrdc.org/experts/patricio-portillo/california-makes-history-clean-trucks-rule>

<sup>12</sup> *Air Pollution Linked with Higher COVID-19 Death Rates*. Harvard School of Public Health, 5 May 2020, [hsph.harvard.edu/news/hsph-in-the-news/air-pollution-linked-with-higher-covid-19-death-rates](https://hsph.harvard.edu/news/hsph-in-the-news/air-pollution-linked-with-higher-covid-19-death-rates)

<sup>13</sup> Śliwińska-Kowalska M, Zaborowski K. *WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Permanent Hearing Loss and Tinnitus*. International Journal of Environmental Research and Public Health; 14(10):1139, 2017, <https://doi.org/10.3390/ijerph14101139>

<sup>14</sup> Yosef, R., Kumbhojkar, S., Sharma, S. et al. *Electric vehicles minimize disturbance to mammals*. Eur J Wildl Res 67, 74, 2021, <https://doi.org/10.1007/s10344-021-01516-z>

There are already case studies demonstrating the health and air quality benefits of transitioning away from diesel MHDVs. For instance, in Leipzig, Germany, a low-emission zone banning older diesel vehicles reduced soot particles with cancer-causing hydrocarbons by 60%, and ultrafine particles, which can be absorbed deep into the lungs, by about 70%.<sup>15</sup> Moreover, a recent Road to Clean Air report found that widespread adoption of EVs nationally by 2050 would prevent 416,000 lost work days, 93,000 asthma attacks, and 6,300 premature deaths, in addition to providing \$72 billion in health benefits and \$113 billion in climate benefits for U.S. residents.<sup>16</sup> These reasons, and other long-engrained injustices, highlight why reducing transportation emissions via electrification, particularly of more heavily-polluting diesel MHDVs, is about more than just GHGs; it's about local air pollution, public health, equity, and environmental justice.

The growing use of clean energy to power our society will improve all of these circumstances. While the extraction, production, and combustion of fossil fuels results in toxic emissions, electricity generated by clean technologies like solar, wind, and hydropower contribute zero emissions after installation. Further, battery electric vehicles (BEVs) emit no tailpipe emissions like smog- and ozone-forming pollutants, such as nitrogen oxides (NOx), volatile organic compounds (VOCs), and other harmful emissions, including carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), particulate matter (PM), and hydrocarbons (HC), that contribute to climate change and local air pollution.<sup>17</sup> By increasing our use of renewables and electrifying the MHD transportation sector, we can begin to phase out fossil fuels and moderate global warming. Additionally, we can do so while providing environmental justice and other invaluable benefits to BIPOC and low-income communities, from improved health and quality of life, to expanded job opportunities, economic growth, cost savings, energy security, and climate justice. After all, “when you look at climate change and when you look at smog, particularly from the heavy-duty sector, we know that it discriminates.”<sup>18</sup> Thus, electric vehicle policy and the electrification of medium- and heavy-duty vehicles is “an investment tool for social justice.”<sup>19</sup>

This paper seeks to identify the most effective and impactful policies and programs to accelerate the deployment of electric MHDVs and associated charging infrastructure across the state of Colorado. This report will also propose specific solutions for electrification in communities along the I-270 freight corridor as a method to curb local air pollution in these disproportionately-impacted neighborhoods. The North Denver area has significant levels of air pollution, since it is directly adjacent to the I-270 corridor and also houses Suncor, an oil refinery with a long history of environmental violations. Focusing policy efforts in this region, along with other Colorado DICs and environmental justice areas, will be vital to the success of any MHDV electrification efforts and future highway project proposals the state undertakes.

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<sup>15</sup> *Healthier Air Due to the Low Emission Zone: Significant Decrease of Black Carbon and Ultrafine Particles in Urban Air*. ScienceDaily, Leibniz Institute for Tropospheric Research (TROPOS), 20 Dec. 2017, <https://www.sciencedaily.com/releases/2017/12/171220122005.htm>

<sup>16</sup> *The Road to Clean Air*. American Lung Association, 2020, [www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf](http://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf)

<sup>17</sup> *Transportation*. American Lung Association, 9 Dec. 2020, <https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/transportation>

<sup>18</sup> Parsons, Rachel. *Report on Heavy-Duty EVs Highlights Opportunity for Social Equity*. The Greenlining Institute, 18 Jan. 2019, <https://greenlining.org/press/2019/report-on-heavy-duty-evs-highlights-opportunity-for-social-equity/>

<sup>19</sup> Stark, Kevin. *Amid e-Commerce Surge, California Cities Want Relief from Truck Pollution*. Energy News Network, 14 Mar. 2019, [energynews.us/2019/03/14/amid-e-commerce-surge-california-cities-want-relief-from-truck-pollution/](http://energynews.us/2019/03/14/amid-e-commerce-surge-california-cities-want-relief-from-truck-pollution/)



# VEHICLE CLASSIFICATIONS AND STATISTICS

In the U.S., the Federal Highway Administration (FHWA) groups vehicles by weight class based on their gross vehicle weight rating (GVWR). Weight class categories range from light-duty (class 1-2; ≤ 10,000 lbs), to medium-duty (class 3-6; 10,0001 - 26,000 lbs), and heavy-duty (class 7-8; ≥ 26,001 lbs).

Gross Vehicle Weight Rating (lbs)	Federal Highway Administration		US Census Bureau
	Vehicle Class	GVWR Category	VIUS Classes
<6,000	Class 1: <6,000 lbs	Light Duty <10,000 lbs	Light Duty <10,000 lbs
10,000	Class 2: 6,001 – 10,000lbs		
14,000	Class 3: 10,001 – 14,000 lbs	Medium Duty 10,001 – 26,000 lbs	Medium Duty 10,001 – 19,500 lbs
16,000	Class 4: 14,001 – 16,000 lbs		
19,500	Class 5: 16,001 – 19,500 lbs		
26,000	Class 6: 19,501 – 26,000 lbs		
33,000	Class 7: 26,001 – 33,000 lbs	Heavy Duty >26,001 lbs	Light Heavy Duty: 19,001 – 26,000 lbs
>33,000	Class 8: >33,001 lbs		

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For the EPA emissions classification of trucks, there is no medium-duty category. Instead, all non-passenger vehicles over 10,000 lbs are classified as heavy-duty and there is an additional class 2b heavy-duty label with GVWR ranging from 8,501-10,000 lbs. Vehicles that fall into class 2b in the EPA classification are sometimes included for the purposes of MHDV incentive programs.

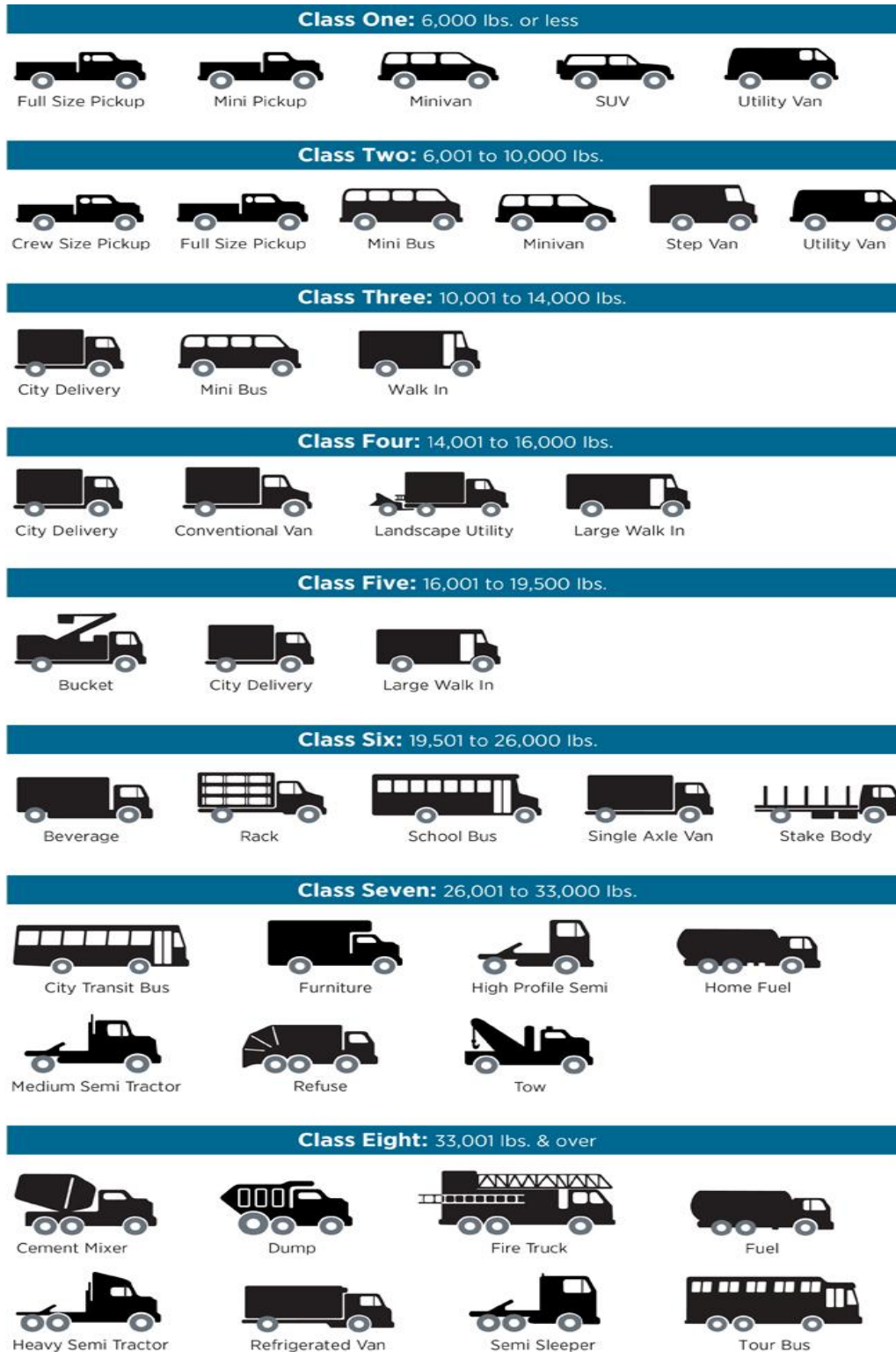
Gross Vehicle Weight Rating (lbs)	EPA Emissions Classification			
	Heavy Duty Vehicle and Engines			Light Duty Vehicles
	H.D. Trucks	H.D. Engines	General Trucks	Passenger Vehicles
<6,000 6,000	Light Duty Truck 1 & 2 <6,000 lbs	Light Light Duty Trucks <6,000 lbs	Light Duty Trucks < 8500 lbs	Light Duty Vehicle < 8500 lbs
8,500	Light Duty Truck 3 & 4 6,001–8,500 lbs	Heavy Light Duty Trucks 6,001–8,500 lbs		
10,000	Heavy Duty Vehicle 2b 8,501–10,000 lbs	Light Heavy Duty Engines 8,501 lbs–19,500 lbs	Heavy Duty Vehicle Heavy Duty Engine >8,500 lbs	Medium Duty Passenger Vehicle 8,501–10,000 lbs
14,000	Heavy Duty Vehicle 3 10,001–14,000 lbs			
16,000	Heavy Duty Vehicle 4 14,001–16,000 lbs			
19,500	Heavy Duty Vehicle 5 16,001–19,500 lbs			
26,000	Heavy Duty Vehicle 6 19,501–26,000 lbs	Medium Heavy Duty Engines 19,501–33,000 lbs		
33,000	Heavy Duty Vehicle 7 26,001–33,000 lbs			
60,000	Heavy Duty Vehicle 8a 33,001–60,000 lbs	Heavy Heavy Duty Engines Urban Bus >33,001		
>60,000	Heavy Duty Vehicle 8b >60,001			

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<sup>20</sup> Vehicle Weight Classes & Categories. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/data/10380>

<sup>21</sup> Vehicle Weight Classes & Categories. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/data/10380>

Below, is a graphic showing examples of vehicle types in each FHWA weight class category.



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<sup>22</sup> Types of Vehicles By Weight Class. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/data/widgets/10381>

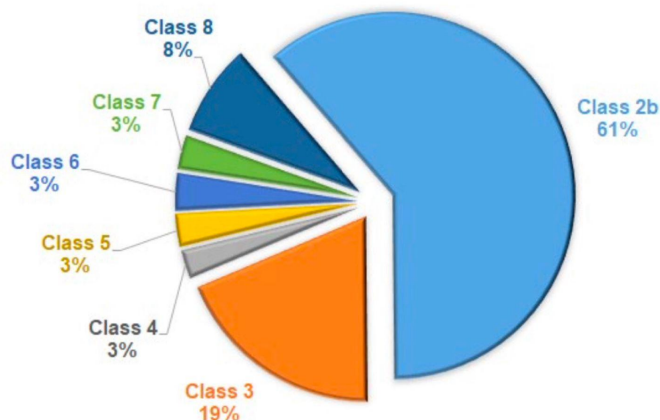
According to the Colorado Department of Revenue, as of fiscal year 2020, there were over 5.65 million vehicles registered in the state.<sup>23</sup> Of those, the Colorado Medium- and Heavy-Duty Vehicle Study found that around 480,000 qualify as MHDVs. Within the MHDV classification in Colorado, class 2b comprises 61% of vehicles, with class 3 being 19%, class 8 composing 8%, and classes 4-7 making up 12%.<sup>24</sup>

Registered Vehicles by Type and County (continued)													
Fiscal Year 2020													
County	Bus	Dealer	Farm Truck / Tractor	GW Truck / Trailer	Light Truck	Motorcycle	Motorhome	Passenger	Recreational Truck	Special Mobile Machinery	Special Use Truck	Trailer	Total
Total	12,011	39,348	61,914	16,402	1,043,224	177,115	30,713	3,507,700	29,326	96,802	5,433	644,618	5,664,606

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**Figure 5** Colorado M/HD Vehicles by Weight Class

#### Colorado Medium & Heavy Duty Vehicles by Class



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<sup>23</sup> 2020 Annual Report. Colorado Department of Revenue, 2020, <https://drive.google.com/file/d/1gngCw5D52MFC9vmSS-7vwf2gdDdNEBlj/view>

<sup>24</sup> Colorado Medium- and Heavy-Duty (M/HD) Vehicle Study. Colorado Energy Office, Sept. 2021, <https://drive.google.com/file/d/1N8tOp0v1RPK86Kle08ZQ83rKsY4Ja5Tx/view>

<sup>25</sup> 2020 Annual Report. Colorado Department of Revenue, 2020, <https://drive.google.com/file/d/1gngCw5D52MFC9vmSS-7vwf2gdDdNEBlj/view>

<sup>26</sup> Colorado Medium- and Heavy-Duty (M/HD) Vehicle Study. Colorado Energy Office, Sept. 2021, <https://drive.google.com/file/d/1N8tOp0v1RPK86Kle08ZQ83rKsY4Ja5Tx/view>

# ELECTRIFICATION BARRIERS

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There are a number of barriers that must be overcome to successfully advance the electrification of the transportation sector. The primary obstacles to transportation electrification include:

- 1) More expensive upfront costs for electric vehicles,
- 2) Insufficient and costly charging infrastructure,
- 3) Lack of vehicle model availability, and
- 4) Gaps in consumer education and familiarity.<sup>27</sup>

When it comes to electrifying MHDVs specifically, these impediments are amplified and expanded. Research has shown that EVs already have a lower total cost of ownership (TCO) than their internal combustion engine (ICE) counterparts due to reduced fueling and maintenance costs. EVs are 2-5 times more energy efficient, about 1/3 as expensive to fuel (\$1.10 per an electric eGallon vs \$3.49 per diesel gallon in Colorado as of 10/31/21), and 50% less to maintain.<sup>28,29,30,31</sup> However, a fleet may still be unable to electrify if it lacks the capital or financing necessary to cover the incremental costs of the more expensive vehicles. MHDVs also have larger batteries than light-duty cars, resulting in increased power requirements and longer charging times to refuel. As a result, charging infrastructure for such vehicles can be prohibitively expensive and may necessitate time-intensive and costly electrical system upgrades. These changes in electrical capacity and demand can translate into electric bill surcharges if the vehicles are not optimally charged during off-peak periods, requiring fleet managers to dedicate time to adjusting business processes and planning in advance when, where, and how vehicles will be charged.

The longer fueling times, as well as both the perceived (“range anxiety”) and actual range limitations of electric MHDVs, can also stand in the way of fleet procurement due to route efficiency and downtime considerations - key factors in organizational decision-making. Knowledge gaps present another primary concern. The market for EVs and their components is relatively new and rapidly changing; thus, it presents a variety of new risks and uncertainties fleet operators must account for; for instance, having qualified technicians able to work on these new electric vehicles in the case of maintenance issues. For all of these reasons and more, a new framework to expand on traditional TCO assessments known as the Total Cost of Electrification (TCE) has been developed to assist in recognizing and overcoming the additional barriers faced when electrifying fleets and MHDVs.

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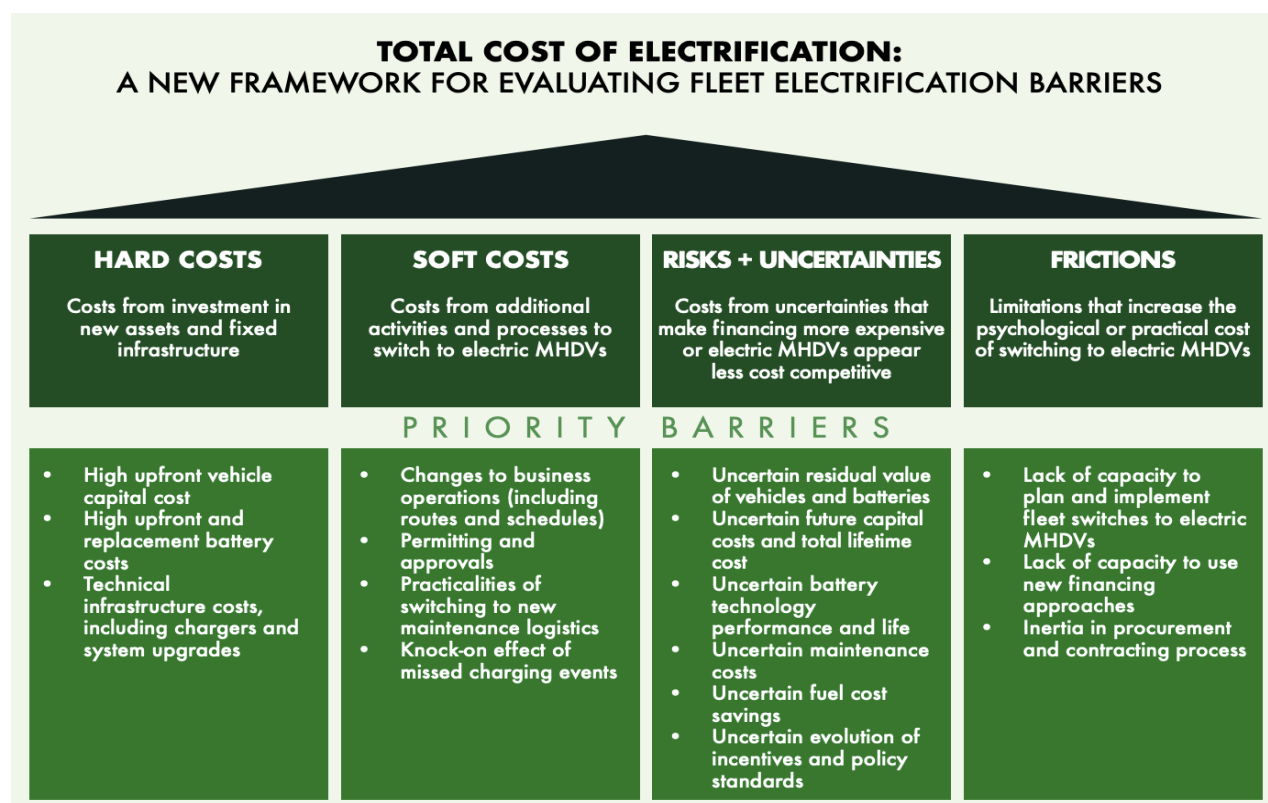
<sup>27</sup> *Transportation electrification*. Western Resource Advocates, <https://westernresourceadvocates.org/clean-energy-and-climate/revitalizing-the-economy/transportation-electrification/>

<sup>28</sup> *eGallon*. U.S. Department of Energy, <https://www.energy.gov/maps/egallon>

<sup>29</sup> *State Gas Price Averages*. AAA, 31 Oct. 2021, <https://gasprices.aaa.com/state-gas-price-averages/>

<sup>30</sup> *Advanced Clean Trucks Fact Sheet*. California Air Resources Board, 20 Aug. 2021, <https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet>

<sup>31</sup> Preston, Benjamin. *EVs Offer Big Savings over Traditional Gas-Powered Cars*. Consumer Reports, 8 Oct. 2020, <https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/>



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Considering the variety of obstacles to MHDV electrification, it's clear there is a need for robust policy and financial assistance to accelerate MHDEV market penetration. Such solutions must not only address ways to reduce the incremental hard costs to fleets via structures like rebates and vouchers, but also, the additional impacts and concerns fleet managers and operators must account for in their organizational planning and processes. In the next section of this report, we examine the electrification initiatives currently in place in Colorado and other states and municipalities across the U.S. We then conclude with recommendations for the state of Colorado to effectively overcome these obstacles.

## COLORADO INITIATIVES

Before we provide recommendations for further policy action in Colorado, we will review key state actions already in place. On January 14, 2021, Colorado released its [Greenhouse Gas Pollution Reduction Roadmap](#) providing an outline to achieve the state's targets as set out in House Bill 19-1261, the [Climate Action Plan To Reduce Pollution](#). HB 19-1261 established targets to achieve "at a minimum" a 26% reduction in statewide GHG pollution below 2005 baseline levels by 2025, a 50% reduction by 2030, and a 90% reduction by 2050.<sup>33</sup> The state has already implemented a number of actions to meet these

<sup>32</sup> Rojas, Victor A., et al. *Financing the Transition*. Environmental Defense Fund, Nov. 2020, [https://www.edf.org/sites/default/files/documents/EDF\\_Financing\\_The\\_Transition.pdf](https://www.edf.org/sites/default/files/documents/EDF_Financing_The_Transition.pdf)

<sup>33</sup> *Climate Action Plan to Reduce Pollution*. Colorado General Assembly, 30 May 2019, <https://leg.colorado.gov/bills/hb19-1261>

science-based targets, but per the CO GHG Pollution Reduction Roadmap, “progressing toward these goals will require additional policies beyond the actions the state has taken already.”<sup>34</sup>

Specific to the transportation sector, Colorado is aiming for a 12.7 million ton reduction in GHG emissions by 2030. Half of this abatement is estimated to come from existing policies and “the other 6 million tons will come from additional actions, including public investment, incentives, changes to transportation planning designed to reduce the growth of vehicle miles traveled, regulatory requirements, and increased adoption of zero-emission cars, trucks and buses.”<sup>35</sup> Some state policies and goals, including the 2020 Colorado Electric Vehicle Plan, with a high scenario target of 940,000 EVs on Colorado roads by 2030, as well as a 2019 zero-emission vehicle (ZEV) regulation, have already been instituted to expedite the transition to electrified transportation.<sup>36</sup> However, these measures are not specific to the medium- and heavy-duty sector, which poses the largest public health danger per vehicle to low-income, BIPOC, and environmental justice communities. The ZEV regulation, which requires auto manufacturers to sell an increasing percentage of zero-emission vehicles by 2023 and beyond, even specifically notes that “medium-duty vehicles shall not be required to meet the ZEV requirement.”<sup>37</sup> At the same time, there are some state initiatives already in place in Colorado related to MHDVs and charging infrastructure, which include: [Plug-in Electric Vehicle \(PEV\)](#) and [Alternative Fuel Vehicle \(AFV\) Tax Credits](#), [ALT Fuels Colorado \(AFC\)](#), [Charge Ahead Colorado \(CAC\)](#), [EV Fast-Charging Corridors](#), [EV Fast-Charging Plazas](#), and the [Transit Bus Replacement Program](#) that have provided combined grants for over \$65 million for alternative fuel vehicles and fueling / charging stations.<sup>38,39,40,41,42</sup>

## Plug-in Electric Vehicle and Alternative Fuel Vehicle Tax Credits

Colorado offers a PEV and AFV tax credit known as the Innovative Motor Vehicle Tax Credit that provides increased support specifically for MHDVs. For 2021, these credits amount to \$5,000 for the purchase or conversion of medium-duty trucks, with \$2,500 available for leases; they also offer \$10,000 for the purchase or conversion of heavy-duty trucks, with \$5,000 for heavy-duty leases. In 2022, these amounts remain the same, but will no longer apply to conversions for AFVs. From 2023-2025, the incentives will solely become available for electric vehicles and will drop to \$4,000 and \$8,000 respectively for purchases of electric medium- and heavy-duty trucks with tax credits for leases remaining the same as 2021 and 2022.<sup>43,44</sup>

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<sup>34</sup> Colorado GHG Pollution Reduction Roadmap. Colorado Energy Office, 14 Jan. 2021, [drive.google.com/file/d/1jzLvFcrDryhhs9ZkT\\_UXkQM\\_0LiiYZfq/view](https://drive.google.com/file/d/1jzLvFcrDryhhs9ZkT_UXkQM_0LiiYZfq/view)

<sup>35</sup> Colorado GHG Pollution Reduction Roadmap. Colorado Energy Office, 14 Jan. 2021, [drive.google.com/file/d/1jzLvFcrDryhhs9ZkT\\_UXkQM\\_0LiiYZfq/view](https://drive.google.com/file/d/1jzLvFcrDryhhs9ZkT_UXkQM_0LiiYZfq/view)

<sup>36</sup> Colorado EV Plan 2020. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/colorado-ev-plan-2020>

<sup>37</sup> Reg 20 with ZEV Rule. Department of Public Health and Environment, 2018, [drive.google.com/file/d/1LmJQHfKUKzg6HuAKDZ0xzDO4MIMchxxA/view](https://drive.google.com/file/d/1LmJQHfKUKzg6HuAKDZ0xzDO4MIMchxxA/view)

<sup>38</sup> ALT Fuels Colorado. Clean Air Fleets, <https://cleanairfleets.org/programs/alt-fuels-colorado>

<sup>39</sup> Charge Ahead Colorado. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/charge-ahead-colorado>

<sup>40</sup> Electric Vehicle Fast-Charging Corridors. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/electric-vehicle-fast-charging-corridors>

<sup>41</sup> EV Fast-Charging Plazas. Colorado Energy Office, <https://energyoffice.colorado.gov/ev-fast-charging-plazas>

<sup>42</sup> Volkswagen Settlement - Transit Bus Replacement Program. Colorado Department of Transportation, <https://www.codot.gov/programs/planning/grants/vw-settlement-bus>

<sup>43</sup> Plug-In Electric Vehicle (PEV) Tax Credit. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/11702>

<sup>44</sup> Alternative Fuel Vehicle (AFV) Tax Credit. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/11704>



## ALT Fuels Colorado

[ALT Fuels Colorado](#) offers funding to MHDV fleets to support the scrappage and substitution of 2009 and earlier diesel vehicles with cleaner alternatives. From 2014 to 2018, \$30 million in grants for 800 alternative fuel vehicles (including battery electric, compressed natural gas, renewable natural gas, propane, and diesel replacements) and associated fueling stations were provided by the Congestion Mitigation and Air Quality Improvement (CMAQ) program through the FHWA for Alt Fuels.<sup>45,46,47</sup> Beginning in 2019, CMAQ funding was exhausted and AFC was budgeted new funding of approximately \$21.5 million from the [Volkswagen Environmental Mitigation Trust](#).<sup>48</sup> At the same time, AFC began to limit replacements to solely electric and RNG-fueled equipment. Eligible vehicles for AFC include: class 4-8 local freight trucks, shuttle, transit, and school buses, railroad switchers, airport ground-support equipment, heavy forklifts, and cargo handling equipment.<sup>49</sup> Beyond the scrappage requirement, AFC funding requires vehicles to be domiciled in Colorado and to operate within established state boundaries at least 60% of the time. AFC funding is reimbursable and is available for up to 110% of the cost difference between an analogous new diesel vehicle and the electric or RNG alternative. The Regional Air Quality Council (RAQC), which manages the funds in coordination with CDPHE, CDOT, and CEO, expects AFC grants to be fully spent by 2023. For a list of vehicles, equipment, and fleets awarded AFC funding since September 2018 and details on the most recent round of awards distributed in July 2021, click [here](#). ALT Fuels funding is also accessible for level 2 and 3 electric vehicle supply equipment (EVSE) to charge AFC-funded vehicles. However, if applying for EVSE only and not replacing vehicles, grants would be available through the Charge Ahead Colorado program rather than ALT Fuels.<sup>50</sup>

## Charge Ahead Colorado

[Charge Ahead Colorado](#) is an initiative run by the Colorado Energy Office and Regional Air Quality Council that provides grants covering up to 80% of the costs of level 2 and 3 electric vehicle charging stations. CAC funding is available up to the following amounts:

- \$6,000 for fleet only level 2 chargers,
- \$9,000 for dual port EVSE (up to 25kW)
- \$35,000 for level 3 standard multi-connection chargers (at least 50kW), and
- \$50,000 for ultra-fast multi-connection EVSE (at least 100kW), with precedence given to entities not qualified for other existing state incentives.

While the RAQC offers funding from the federal CMAQ program for the DRCOG area, CEO provides grants for applicants across the rest of the state with finances approved by the Colorado state

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<sup>45</sup> ALT Fuels Colorado. Clean Air Fleets, <https://cleanairfleets.org/programs/alt-fuels-colorado>

<sup>46</sup> Alt Fuels Colorado Fact Sheet. Colorado Energy Office and Regional Air Quality Council, <http://cleanairfleets.org/wp-content/uploads/2014/08/Alt-Fuels-Colorado-Fact-Sheet-2.pdf>

<sup>47</sup> Alt Fuels Colorado Settlement Funding Program Guide. Regional Air Quality Council, 22 Apr. 2021, <https://raqc.egnyte.com/dl/ryNkMQYh78/>

<sup>48</sup> Beneficiary Mitigation Plan Volkswagen, Audi, and Porsche Clean Air Act Settlements. Colorado Department of Transportation, 16 Sept. 2019, <https://www.codot.gov/programs/planning/assets/grants/2019bmp>

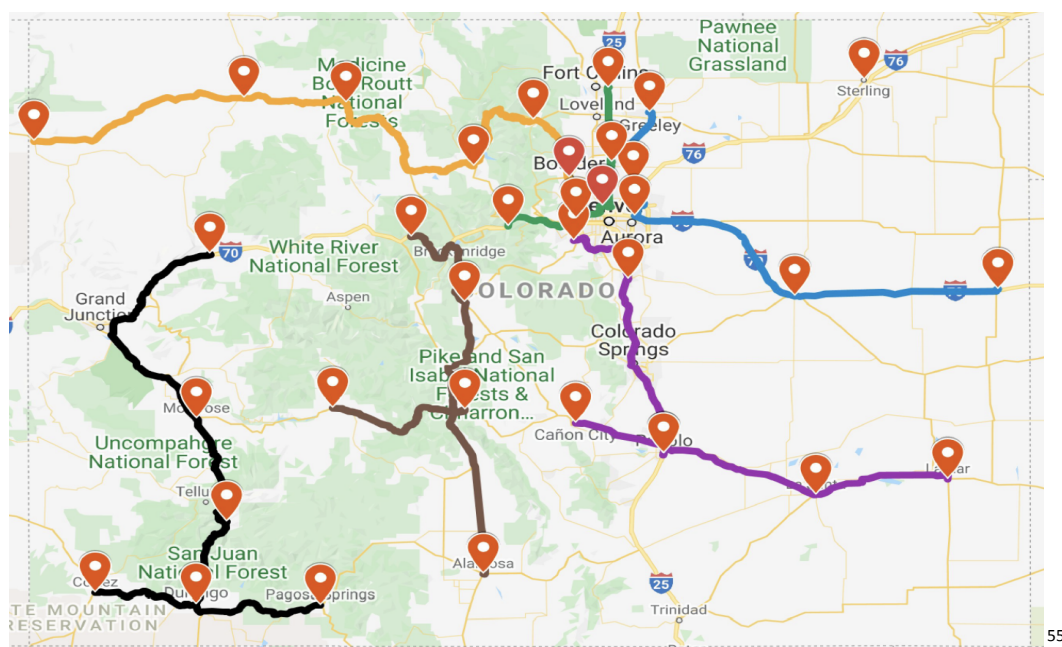
<sup>49</sup> Projects Eligible to Receive Funds. Colorado Department of Public Health & Environment, <https://cdphe.colorado.gov/projects-eligible-to-receive-funds>

<sup>50</sup> Alt Fuels Colorado Settlement Funding Program Guide. Regional Air Quality Council, 22 Apr. 2021, <https://raqc.egnyte.com/dl/ryNkMQYh78/>

legislature.<sup>51</sup> Since program commencement in 2013, Charge Ahead has provided financial support for the installation of over 1,000 EV chargers across Colorado at locations ranging from “local governments, (to) state agencies, public universities, public transit agencies, private nonprofit or for-profit corporations, landlords of multi-family apartment buildings, and homeowner associations,” amongst other applications, with the goal to improve air quality across the state by incentivizing EV adoption.<sup>52,53</sup> The following links include information on Charge Ahead Colorado awardees and funding amounts in [2018](#) and [2019](#) with additional CAC resources included [here](#), as well as CAC best practices and additional grantee organizations documented at [this link](#).

## Electric Vehicle Fast-Charging Corridors

In addition to the ALT Fuels and Charge Ahead programs, in November 2018, Colorado also awarded a \$10.33 million grant to ChargePoint to install direct current fast-charging (DCFC) stations at 34 locations across 6 major state transportation corridors as part of the [EV Fast-Charging Corridors](#) program launched by the Colorado Energy Office.<sup>54</sup> A map of those stations can be viewed below and a list of program-related awardees is available [here](#).



<sup>51</sup> Charge Ahead Colorado. Clean Air Fleets, <https://cleanairfleets.org/programs/charge-ahead-colorado>

<sup>52</sup> Charge Ahead Colorado. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/charge-ahead-colorado>

<sup>53</sup> *Charge Ahead Colorado*, Clean Air Fleets, <https://cleanairfleets.org/programs/charge-ahead-colorado>

<sup>54</sup> *Electric Vehicle Fast-Charging Corridors*. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/electric-vehicle-fast-charging-corridors>

<sup>55</sup> *Electric Vehicle Fast-Charging Corridors*. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/electric-vehicle-fast-charging-corridors>

## Electric Vehicle Fast-Charging Plazas

The state's [EV Fast-Charging Plazas](#) program sets itself apart from Charge Ahead in that it includes stricter provisions with respect to location, implementation, and deployment of EVSE. The program specifically targets anticipated high-use locations, with awards primarily focused on Denver International Airport (DEN) and in urban centers along the Front Range in Denver, Aurora, Lakewood, and Boulder. The program may also include DCFC installations in Pueblo, Colorado Springs, and Fort Collins, depending on site characteristics and qualifications. Urban settings close to large commercial and transit developments, high-density housing, and high-mileage fleet drivers and operations, such as Transportation Network Companies (TNCs), are prime considerations for EV Fast-Charging Plazas awards. The primary goal of the program is to provide rapid charging availability to drivers that lack access to such capabilities at their home or workplace or that need to refuel multiple times throughout the day.<sup>56</sup> The first round of grants were awarded after the summer of 2020 with 28 DCFC stations installed across 7 locations in Denver, Golden, Aurora, Arvada, and Greenwood Village. Details on Round One awardees can be found [here](#). The second round of applications was recently closed in April 2021 with two specific sites at DEN already determined - one in the Cell Phone Waiting Lot solely for public access and one in the Commercial Holding Lot explicitly for taxis, shuttles, TNCs, and other commercial transportation agencies. Notice of the second round of awardees is anticipated to be publicly released soon. In connection with the program, CEO requires grant recipients to provide a minimum of 5 years of plaza operation and upkeep after EVSE construction and installation.<sup>57</sup> Total grant funding is limited to \$4 million with individual applicants eligible for up to 80% of costs per location.<sup>58</sup>

## Transit Bus Replacement Program

Meanwhile, the Colorado [Transit Bus Replacement Program](#) was provided with a \$30 million budget from the VW Trust to scrap pre-2010 diesel or gas-powered class 4-8 transit buses in exchange for battery electric, hydrogen fuel cell, or RNG replacements. So far, the program has provided funding for [Round One](#) and [Round Two](#) of about \$17 million and offers incentives covering up to 80% of the replacement bus cost or 110% of the incremental cost of a comparable diesel bus with a maximum of \$100,000 towards each fueling station (if approved in tandem).<sup>59</sup> Additional information and program criteria can be found [here](#).

## ReCharge Colorado

Colorado additionally has an EV coaching services program known as [ReCharge Colorado](#) that helps “consumers, local governments, workplaces and multi-unit housing developments identify monetary savings, grant opportunities, and other advantages related to deploying EVs and charging

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<sup>56</sup> *EV Fast-Charging Plazas*. Colorado Energy Office, <https://energyoffice.colorado.gov/ev-fast-charging-plazas>

<sup>57</sup> *EV Fast-Charging Plazas*. Colorado Energy Office, <https://energyoffice.colorado.gov/ev-fast-charging-plazas>

<sup>58</sup> *Direct Current (DC) Fast Charging Plazas Program*. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/12432>

<sup>59</sup> *Volkswagen Settlement - Transit Bus Replacement Program*. Colorado Department of Transportation, <https://www.codot.gov/programs/planning/grants/vw-settlement-bus>

infrastructure.” ReCharge Colorado includes coaching for any questions consumers or entities may have, as well as direct assistance with electric utility and Colorado state programs such as those noted above.<sup>60</sup>

## Clean Truck Strategy

In 2020, Colorado signed on to a Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding ([MHD ZEV MOU](#)) pledging that 30% of all new MHDVs sold in the state will be zero-emission by 2030 with 100% by 2050.<sup>61</sup> Also in July 2020, Colorado introduced a [Clean Truck Strategy](#) to work with stakeholders across sectors and regions to create recommendations to mitigate emissions from MHDVs in the state. The following “key areas of exploration” cited in this strategy include many of those being examined in our research and final recommendations.

- Accelerating opportunities for fleet turnover within the conventional truck fleet, including diesel emissions reduction strategies,
- Developing infrastructure to support ZEVs in medium- and heavy-duty (MHD) fleets,
- Incorporating clean technologies into key freight corridors and highway projects and developing a strategy for MHD ZEV fueling infrastructure along these critical routes,
- Exploring opportunities for cleaner major fleets operating in Colorado,
- Exploring potential adoption of Advanced Clean Truck standards for medium and heavy trucks
- Exploring emission reductions for last mile freight delivery and pickup and deployment of sustainable options,
- Working with and assisting truck dealerships and private maintenance shops in supporting workforce development and ZEV vehicle implementation,
- Encouraging private fleets to become partners in the voluntary EPA SmartWay Program, and
- Leading by example through green procurement of state fleet vehicles and contracted services.<sup>62</sup>

Existing Colorado state policies and programs, as well as the recent signing of the Multi-State MHD ZEV MOU are large steps in the right direction. At the same time, the MOU is not binding and the GHG Pollution Reduction Roadmap directly states that additional policies will need to be undertaken to address the specific barriers to zero-emission MHDV adoption.

## Sustainability of the Transportation System

Senate Bill 21-260, [Sustainability of the Transportation System](#), recently passed in June 2021, will present the state of Colorado with the opportunity to transform its transportation sector. SB 21-260 will provide \$734 million of new fee revenue specifically devoted to three new state electrification enterprises at CDPHE, CDOT, and CEO. The Clean Fleet Enterprise at CDPHE (\$289 million) will support the replacement of highly-polluting delivery trucks, school buses, transit buses, Uber and Lyft vehicles,

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<sup>60</sup> ReCharge Colorado. Colorado Energy Office, <https://energyoffice.colorado.gov/zero-emission-vehicles/recharge-colorado>

<sup>61</sup> Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding. NESCAUM, July 2020, <https://www.nescaum.org/documents/multistate-truck-zev-governors-mou-20200714.pdf/>

<sup>62</sup> Colorado Clean Trucking Strategy FAQs. Colorado Department of Transportation, 18 Nov. 2020, [drive.google.com/file/d/14n-GHzEPRFRLYN0RiFLKEGoz6HYKSPmH/view](https://drive.google.com/file/d/14n-GHzEPRFRLYN0RiFLKEGoz6HYKSPmH/view)

and other private and government fleet vehicles with EVs, particularly in disproportionately-impacted communities. The Clean Transit Enterprise at CDOT (\$134 million) will advance clean public transit through electrification planning, facility upgrades, fleet replacement, and development of EV charging and fueling infrastructure. The Community Access Enterprise at CEO (\$310 million) will support the widespread and equitable adoption of EVs, provide access to EV community charging and fueling infrastructure, and increase clean, alternative transportation options.<sup>63,64</sup>

With existing state resources and programs, as well as the new fee revenue established in SB 21-260, the time is now to research, plan, and prepare to implement the policies and initiatives needed to sufficiently mitigate pollution from the Colorado medium- and heavy-duty vehicle sector.

## STATE AND CITY POLICIES & PROGRAMS

In the section below, we describe existing state and municipal MHDV and non-road vehicle strategies and initiatives from across the United States. These include:

- Rulemakings and mandates,
- City and state voucher programs,
- Zero-emission and smart zones,
- Pilot projects,
- Purchasing collaboratives, and
- State exemptions and tax credits.

The examples highlighted serve as models Colorado can utilize to accelerate MHDV electrification and to mitigate co-pollutants in the state. An online spreadsheet with additional details on eligibility, funding, incentives, and results of existing U.S. MHDV voucher programs can also be viewed [here](#).

### California: Advanced Clean Trucks Regulation

The Advanced Clean Trucks ([ACT](#)) regulation was adopted in 2019 by the California Air Resources Board (CARB) and builds on the success of the state's Advanced Clean Cars program (ZEV regulation). Under the ACT regulation, beginning in 2024, CARB requires all MHDV manufacturers operating in California to sell an increasing percentage of zero-emission medium- and heavy-duty vehicles every year up to 2035 and beyond. CARB also set a goal for all new trucks sold in California to be zero-emission by 2045. The Advanced Clean Trucks regulation additionally has a one-time reporting requirement for large entities and fleets in order to determine where zero-emission vehicles are needed currently, any barriers

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<sup>63</sup> Draft Legislative Proposal on State Transportation Funding. Mar. 2021, [wp-cpr.s3.amazonaws.com/uploads/2021/03/transportation-funding-proposal.pdf](https://wp-cpr.s3.amazonaws.com/uploads/2021/03/transportation-funding-proposal.pdf)

<sup>64</sup> Sustainability of the Transportation System. Colorado General Assembly, 17 June 2021, <https://leg.colorado.gov/bills/sb21-260>

to adoption, and vehicle characteristics necessary for specific fleets.<sup>65</sup> “An independent report on the proposed regulation by Energy Innovation and the Environmental Defense Fund found it would create \$7 to \$12 billion in savings for truck fleet operators in addition to at least \$9 billion in public health benefits across the state” of California.<sup>66</sup>

As shown in the table below, for class 2b-3 vehicles, the ACT regulation requires 5% ZEV sales for Model Year (MY) 2024 and 55% by MY 2035. For class 4-8, ZEV sales are required at 9% and increase to 75%. For class 7-8 tractors, ZEV sales begin at 5% and increase to 40% by the 2032 MY and beyond.

Table A-1. ZEV Sales Percentage Schedule

Model Year	Class 2b-3 Group	Class 4-8 Group	Class 7-8 Tractors Group
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035 and beyond	55%	75%	40%

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## California: Voucher Program

The state of California runs a MHDV voucher program called the California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program ([HVIP](#)). There is \$167 million total available in funding for fiscal year (FY) 20-21. Since its inception in 2009, over \$589 million has been allocated through the HVIP. The program is administered by CALSTART and funded by California Climate Investments, a statewide initiative funded by cap-and-trade proceeds with \$25 million in additional funding for FY 20-21 from the California Air Quality Improvement Program (AQIP).<sup>68,69</sup> This program is a first-come, first-serve initiative for companies with medium- and heavy-duty trucks and buses in California to earn vouchers applied immediately at the point-of-sale for electric and hybrid MHDVs.<sup>70</sup> The HVIP program has released a guidebook for all 150 vehicles eligible under the program and pricing,

<sup>65</sup> *Advanced Clean Trucks Fact Sheet*. California Air Resources Board, 20 Aug. 2021, <https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet>

<sup>66</sup> Bruno, Bianca. *California Adds Trucks to Its Electric-Vehicle Mandate, a U.S. First*. Courthouse News Service, 26 June 2020, [www.courthousenews.com/california-set-to-add-trucks-to-its-electric-vehicle-mandate/](https://www.courthousenews.com/california-set-to-add-trucks-to-its-electric-vehicle-mandate/)

<sup>67</sup> *Final Regulation Order - Advanced Clean Trucks Regulation*. California Air Resources Board (CARB), 2020, [ww3.arb.ca.gov/regact/2019/act2019/fro2.pdf](https://ww3.arb.ca.gov/regact/2019/act2019/fro2.pdf)

<sup>68</sup> *Growth in Clean Truck and Bus Market Drives Record Demand for Statewide Truck and Bus Incentive Program*. California Air Resources Board, 1 Nov. 2019, <https://ww2.arb.ca.gov/news/growth-clean-truck-and-bus-market-drives-record-demand-statewide-truck-and-bus-incentive>

<sup>69</sup> *Funding Updates*. California HVIP, <https://californiahvip.org/funding/>

<sup>70</sup> *Incentives for Clean Trucks and Buses*. California HVIP, <https://californiahvip.org/>



including voucher discounts. Eligible vehicles include: electric power take-off (ePTO), heavy-duty buses, medium-duty buses, refuse trucks, step and panel vans, straight trucks, and tractors.<sup>71</sup> Unlike the NY, NYC, and NJ voucher programs described below, no application is necessary, meaning less paperwork for fleets and removal of administrative hassles. No scrappage of older vehicles is required in exchange for a voucher. As a result of its point-of-purchase discount process, electric and hybrid vehicle manufacturers and merchants receive more certainty of price parity with traditional internal combustion engine models. HVIP also approves and trains vehicle dealers on the program. Manufacturers are limited to 100 unredeemed vouchers at any time, thereby increasing competition among the MHDEV manufacturing sector. Different from the NY and NYC voucher programs, fleet size does not matter for the number of vouchers awarded. Each fleet is limited to 30 vouchers per calendar year and drayage vehicle fleets are limited to 50 per calendar year.<sup>72</sup> The HVIP voucher amounts are included in the table below.

<b>Proposed ZEV Incentives</b>	
<b>Vehicle Weight Class</b>	<b>Base</b>
Class 2b	TBD
Class 3	\$45,000
Class 4-5	\$60,000
Class 6-7	\$85,000
Class 8	\$120,000
Class 8 Drayage Truck Early Adopter*	\$150,000

*\*Drayage tractor voucher amounts revert to Class 8 voucher amounts on 12/31/21*

<b>Voucher Modifiers (plus-ups and discounts)</b>	
Disadvantaged Community	+10%
Class 8 Fuel Cell	+100%
Public Transit Agencies	+15%
School Buses for Public School Districts	+65%
Plug-in Hybrid (>35 mi AER)	-50%
In-Use Converted/Remanufactured	-50%

In the new voucher table, an approved vehicle's voucher amount is determined by the vehicle's weight and then multiplied by the appropriate modifiers. There can be multiple modifiers, but the additions or subtractions do not compound. For example, a full-sized urban bus (class 8, \$120,000), sold to a transit agency (15% x \$120,000), and domiciled in a DAC (10% x \$120,000) would receive the base voucher amount of \$120,000 plus the sum of its modifiers (\$18,000 + \$12,000), or \$150,000. While most new voucher amounts represent a modest 8 to 10 percent reduction, vehicles purchased by public agencies, like transits and school districts, would continue using matching funding sources, including those from the Federal Transit Administration (FTA), AB 923, and local sales tax revenue. Notably, the table does not include ePTO. Those voucher amounts, which are set very differently from the other technologies in HVIP, will remain unchanged.

<sup>71</sup> All Vehicles. California HVIP, <https://californiahvip.org/vehicles/>

<sup>72</sup> Incentives for Clean Trucks and Buses. California HVIP, <https://californiahvip.org/>

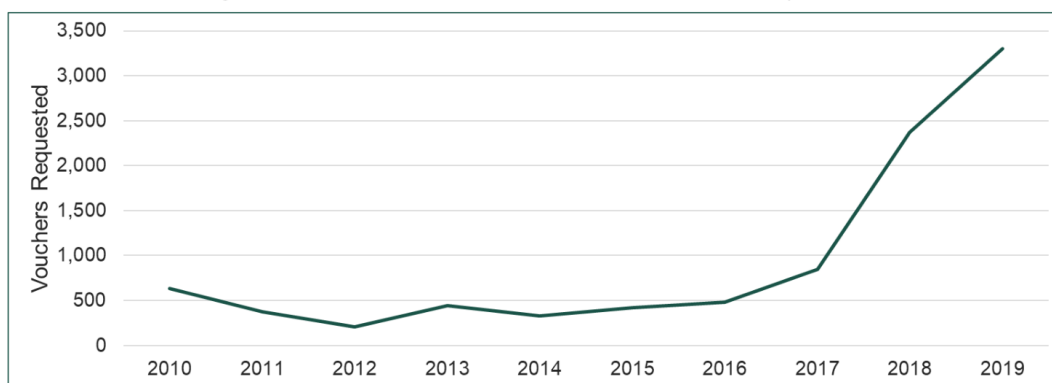
### ePTO Voucher Caps (up to 50% of the IC)

Energy Storage Capacity	Base Vehicle Incentive*
3 – 10 kWh	\$20,000
10 – 15 kWh	\$30,000
> 15 kWh	\$40,000

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Bonus additions to the voucher program include a 10% increase on vouchers for vehicles domiciled in designated disadvantaged communities (DACs). Per HVIP, “DACs are Census-designated areas that are especially affected by air pollution due to geographic and socioeconomic factors.”<sup>74</sup> 58% of all vouchers distributed so far have funded disadvantaged community fleets.<sup>75</sup> Combining incentives from various programs is also possible in California, but differs based on program requirements. The total incentives may not exceed 90% of the total vehicle cost for purchases by the private sector, and 100% for purchases by public entities. Since its beginning in 2010, HVIP has provided vouchers for the purchase of 3,000 zero-emission trucks and buses, 2,500 hybrid trucks, 3,000 natural gas combustion engines, and 200 trucks outfitted with electric power take-off systems. Voucher funding is increasingly being requested for these vehicles in the past few years with 80% of the voucher money requested since 2009 occurring between 2017 and 2019.

**Figure 2: HVIP Vouchers Requested by Year**



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## California: Zero-Emissions Delivery Zone

While European cities like London, Paris, and Madrid have made news by banning or charging fees for diesel vehicles entering their city centers, such initiatives have not yet sprung up across the

<sup>73</sup> Funding Updates. California HVIP, <https://californiahvip.org/funding/>

<sup>74</sup> Purchasers - Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project. California HVIP, <https://californiahvip.org/purchasers/>

<sup>75</sup> Impact. California HVIP, <https://californiahvip.org/impact/>

<sup>76</sup> Public Workshop on The Fiscal Year 2020-21 Funding Plan for Clean Transportation Incentives. California Air Resources Board, 22 Sept. 2020, [https://ww2.arb.ca.gov/sites/default/files/2020-09/fy2021\\_fp\\_discussion\\_document\\_0.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-09/fy2021_fp_discussion_document_0.pdf)

Atlantic. However, in California, the City of Santa Monica has begun piloting a first-of-its-kind project in the United States to promote last-mile zero-emission deliveries. In 2019, Los Angeles released a city-wide version of the Green New Deal, which called for all urban delivery vehicles to be zero-emission by 2035.<sup>77</sup> In support of this goal, Los Angeles partnered with C40, a global nonprofit organization, pledging the creation of a zero-emissions delivery zone (ZEDZ) in the region. This commitment aligned with the goals of the Transportation Electrification Partnership (TEP), launched by an organization called the Los Angeles Cleantech Incubator (LACI), which brought together local stakeholders ranging from public government, to state regulators, utilities, private companies, and startups, with the plan to reduce GHG emissions and associated air pollution in the city by 25% via the accelerated electrification of transportation and goods movement. The TEP roadmap also established a target to transition 60% of medium-duty delivery vehicles in LA County to electric in anticipation of the 2028 Olympic and Paralympic Games.<sup>78</sup>

With these synchronicities, the city of Los Angeles partnered with LACI to coordinate and allocate the funding for a zero-emissions delivery zone pilot in a one-square mile radius covering the commercial center of Santa Monica. The ZEDZ is being funded by a grant from the California Governor's Office of Business and Economic Development with \$10,000 of the funding being utilized by the city to assist with staff costs and signage and the remaining funds being used by LACI for staffing needs.<sup>79</sup> The ZEDZ is voluntary, so it does not require zero-emission delivery vehicles, nor prohibit fossil-fuel-powered transportation, but rather, is employing partnerships, policies, and technologies in the area to boost emissions-free deliveries and reduce associated local air pollution.

Some of the wide-ranging technologies and strategies being utilized in Santa Monica's ZEDZ include:

- Heavy-, medium-, and light-duty electric delivery vehicles,
- Commercial EV car- and truck-shares,
- Micromobility (e-scooters, e-bikes, and plug-in three wheelers with cargo capacity),
- Remotely-operated delivery robots (providing increased value during the pandemic),
- Priority zero-emission loading zones / curb management, and
- Data tracking to identify progress, efficiencies, lessons learned, and best practices.

The ZEDZ will serve as a testing ground for companies to experiment with the deployment of many of these new first- and last-mile zero-emission ideas and innovations.<sup>80</sup>

One such innovation is a first-in-the-nation, commercial medium-duty electric truck-sharing program for small businesses. The truck-sharing program will relieve participating businesses from the cost of purchasing and owning an electric MHDV, as well as the required infrastructure associated with

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<sup>77</sup> *Los Angeles' Green New Deal*. C40 Knowledge, Apr. 2019,

[https://www.c40knowledgehub.org/s/article/Los-Angeles-Green-New-Deal?language=en\\_US](https://www.c40knowledgehub.org/s/article/Los-Angeles-Green-New-Deal?language=en_US)

<sup>78</sup> *Santa Monica Zero Emissions Delivery Zone Pilot*. Los Angeles Cleantech Incubator, [lincubator.org/zedz/](http://lincubator.org/zedz/)

<sup>79</sup> Crowe, Cailin. *Santa Monica, CA Aims to Create Zero-Emissions Delivery Zone Playbook*. Smart Cities Dive, 3 Mar. 2021, [www.smartcitiesdive.com/news/santa-monica-LACI-zero-emission-delivery-zone-cities/595919/](http://www.smartcitiesdive.com/news/santa-monica-LACI-zero-emission-delivery-zone-cities/595919/)

<sup>80</sup> *Santa Monica Zero Emissions Delivery Zone Pilot*. Los Angeles Cleantech Incubator, [lincubator.org/zedz/](http://lincubator.org/zedz/)

the trucks. Charging infrastructure costs will be shared by the participants and therefore, lowered for all members of the program. Simultaneously, the truck and fleet vehicle-sharing programs will reduce the total number of such vehicles on the road and provide first-time access to companies and drivers that have yet to experience driving an electric truck.<sup>81</sup>

Priority zero-emission loading zones are being accomplished through the development of up to 20 zones designated specifically for ZEV deliveries in some of the most congested areas of the city with 1 to 2 previously dedicated parking spaces per loading zone.<sup>82</sup> These priority access zones will incentivize the use of zero-emission vehicles over fossil-fuel-powered alternatives. Active curb management and monitoring will expand upon this by providing a mobile application for companies and drivers to locate and reserve these zero-emission delivery zones. Real-time tracking and data collection will be managed through the use of stickers on vehicles participating in the project and traced by video analytics software and street cameras near curb spaces and loading zones.<sup>83</sup> These concepts will allow for increased delivery efficiency, safety improvements, reduced pollution, and congestion mitigation in the city center. They will also reduce the need for delivery vehicles to search for parking, avoid the unnecessary blocking of roadways and bike lanes, and increase the ease of parking enforcement. Plans are currently in place for the artificial intelligence company Automotus to analyze the associated data, determine how often the zones are used and how much time each vehicle spends parked, provide real-time parking availability to drivers, and evaluate the results of any changes in traffic, congestion, safety, and emissions.<sup>84</sup> Data and analysis generated from the project is intended to be used as a blueprint for other cities to shorten the learning curve associated with the development and implementation of future ZEDZs and smart zones (areas that solely incorporate real-time parking availability and curb space management practices, such as pilots in [Aspen](#), [Nashville](#), [Omaha](#), and [West Palm Beach](#)). Eventually, the Santa Monica ZEDZ and other smart zones (SZs) could lead to future pricing schemes for curbside management with ICE vehicles paying a fee and free access provided to ZEVs, further strengthening the case for companies to transition to clean fleets and providing additional funding for related priorities.<sup>85</sup>

The establishment of public-private partnerships in association with the Santa Monica ZEDZ will also strengthen local community and business collaboration, invite innovation by growing the local network of clean transportation and technology start-ups, increase corporate interest in the area, and promote green job opportunities. There are a significant number of wide-ranging industry, advisory, and mobility partners taking part in the Santa Monica ZEDZ. For a detailed list of those participants, visit the

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<sup>81</sup> Farrell, Constance. *LACI Launches First-In-Nation Zero Emissions Delivery Zone With City of Santa Monica and Partners Including Nissan, IKEA*. City of Santa Monica, 25 Feb. 2021, [www.santamonica.gov/press/2021/02/25/laci-launches-first-in-nation-zero-emissions-delivery-zone-with-city-of-santa-monica-and-partners-including-nissan-ikea](http://www.santamonica.gov/press/2021/02/25/laci-launches-first-in-nation-zero-emissions-delivery-zone-with-city-of-santa-monica-and-partners-including-nissan-ikea)

<sup>82</sup> Farrell, Constance. *LACI Launches First-In-Nation Zero Emissions Delivery Zone With City of Santa Monica and Partners Including Nissan, IKEA*. City of Santa Monica, 25 Feb. 2021, [www.santamonica.gov/press/2021/02/25/laci-launches-first-in-nation-zero-emissions-delivery-zone-with-city-of-santa-monica-and-partners-including-nissan-ikea](http://www.santamonica.gov/press/2021/02/25/laci-launches-first-in-nation-zero-emissions-delivery-zone-with-city-of-santa-monica-and-partners-including-nissan-ikea)

<sup>83</sup> Carpenter, Susan. *Santa Monica Rolls Out Nation's First Zero-Emissions Delivery Zone*. Spectrum News, 16 Feb. 2021, [spectrumnews1.com/ca/la-west/transportation/2020/12/14/santa-monica-will-be-site-of-nation-s-first-zero-emissions-delivery-zone](https://spectrumnews1.com/ca/la-west/transportation/2020/12/14/santa-monica-will-be-site-of-nation-s-first-zero-emissions-delivery-zone)

<sup>84</sup> Crowe, Cailin. *Santa Monica, CA Aims to Create Zero-Emissions Delivery Zone Playbook*. Smart Cities Dive, 3 Mar. 2021, [www.smartcitiesdive.com/news/santa-monica-LACI-zero-emission-delivery-zone-cities/595919/](https://www.smartcitiesdive.com/news/santa-monica-LACI-zero-emission-delivery-zone-cities/595919/)

<sup>85</sup> Peters, Adele. *Santa Monica Is Testing the First Zero-Emissions Delivery Zone*. Fast Company, 26 Feb. 2021, [www.fastcompany.com/90608666/santa-monica-is-testing-the-first-zero-emissions-delivery-zone](https://www.fastcompany.com/90608666/santa-monica-is-testing-the-first-zero-emissions-delivery-zone)

[Santa Monica Zero Emissions Delivery Zone Pilot homepage](#). Also, included [here](#) is a link to a video featuring LACI's CEO providing an update on the Santa Monica ZEDZ one month into the pilot.

## Massachusetts: Voucher Program

The Massachusetts Department of Energy Resources (DOER) runs a rebate program for zero-emission trucks called [MOR-EV Trucks](#) that provides vouchers to private and public entities purchasing electric or fuel cell MHDVs. The \$10 million in funding for the initiative comes from the northeast cap-and-trade program, the Regional Greenhouse Gas Initiative (RGGI), and the Center for Sustainable Energy (CSE) administers the proceeds.<sup>86</sup> Rebates cannot be combined with VW Trust funds and each requesting fleet may only reserve up to 10% of each block size shown in the table below. Fleets that provide proof of ownership and 50% of vehicle usage in areas that fit the state's definition of an environmental justice community are eligible for an additional 10% rebate. Fleets that receive vouchers for the purchase of ZEV trucks are also required to report on vehicle miles traveled (VMT) after purchase for further informing the development of the program.

GVWR (lbs)	Remaining Rebates/ Vouchers in Current Block	Current Value	Next Block Value
8,501 - 10,000	200	\$ 7,500	\$ 6,375
10,001 - 14,000		\$ 15,000	\$ 12,750
14,001 - 16,000	91	\$ 30,000	\$ 25,500
16,001 - 19,500		\$ 45,000	\$ 38,250
19,501 - 26,000		\$ 60,000	\$ 51,000
26,001 - 33,000	50	\$ 75,000	\$ 63,750
33,001 +		\$ 90,000	\$ 76,500
Last Updated:	7/14/2021		
Funds Remaining	\$ 9,520,000		

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## New Jersey: Voucher Program

As of this writing, New Jersey has the newest state clean truck voucher initiative called the New Jersey Zero-Emission Incentive Program ([NJ ZIP](#)), which began accepting applications on April 6, 2021. The \$15 million allocated to the program, which was recently increased to \$24.25 million, was made available from RGGI. The New Jersey Economic Development Authority (NJEDA) requires reporting on vehicles being replaced to be provided back to RGGI on GHG emission reductions from the program. The funding for New Jersey ZIP only provides vouchers for class 2b-6 medium-duty vehicles operating in the

<sup>86</sup> Vanderspek, Anna. *New Electric Truck Incentives In Massachusetts*. Green Energy Consumers Alliance, 6 Apr. 2021, <https://blog.greenenergyconsumers.org/blog/new-electric-truck-incentives-in-massachusetts>

<sup>87</sup> MOR-EV Rebate Program. Mass.gov, [www.mass.gov/service-details/mor-ev-rebate-program](http://www.mass.gov/service-details/mor-ev-rebate-program)

eligible “overburdened” communities of greater Camden, Newark, and New Brunswick. Vouchers are for a maximum of 100% of the vehicle cost, which does not include charging infrastructure, shipping, taxes, or fees. In order to qualify for this application-based program, companies must prove that their vehicle’s annual mileage is 75% or more within NJ state limits and is also 50% or more within a 10-mile radius of the eligible “overburdened” communities. Accepted proof of truck routes include: telematics devices, fixed route maps and associated daily mileage, third-party tracking contracts (e.g., battery supplier or vehicle manufacturer agreements), historical delivery or scheduled operations, or proposed format for use records that will document daily use (purpose, distance, location). If this requirement is not met, a company can also qualify if their trucks are registered and domiciled in the eligible communities. Vouchers range from \$25,000-\$100,000 and are first come, first serve; however, \$5 million of the \$24.25 million program budget is set aside specifically for small businesses. For NJ ZIP, to qualify as a small business, a company must have 25 or fewer employees or make \$5 million or less in annual revenue.<sup>88</sup>

Voucher GVWR	Vehicle Class	Voucher Amount
8,501-10,000 lbs	Class 2	\$25,000
10,001-14,000 lbs	Class 3	\$55,000
14,001-16,000 lbs	Class 4	\$75,000
16,001-19,500 lbs	Class 5	\$85,000
19,501-26,000 lbs	Class 6	\$100,000

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The NJ ZIP program incorporates specific social and economic justice features as bonus criteria and offers additional funding for these qualifications on top of the standard voucher scale. Bonuses can be combined if voucher recipients are eligible for multiple criteria:

- Certified women-, minority-, or veteran-owned businesses receive an additional \$4,000 per vehicle.
- Small businesses receive a 25% increase in the base amount for each voucher. For each vehicle that a qualifying small business scraps and replaces with a zero-emission vehicle, they will receive an additional \$2,000.
- Businesses that provide documentation that their vehicles purchased with vouchers were manufactured, designed, and/or assembled with at least 25% of parts or labor contained within New Jersey state limits will receive a 25% increase on the base of the voucher amount.
- Vehicle purchasers that provide at least two public training sessions per quarter in the year after approval (including at least an overview of the technology, operation, and safety of MHDEVs) and at least one quarterly opportunity for test drives or public viewings in the eligible communities, will receive an additional \$2,000 per vehicle.<sup>90</sup>

<sup>88</sup> NJ ZIP New Jersey Zero Emission Incentive Program. NJEDA, [www.njeda.com/nizip/](http://www.njeda.com/nizip/)

<sup>89</sup> NJ ZIP New Jersey Zero Emission Incentive Program. NJEDA, [www.njeda.com/nizip/](http://www.njeda.com/nizip/)

<sup>90</sup> NJ ZIP New Jersey Zero Emission Incentive Program. NJEDA, [www.njeda.com/nizip/](http://www.njeda.com/nizip/)



As an example, if a qualified, small, veteran-owned business located in greater Camden wants to scrap a pre-2009 class 3 diesel truck and replace it with a new zero-emission class 3 vehicle, it would receive the following voucher amount: The base voucher of \$55,000, plus \$13,750 (small business 25% increase), plus \$4,000 (veteran-owned), plus \$2,000 (scrap and replace) = \$74,750.

## New York: Voucher Program

In 2019, New York State relaunched its voucher program to upgrade medium- and heavy-duty vehicles to electric or lower-carbon fuel models. The New York Clean Truck Voucher Incentive Program ([NYTVIP](#)) has \$54 million available in an application-based program to partially cover new battery electric, hydrogen fuel cell electric, plug-in hybrid electric, conventional hybrid electric, compressed natural gas, and propane medium- and heavy-duty vehicles.<sup>91</sup> NYTVIP funding comes from the Federal Highway Administration's CMAQ program, as well as the VW Trust. The voucher program is run by the New York State Energy Research and Development Authority (NYSERDA) in partnership with the New York State Department of Transportation (NYSDOT) and the New York State Department of Environmental Conservation (NYSDEC).<sup>92</sup> Vouchers are awarded based on incremental cost percentage limits assigned by vehicle weight class and fuel type as shown in the figures below.

**Table 1. Voucher Amounts and Caps for Trucks**

Vehicle Technology	Incremental Cost %	Vehicle Weight Class (GVWR)				
		4	5	6	7	8
BEV	95%	\$100,000	\$110,000	\$125,000	\$150,000	\$185,000
FCEV	95%	\$100,000	\$110,000	\$125,000	\$150,000	\$185,000
PHEV	90%	\$55,000	\$60,000	\$70,000	\$100,000	\$120,000
HEV	90%	\$25,000	\$35,000	\$45,000	\$50,000	\$55,000
CNG	90%	\$30,000	\$40,000	\$50,000	\$55,000	\$60,000
Propane	90%	\$30,000	\$40,000	\$50,000	\$55,000	\$60,000

**Table 2. Voucher Amounts and Caps for Transit Buses**

Vehicle Technology	Incremental Cost %	Vehicle Weight Class (GVWR)				
		4	5	6	7	8
BEV / FCEV	100%	\$100,000	\$125,000	\$150,000	\$250,000	\$385,000

<sup>91</sup> NY Truck Voucher Incentive Program. NYSEDA, 2020, [www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program](http://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program)

<sup>92</sup> Voucher Funding Sources and Requirements. NYSEDA, <https://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program/How-the-Program-Works/Funding-Sources>

**Table 3. Voucher Amounts and Caps for School Buses**

Vehicle Technology	Incremental Cost %	Vehicle Weight Class (GVWR)				
		4	5	6	7	8
BEV	100%	\$100,000	\$120,000	\$150,000	\$200,000	\$220,000
CNG	90%	\$30,000	\$40,000	\$50,000	\$55,000	\$60,000
Propane	90%	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000

**Table 4. Voucher Amounts and Caps for Other Vehicle Types**

Vehicle Technology	Incremental Cost %	Vehicle Weight Class (GVWR)					
		3	4	5	6	7	8
BEV	80%	\$60,000	\$90,000	\$100,000	\$110,000	\$120,000	\$150,000

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NYTVIP only covers new vehicle procurement, but they can either be purchased or leased to qualify for funding. After the awarding of vouchers, companies are required to provide semi-annual reporting on the usage of new vehicles. Older diesel vehicles are required to be scrapped to receive a voucher and only 2009 and earlier MHDV models are eligible for scrappage. A single fleet cannot use more than 25% of the entire program proceeds.<sup>94</sup> The program does not cover charging infrastructure, but the New York Public Service Commission has separately made \$15 million available for make-ready medium- and heavy-duty charging infrastructure as part of a massive \$701 million make-ready EV infrastructure program that will subsidize the installation of 1,000s of EVSE across the state.<sup>95</sup>

## New York City: Voucher Program

New York City has its own version of the NYTVIP program called the New York City Clean Trucks Program ([NYCCTP](#)). NYCCTP has \$9.8 million available in funding as of June 2020. Finances come from the VW Trust and are overseen by the NYC Department of Transportation.<sup>96</sup> New York City's voucher program is similar to the state's, but it more heavily prioritizes zero-emission vehicles like battery electric by removing limits on the number of BEVs a company can receive vouchers for. Fleets with 1 to 14 trucks may receive funding for up to 3 diesel replacement trucks; after which, they must purchase at least 1


<sup>93</sup> NY Truck Voucher Incentive Program. NYSDOT, 2020, [www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program](http://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program)

<sup>94</sup> New York Truck Voucher Incentive Program Implementation Manual. New York Truck Voucher Incentive Program, June 2021, <https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00Pt000000Ta85fEAB>

<sup>95</sup> Walton, Robert. New York Investor-Owned Utilities to Fund \$701M Make-Ready EV Infrastructure Program. Utility Dive, 21 July 2020, <https://www.utilitydive.com/news/new-york-investor-owned-utilities-to-fund-701m-make-ready-ev-infrastructure/581975/>




<sup>96</sup> Henderson, Lidia. NYC Clean Trucks Program: Cleaner Trucks for a Greener New York City. ACT News, 3 June 2020, <https://www.act-news.com/news/nyc-clean-trucks-program-cleaner-trucks-for-a-greener-new-york-city/>

battery electric vehicle in order to receive vouchers for the 4th to 6th diesel replacement trucks. Fleets with more than 14 trucks do not qualify for diesel replacements at all.<sup>97</sup> Eligibility for NYCCTP requires proof that vehicles have operated within the Identified Business Zones (IBZs) of the program for the past 24 months and that they currently operate there or within 0.5 mile of the IBZs at least twice per week. Scrappage is required and trucks being replaced must be registered in the 9 county region of the Bronx, Kings, Queens, Nassau, New York, Richmond, Rockland, Suffolk, or Westchester.<sup>98</sup> The below charts exhibit the specific voucher amounts in association with NYCCTP.

Battery Electric Replacement Truck Incentives*	
There is <b>no limit</b> on the number of battery electric replacement trucks a fleet can purchase using NYC Clean Trucks Program funding.	
	
Class 4	\$100,000
Class 5	\$110,000
Class 6	\$125,000
Class 7	\$150,000
Class 8	\$185,000

### Non-Electric Replacement Truck Incentives\*\*

The program also funds the purchase of CNG, diesel-electric hybrid, plug-in hybrid electric, and new diesel trucks meeting **specific requirements** based on **fleet size**.

	 <b>CNG</b> CNG Replacement Truck	 <b>Hybrid</b> Diesel-Electric Hybrid    Plug-In Hybrid Electric	 <b>Diesel</b> Diesel Replacement Truck	
Class 4	\$30,000	\$25,000	\$55,000	\$12,000
Class 5	\$40,000	\$35,000	\$60,000	\$13,000
Class 6	\$50,000	\$45,000	\$70,000	\$20,000
Class 7	\$55,000	\$50,000	\$100,000	\$21,000
Class 8	\$60,000	\$55,000	\$120,000	\$30,000

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<sup>97</sup> Available Funding. NYC Clean Trucks Program, <https://www.nycctp.com/available-funding/>

<sup>98</sup> Eligibility Requirements. NYC Clean Trucks Program, <https://www.nycctp.com/eligibility/>

<sup>99</sup> Available Funding. NYC Clean Trucks Program, <https://www.nycctp.com/available-funding/>

## State Pilot Projects and Collaboratives

Electrification Coalition (EC) is currently running an initiative in partnership with Securing America's Future Energy (SAFE) to develop a commercial [freight and goods delivery pilot project](#) to assist companies that want to transition to medium- and heavy-duty electric vehicles. EC also runs a State EV Policy Accelerator that focuses on 5 states in the U.S., though Colorado is not one of them. The Policy Accelerator provides training for companies, governments, and interested parties on the electrification of fleets, electric school bus adoption, consumer incentives, infrastructure development, and utility rate design. The program also explores executive, legislative, and regulatory policies.<sup>100</sup> The Colorado state government, through the Colorado Energy Office, could set up teach-in trainings modeled off of Electrification Coalition's examples, many of which have been recorded and are available online [here](#).

In addition, EC co-runs the [Climate Mayors EV Purchasing Collaborative](#), which is a coalition of mayors from 450 cities in 48 states that use the power of cooperative purchasing through contracts with private EV and charging companies to lower purchase prices through competitive bidding.<sup>101</sup> Cities in Colorado that are part of the Climate Mayors Electric Vehicle Purchasing Collaborative include: Denver, Boulder, Breckenridge, Aspen, Cortez, Fort Collins, Montezuma County, and Wheat Ridge.<sup>102</sup> More cities in Colorado, particularly those along the I-270 transit corridor like Commerce City, as well as other DICs and high emission areas, should join this collaborative. In addition, small businesses in Colorado with existing fleets could form their own purchasing collaborative and use competitive bidding processes to lower prices for electrifying their fleet vehicles. So far, the Climate Mayors EV Purchasing Collaborative has primarily supported the purchase of light-duty vehicles for local government fleets, but there are now a variety of MHDVs and leasing solutions available. Details of current offerings can be found [here](#).

## State Exemptions / Tax Credits

In addition to the incremental cost of purchasing an EV instead of an ICE vehicle, the associated taxes are also higher. MHDEVs also weigh more than ICE vehicles due to their large batteries, and in some cases, exceed the weight limits on state highways. Although a variety of state-level EV tax credits and exemptions exist, medium- and heavy-duty-specific policies are in short supply and would be helpful to expedite their electrification.

One state that does offer such incentives is California, which implemented a sales and use tax exemption for zero-emission transit buses that are eligible for the HVIP voucher.<sup>103</sup> California also implemented an exemption for ZEVs and near-ZEVs that exceed the state weight limit equal to the

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<sup>100</sup> *State EV Policy*. Electrification Coalition, <https://www.electrificationcoalition.org/work/state-ev-policy/>

<sup>101</sup> *Partners*. Climate Mayors, <https://driveevfleets.org/partners/>

<sup>102</sup> What is the collaborative? Climate Mayors, <https://driveevfleets.org/what-is-the-collaborative/>

<sup>103</sup> *Partial Sales and Use Tax Exemption for Zero-Emission Transit Buses*. California HVIP, 10 Jan. 2020, [californiahvip.org/news/partial-sales-and-use-tax-exemption-for-zero-emission-transit-buses/](http://californiahvip.org/news/partial-sales-and-use-tax-exemption-for-zero-emission-transit-buses/)

additional weight of the powertrain, up to 2,000 pounds.<sup>104</sup> Other states have implemented ZEV weight exemptions as well, though they are not necessarily specific to MHDVs.

The state of Colorado is also one of the few states in this category, since it offers increased tax credits specifically for MHD trucks through its Plug-In Electric Vehicle (PEV) and Alternative Fuel Vehicle (AFV) Tax Credit offerings detailed in the [Colorado initiatives](#) section above. Colorado also has a Low-Emission Vehicle (LEV) Sales Tax Exemption for qualified vehicles with a GVWR greater than 26,000 lbs (class 7 or 8) or 10,000 lbs in the case the vehicle meets specific truck definitions per Colorado statutes.<sup>105</sup>

Another state that provides HDV-specific tax credits is Utah. For qualifying alternative fuel HDVs, including electric, hydrogen, and natural gas, each vehicle is entitled to tax credits decreasing \$1,500 annually from \$15,000 in 2021 to \$1,500 in 2030, as long as a minimum of 50% VMT are driven within the state of Utah. 25% of the tax credits are specifically set aside for small fleets with 40 vehicles or less.<sup>106</sup>

## UTILITY PROGRAMS

The lack of sufficient access, high cost, and electrical system upgrades associated with MHDEV charging infrastructure are among the most significant barriers to electric truck adoption. Utilities therefore play a critical role in building out the charging infrastructure required to electrify the market and accelerate the deployment of these vehicles. Although the majority of utilities have not yet implemented MHDEV-specific investment initiatives, the three largest electric utilities in California have been approved by the California Public Utilities Commission (CPUC) for significant MHDV electrification investments under Senate Bill 350, the [Clean Energy and Pollution Reduction Act](#). Similarly to House Bill 19-1261 here in Colorado, Senate Bill 350 establishes 2030 GHG reduction targets of 40% from 1990 levels as a requirement of CPUC decisions. It also targets a minimum of 50% renewable procurement, energy efficiency improvements, and transportation electrification requirements for investor-owned utilities (IOUs) in the state.<sup>107</sup> In connection with SB 350, Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) each have been authorized for \$236 million and \$343 million in infrastructure programs for MHDEVs respectively as of May 31, 2018. San Diego Gas and Electric (SDG&E) was separately approved for a \$107.4 million MHDEV program on August 15, 2019.<sup>108,109</sup> In total, the three electric utilities will invest a combined \$686.4 million in MHDEV charging infrastructure initiatives in their California territories over a 5 year-term from the start of each program's initiation, plus additional

<sup>104</sup> Zero Emission Vehicle (ZEV) and Near-ZEV Weight Exemption. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/12069>

<sup>105</sup> Low Emission Vehicle (LEV) Sales Tax Exemption. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/202>

<sup>106</sup> Qualified Heavy-Duty Alternative Fuel Vehicle (AFV) Tax Credit. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/11624>

<sup>107</sup> Clean Energy and Pollution Reduction Act of 2015 (SB 350). California Public Utilities Commission, <https://www.cpuc.ca.gov/industries-and-topics/natural-gas/implementation-of-sb-350>

<sup>108</sup> Summary of Decision on Transportation Electrification Program Proposals from the Investor-Owned Utilities May 31, 2018. California Public Utilities Commission, 31 May 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457607-summary-of-te-decision-may-31-2018.pdf>

<sup>109</sup> Application of San Diego Gas & Electric Company (U902E) For Approval of Senate Bill 350 Transportation Electrification Proposals Regarding Medium and Heavy-Duty Electric Vehicles and a Vehicle-To-Grid Pilot. California Public Utilities Commission, 15 Aug. 2019, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K114/31114709.pdf>

funding set aside for project evaluation. An additional \$42.8 million was also approved by the CPUC in a previous decision on January 11, 2018 for 15 pilots, of which, 10 projects and \$27 million are specific to MHD and non-road vehicles (PG&E: 3 Projects, \$7.3M; SCE: 3 Projects, \$7.5M; SDG&E: 4 Projects, \$12.1M).<sup>110</sup> A further \$8 million of that funding is split equally between SCE and SDG&E dedicated to public DCFC programs, with another \$22 million approved in the May 2018 CPUC decision for a DCFC make-ready program from PG&E. A summary graphic of all of the approved programs for PG&E, SCE, and SDG&E under SB 350 through the end of 2018 is shown below (the table does not include SDG&E's MHDEV program that was later approved in 2019).

Approved SB 350 Projects (D.18-01-024, D.18-05-040)							
	Medium/Heavy Duty Infrastructure	Residential Infrastructure	Offroad Infrastructure	Public DC Fast Charging	Taxi/ Shuttle	Education/ Outreach	
	\$592 Million	\$141 Million	\$13 Million	\$30 Million	\$3.2 Million	\$2.3 Million	
SDG&E	Fleet Delivery Services \$3.7 M	Residential Charging Infrastructure \$137 M	Airport Ground Support Equipment \$2.8 M	Electrify Local Highways \$4 M	Green Shuttle \$3.2 M	Car Dealer Incentives \$1.8 M	Total SDG&E Budget: \$155 M
		Residential Grid Integration Rate	MD/HD and Forklift Port Electrification \$2.4 M				
SCE	Transit Bus Make-Ready & Rebate \$4 M	Residential Make-Ready Rebate \$4 M	Port of Long Beach Gantry Crane \$4 M	Urban DC Fast Charger Clusters \$4 M			Total SCE Budget: \$360 M
	MD/HD Charging Infrastructure \$343 M		Port of Long Beach ITS Terminal Yard Tractor \$0.5 M				
	Commercial EV Rate Design						
PG&E	MD/HD Fleet Demonstration \$3.4 M		Idle-Reduction Technology Demonstration \$1.7 M	Fast Charge Infrastructure \$22 M		Home Charger Information \$0.5 M	Total PG&E Budget: \$266 M
	Electric School Bus Renewables Integration \$2.2 M						
	FleetReady Make-Ready Infrastructure \$236 M						
<div> <div>Priority Review</div> <div>Standard Review</div> <div>Rate Design Proposals</div> </div>							

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## Pacific Gas and Electric

On May 31, 2018, the CPUC authorized \$738M in transportation electrification initiatives to be rolled out over a 5-year span and distributed amongst the three largest electric utilities in California. Of this funding, \$236M is dedicated to Pacific Gas and Electric's (PG&E's) MHD "FleetReady" program, otherwise known as "[EV Fleet](#)." The EV Fleet program targets utility-owned, make-ready installations, and has set goals of placing such infrastructure at 700 or more varying locations and advancing the

<sup>110</sup> Summary of Approved SB 350 Transportation Electrification Priority Review Projects for SDG&E, SCE, and PG&E. 11 Jan. 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442455977-summary-of-priority-review-te-projects.pdf>

<sup>111</sup> Approved SB 350 Projects. 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/a/6442457944-approved-sb-350-projects.pdf>



electrification of a minimum of 6,500 MHD fleet vehicles by 2024.<sup>112</sup> The program authorizes up to 8,800 charging ports at these sites, and includes cost incentives, site design and permitting, construction, operation, maintenance, and upgrades of the make-ready infrastructure, from the transformer to the meter (TTM). The program also includes access to EV Fleet specialists at PG&E, as well as an education, outreach, and awareness component (~\$10M) to highlight available assistance, savings, costs, and benefits of electrifying fleet vehicles.<sup>113</sup>

There are various requirements attached to the program's funding, including:

- 1) At least 25% of the program budget to be spent in disadvantaged communities (DACs),
- 2) At least 15% of the infrastructure reserved for transit agencies, and
- 3) A maximum of 10% of the infrastructure for electric forklifts.

In addition, PG&E will be required to provide behind the meter (BTM) rebates covering up to 50% of the cost of the EVSE for qualified sites located in DACs or that operate school and transit buses.<sup>114</sup> Otherwise, fleets will be responsible for any infrastructure from the electrical meter to the charger.

There are a variety of customer requirements for the program as well, most noteworthy that fleets must:

- 1) Be PG&E customers,
- 2) Lease / own the property and have permission to install such infrastructure,
- 3) Deploy at least 2 MHDEVs by 2024 and provide an electrification proposal / commitment if planning to support future MHDEV purchases,
- 4) Provide vehicle utilization data for 5 years after initiation, and
- 5) Consent to utilizing equipment for a minimum of 10 years, amongst other eligibility provisions.<sup>115</sup>

Per PG&E, one of the main objectives of the program is to “minimize costs that can be a significant deterrent to deployment of EVs for customers such as transit agencies, delivery service providers, and other trucking and fleet companies,” by assisting with building out electric make-ready infrastructure. At the same time, by restricting funding primarily up to, but not including, the EVSE nor the vehicles, the program synchronizes with existing incentives, optimizes costs, and puts the onus on fleets to commit to shared electrification investments.<sup>116</sup> Included below, are two tables identifying the infrastructure incentive amounts, as well as the charger rebates available for customers that are eligible. Also, [here](#) is a graphic from PG&E demonstrating the EV Fleet electrification process and timeline.

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<sup>112</sup> *Summary of Decision on Transportation Electrification Program Proposals from the Investor-Owned Utilities May 31, 2018*. California Public Utilities Commission, 31 May 2018,

<https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457607-summary-of-te-decision-may-31-2018.pdf>

<sup>113</sup> *Application of San Diego Gas & Electric Company (U 902E) for Approval of SB 350 Transportation Electrification Proposals*. California Public Utilities Commission, 6 June 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/d/6442457637-d1805040.pdf>

<sup>114</sup> *Summary of Decision on Transportation Electrification Program Proposals from the Investor-Owned Utilities May 31, 2018*. California Public Utilities Commission, 31 May 2018,

<https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457607-summary-of-te-decision-may-31-2018.pdf>

<sup>115</sup> *EV Fleet Program*. Pacific Gas and Electric,

[https://www.pge.com/en\\_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page](https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page)

<sup>116</sup> *Application of San Diego Gas & Electric Company (U 902E) for Approval of SB 350 Transportation Electrification Proposals*. California Public Utilities Commission, 6 June 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/d/6442457637-d1805040.pdf>

### Infrastructure Incentives

Vehicle type	Per vehicle incentive cap*
Transit buses and Class 8 vehicles	\$9,000 per vehicle
Transportation refrigeration units (TRU), truck stop electrification (TSE), airport ground support equipment (GSE), and forklifts	\$3,000 per vehicle
School buses, local delivery trucks, and other vehicles	\$4,000 per vehicle

\*Incentives limited to 25 vehicles per site; sites with more vehicles to be considered on an individual basis.

### Charger Rebates

Power output	Rebate for eligible customers*
Up to 50 kW	50% of the cost of EV charger, up to \$15,000
50.1 kW – 149.9 kW	50% of the cost of EV charger, up to \$25,000
150 kW and above	50% of the cost of EV charger, up to \$42,000

\*Charging equipment rebates for school buses, transit buses and disadvantaged communities. Rebate not to exceed 50% of charger equipment. EVSE must meet minimum and standard requirements to be eligible for rebate. Fortune 1000 companies are not eligible.

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In addition to the \$236M EV Fleet program, PG&E is also carrying out a make-ready commercial DCFC program called [EV Fast Charge](#). EV Fast Charge has allocated \$22.4M to provide similar incentives to EV Fleets at 52 locations with up to 234 DCFCs, 25% of which must be located in DACs. The make-ready infrastructure would be for public DCFCs, covering the costs from the utility pole to the parking space, and similarly, not including the charger itself. In qualified DACs however, PG&E will offer

<sup>117</sup> EV Fleet Program. Pacific Gas and Electric, [https://www.pge.com/en\\_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page](https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page)

EVSE rebates of up to \$25,000 per DC fast charger.<sup>118</sup> Chargers must be made available to the public 24/7 and must be purchased from [vendors](#) approved by the program. By previously approving dealers, much of the time and legwork associated with program applications and vetting can be outsourced to the installers (who are contacted directly by site hosts to determine site eligibility), a helpful tactic that can be applied to charging infrastructure programs here in Colorado.<sup>119</sup>

Three earlier pilot projects related to electric MHD and non-road vehicles were also approved in the CPUC priority review decision on January 11, 2018. They include: (1) Medium- and Heavy-Duty Fleet Customer Demonstration, (2) Electric School Bus Renewables Integration, and (3) Idle Reduction Technology Demonstration. For the Medium- and Heavy-Duty Fleet Customer Demonstration program, PG&E plans to partner with one fleet in a disadvantaged area to analyze the cost differential between current truck models and an electric fleet. The analysis will culminate in a handbook of lessons learned. PG&E will further deploy charging infrastructure with rebates and provide technical assistance to this fleet. For the second pilot, PG&E plans to install charging stations for 2 to 5 school buses that serve one or more disadvantaged communities and explore time of renewables (TOR) charging (charging when renewable energy is being generated on the grid). The Electric School Bus Renewables Integration pilot, studying TOR charging optimization, could eventually be expanded to other MHDEVs beyond electric buses. Third, PG&E will demonstrate idle reduction technologies for truck stop electrification or transport refrigeration units (TRUs) in a disadvantaged area. This plan is subject to approval by the California Public Utilities Commission and will prioritize data collection efforts to help design future rates for electrification projects at truck stops.<sup>120</sup> The first and third PG&E pilot programs would be particularly applicable to the Colorado landscape, since the residents around the I-270 freight corridor suffer from extreme air pollution externalities from the conventionally-fueled trucking industry. Xcel could consider adopting similar pilots to help companies in DICs to analyze cost differentials between their current truck models and electric fleets, as well as fund a study for idle reduction technologies at truck stops or for TRUs located along the corridor.

## Southern California Edison

Southern California Edison's (SCE's) medium- and heavy-duty infrastructure initiative, "[Charge Ready Transport \(CR Transport\)](#)," was authorized in the CPUC's May 31, 2018 decision. CR Transport was allocated a budget of \$342.6M to be spent over a 5-year term, plus additional funding for program evaluation, and is modeled off of SCE's Charge Ready Pilot for light-duty vehicle charging infrastructure.

The CPUC has established specific requirements for CR Transport's program funding, which include:

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<sup>118</sup> *Summary of Decision on Transportation Electrification Program Proposals from the Investor-Owned Utilities May 31, 2018*. California Public Utilities Commission, 31 May 2018,

<https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457607-summary-of-te-decision-may-31-2018.pdf>

<sup>119</sup> *EV Fast Charge Program*. Pacific Gas and Electric,

[https://www.pge.com/en\\_US/large-business/solar-and-vehicles/clean-vehicles/ev-charge-network/ev-fast-charge.page](https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-charge-network/ev-fast-charge.page)

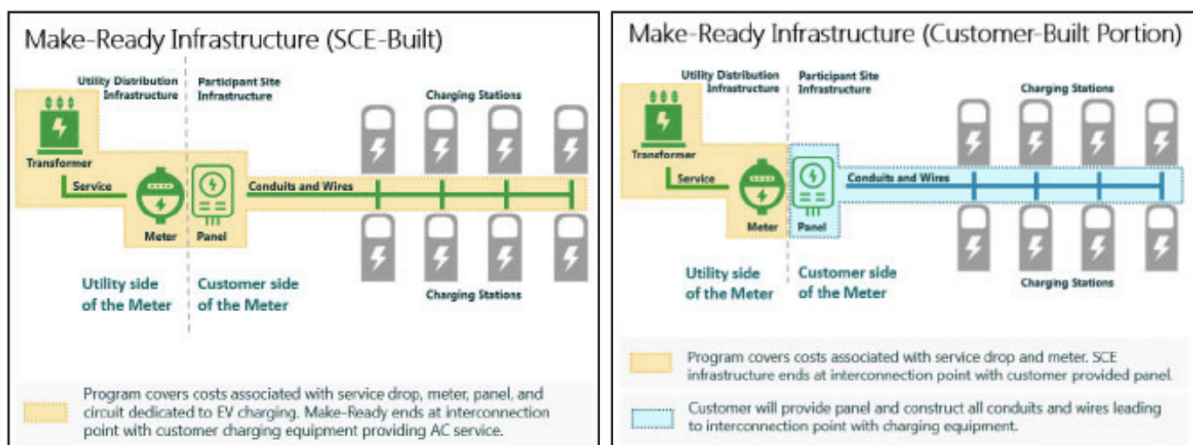
<sup>120</sup> *Summary of Approved SB 350 Transportation Electrification Priority Review Projects for SDG&E, SCE, and PG&E*. 11 Jan. 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442455977-summary-of-priority-review-te-projects.pdf>

- 1) At least 40% allocated to sites in DACs or transit agencies,
- 2) At least 15% to serve transit agencies,
- 3) At least 25% at warehouses and ports,
- 4) No more than 10% for electric forklifts, and
- 5) No more than 10% towards program management.

SCE has established CR Transport program goals of deploying make-ready charging infrastructure at 870 different sites serving 8,490 MHD electric fleet vehicles by program completion in 2024.<sup>121</sup>

CR Transport is similar to PG&E's EV Fleet program in that SCE will design, build, construct, and maintain all utility-side make-ready infrastructure at no cost to fleet participants and provide technical support. At the same time, it expands beyond PG&E's initiative to also include customer-side infrastructure beyond the electric meter and "up to the first point of interconnection with the Participant's EV charging equipment." Like PG&E's program however, it does not include the purchase, installation, or maintenance of the EV charging equipment itself, nor the vehicles (See Figure below). Also similar to EV Fleet, SCE will offer a Charging Equipment Rebate for qualified customers for a percentage of EVSE costs (from the [SCE Approved Product List](#)) if the customer is located in an eligible DAC, is purchasing and operating transit or school buses, and is not a Fortune 1000 company. Another rebate offered in connection with CR Transport, known as the Make-Ready rebate, will be available to fleets that choose to complete the customer-side of the make-ready infrastructure themselves; in which case, SCE will cover up to 80% of the costs they would have alternatively spent. In the case the customer prefers SCE to install the customer-side make-ready infrastructure, those costs would be fully paid for.<sup>122</sup>

**Figure 1 – CR Transport Program - Infrastructure Delineation**



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<sup>121</sup> Charge Ready Transport Program Handbook. Southern California Edison, 10 July 2019, [https://www.sce.com/sites/default/files/2019-08/sce\\_charge-ready-transport\\_handbook\\_v6.pdf](https://www.sce.com/sites/default/files/2019-08/sce_charge-ready-transport_handbook_v6.pdf)

<sup>122</sup> Charge Ready Transport Program Handbook. Southern California Edison, 10 July 2019, [https://www.sce.com/sites/default/files/2019-08/sce\\_charge-ready-transport\\_handbook\\_v6.pdf](https://www.sce.com/sites/default/files/2019-08/sce_charge-ready-transport_handbook_v6.pdf)

<sup>123</sup> Charge Ready Transport Program Handbook. Southern California Edison, 10 July 2019, [https://www.sce.com/sites/default/files/2019-08/sce\\_charge-ready-transport\\_handbook\\_v6.pdf](https://www.sce.com/sites/default/files/2019-08/sce_charge-ready-transport_handbook_v6.pdf)

Consistent with PG&E's EV Fleet program, one of Charge Ready Transport's primary goals is to reduce the cost, time, and complexity associated with building the infrastructure to support EVSE for electric MHD and non-road vehicles - one of the primary barriers to MHDEV deployment - in order to increase their adoption and further incentivize such vehicles, particularly in DACs.

To participate in CR Transport, fleets must:

- 1) Be SCE customers,
- 2) Be the owner, tenant (with landlord permission), or manager of the site and operate the EVSE for at least 10 years,
- 3) Own, acquire, or lease at least 2 participating vehicles,
- 4) Install an SCE-approved EVSE, and
- 5) Report usage data for at least 5 years following installation.<sup>124</sup>

Additional information regarding the program, eligibility requirements, qualifying vehicles, and more can be found in the [Charge Ready Transport Program Handbook](#), [Quick Reference Guide](#), and [Fact Sheet](#).

Aside from the Charge Ready Transport fleet initiative, Southern California Edison has also been approved for several vehicle electrification pilot projects, 3 of which are specific to electric MHD or non-road vehicles. The first is the Electric Transit Bus Make-Ready Program, whereby SCE is providing make-ready charging infrastructure at electric transit bus depots and along bus routes in their service area. SCE will also offer rebates to cover the cost of the EVSE, specifically focusing on bus routes that serve disadvantaged communities. SCE's second pilot targets the Gantry Crane at the Port of Long Beach, which is located amongst surrounding disadvantaged communities. SCE is deploying make-ready charging infrastructure at the port to service 9 cranes that do not require EVSE. Lastly, the Port of Long Beach ITS Terminal Yard Tractor has been identified by SCE for make-ready infrastructure installation to power 24 charging stations for electric yard tractors. The Port of Long Beach has also secured outside funding for additional electrification projects as part of a larger port electrification program.<sup>125</sup>

## San Diego Gas and Electric

San Diego Gas and Electric (SDG&E) also runs its own program to provide make-ready charging infrastructure support and technical assistance for electric medium- and heavy-duty fleet vehicles and equipment located in its service territory. The program, "[Power Your Drive for Fleets](#)," was approved in a later CPUC decision on August 15, 2019 and has a \$107.4 million budget available over a 5-year term. In the CPUC decision, the funding was divided into two parts: \$84M upon program approval and the remaining \$23.4M to become available upon an interim progress update.<sup>126</sup> Through the program,

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<sup>124</sup> *Charge Ready Transport Program - Program Details*. Southern California Edison, <https://crt.sce.com/program-details>

<sup>125</sup> *Summary of Approved SB 350 Transportation Electrification Priority Review Projects for SDG&E, SCE, and PG&E*. 11 Jan. 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442455977-summary-of-priority-review-te-projects.pdf>

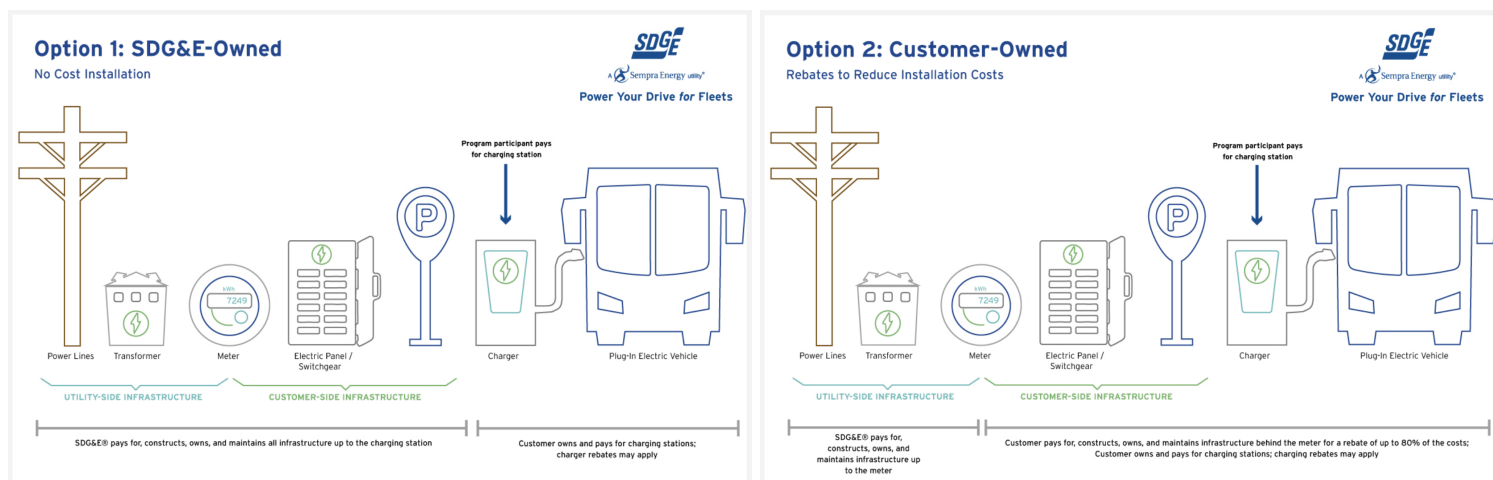
<sup>126</sup> *Application of San Diego Gas & Electric Company (U902E) For Approval of Senate Bill 350 Transportation Electrification Proposals Regarding Medium and Heavy-Duty Electric Vehicles and a Vehicle-To-Grid Pilot*. California Public Utilities Commission, 15 Aug. 2019, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K114/311114709.pdf>

SDG&E will work with fleets over the course of the entire design process, from conception to construction, similar to the other California IOU programs.

There are two options offered by SDG&E with respect to infrastructure installation incentives:

- 1) SDG&E will pay for, build out, own, and operate both the utility-side infrastructure (up to the meter), as well as the customer-side infrastructure (from the meter to the charger) at no cost to the program participant, or
- 2) SDG&E will pay for, build out, own, and operate the utility-side infrastructure, but the customer-side infrastructure will be customer-owned, operated, and maintained.

This format is identical to SCE's Charge Ready Transport program and also offers up to 80% rebates for the cost of the customer-side infrastructure if option 2 is chosen. In both cases (and in all 3 CA IOU programs), the customer is responsible for the purchase and installation of the EVSE, but additional rebates for charging stations are available (up to 50%) for fleets that operate in DACs that are not Fortune 1000 companies or for transit and school buses.



EVSE power	Max. rebate amount*
Up to 19.2 kW	\$3,000 per charger
19.3kW up to 50 kW	\$15,000 per charger
50.1 kW up to 150 kW	\$45,000 per charger
150.1 kW and above	\$75,000 per charger

*\*Eligible sites will receive a rebate for each qualified charger for the lesser of 50% of the cost of the charger or the maximum amount based on power output as detailed above, not to exceed 50% of the cost of the charger*

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<sup>127</sup> Power Your Drive for Fleets. San Diego Gas and Electric, <https://www.sdge.com/business/electric-vehicles/power-your-drive-for-fleets>



Vehicles covered by SDG&E's Power Your Drive For Fleets program include class 2-8 and both on- and off-road applications such as: medium- and heavy-duty trucks and vans, transit, commuter, and school buses, transport refrigeration units, airport ground-support equipment, port equipment, and forklifts. SDG&E aims to support a minimum of 3,000 vehicles at 300 make-ready sites in their service area through the program.<sup>128</sup>

Program funding requirements include:

- 1) At least 30% in DACs,
- 2) At least 10% for transit and school buses,
- 3) No more than 10% for electric forklifts, and
- 4) No more than 10% for program administration.<sup>129</sup>

Eligibility requirements for Power Your Drive For Fleets qualification include:

- 1) Commit to acquiring at least 2 electric fleet vehicles,
- 2) Develop a long-term electrification plan,
- 3) Provide charger usage data for at least 5 years after installation,
- 4) Own or lease the site, and
- 5) Utilize and maintain the chargers and EVs for at least 10 years.<sup>130</sup>

Additional information on SDG&E's MHDEV program can be found on the [Power Your Drive For Fleets](#) website and [Fact Sheet](#). SDG&E also provides an [electrification timeline](#) for interested fleets.

Within the CPUC's allocated program budget for SDG&E, \$1.7M was also authorized to initiate a V2G pilot for 10 electric school buses to charge on cheap, clean energy during the day, and discharge into the California Independent System Operator (CAISO) market at times of peak demand. Sites in DACs are prioritized for the 1-year vehicle-to-grid pilot and SDG&E has offered \$450,000 to assist with the vehicle purchases and an additional \$100,000 to reduce associated electricity costs. Results will help to determine how electric vehicles can be utilized as distributed energy resources in the future to help optimally manage load and further reduce emissions and local air pollution.<sup>131</sup>

In addition to Power Your Drive for Fleets and the V2G pilot project, SDG&E was further authorized for 6 earlier pilot initiatives in the CPUC's priority review decision in January 2018. Of these projects, 4 totaling \$12.1M are related to MHD and non-road vehicles, with another \$4M to electrify

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<sup>128</sup> *Power Your Drive for Fleets - Program Fact Sheet*. San Diego Gas and Electric, <https://www.sdge.com/sites/default/files/documents/Program%20Overview%20Fact%20Sheet.pdf>

<sup>129</sup> *Application of San Diego Gas & Electric Company (U902E) For Approval of Senate Bill 350 Transportation Electrification Proposals Regarding Medium and Heavy-Duty Electric Vehicles and a Vehicle-To-Grid Pilot*. California Public Utilities Commission, 15 Aug. 2019, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K114/311114709.pdf>

<sup>130</sup> *Power Your Drive for Fleets*. San Diego Gas and Electric, <https://www.sdge.com/business/electric-vehicles/power-your-drive-for-fleets>

<sup>131</sup> *Application of San Diego Gas & Electric Company (U902E) For Approval of Senate Bill 350 Transportation Electrification Proposals Regarding Medium and Heavy-Duty Electric Vehicles and a Vehicle-To-Grid Pilot*. California Public Utilities Commission, 15 Aug. 2019, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K114/311114709.pdf>

local highways via the installation of 88 time-of-use (TOU) rate chargers (including level 2 and public DCFC stations) at 4 Park-and-Rides in or next to DACs, with the last being \$1.8M in EV dealership incentives and educational programming. Of the 4 MHD / non-road pilots, the first was for \$3.7M and involved the installation of 79 EV chargers at 4 local delivery fleet locations. The second, for \$2.4M, deployed 12 charging installations at the Port of San Diego to support electric MHDVs and forklifts along the waterfront. The third utilized \$2.8M to install 16 EVSE for electric ground-support service equipment at San Diego International Airport. Lastly, another \$3.2M was allocated to fund 12 EVSE at 4 fixed route shuttle sites to support electrification of shuttle fleets.<sup>132,133</sup>

Providing for a wide variety of programs like those being implemented by PG&E, SCE, and SDG&E – from make-ready infrastructure for fleets, to additional rebates for participants in disadvantaged communities and shuttle and school bus operators, and a broad range of pilot projects – would be a worthwhile model for Colorado IOU's like Xcel Energy and Black Hills Energy. Such initiatives would provide for the deployment, testing, and evaluation of new electric zero-emission MHD and non-road vehicles in a variety of applications, helping to considerably reduce air pollution in local Colorado communities like those along the I-270 freight corridor and other high emission areas. Educational programs and incentives, plus make-ready charging infrastructure, as well as technical assistance, would significantly help smaller businesses with planning and electrifying their MHD fleets as well.

## Xcel Energy

As of August 2020, Xcel Energy (Xcel) had proposed \$300 million in investments to advance the adoption of electric vehicles across its service territories in Colorado, New Mexico, Wisconsin, and Minnesota, with a goal to power 1.5 million EVs across these areas by 2030.<sup>134</sup> As part of these plans, Xcel has already begun to establish programs and partnerships to reduce obstacles to EV adoption, while making charging cheaper and easier for its customers. In Colorado specifically, where Xcel is the largest investor-owned utility, Xcel's Transportation Electrification Plan (TEP) was approved by the CPUC on January 11, 2021 with a budget of approximately \$110 million over the next three years. Xcel's Colorado TEP was the state's first approval of a utility transportation electrification plan under SB 19-077, legislation that requires IOUs in the state to submit such plans. Xcel's TEP will cost Colorado residential customers less than 30 cents on an average bill and will support the deployment of an estimated 20,000 EV chargers throughout the state. It also includes a minimum 15% equity carve-out across the entire plan reserved for underserved communities, low-income customers, and areas disproportionately-impacted by air pollution.<sup>135</sup>

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<sup>132</sup> SDG&E Clean Transportation Initiatives. San Diego Gas & Electric, [www.sdge.com/residential/electric-vehicles/electrification-projects-overview](http://www.sdge.com/residential/electric-vehicles/electrification-projects-overview)

<sup>133</sup> Summary of Approved SB 350 Transportation Electrification Priority Review Projects for SDG&E, SCE, and PG&E. 11 Jan. 2018, <https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442455977-summary-of-priority-review-te-projects.pdf>

<sup>134</sup> Xcel Energy's New Electric Vehicle Vision to Save Customers Billions While Delivering Cleaner Air. Xcel Energy, 12 Aug. 2020, <https://investors.xcelenergy.com/news-market-information/press-releases/press-release/2020/Xcel-Energys-new-electric-vehicle-vision-to-save-customers-billions-while-delivering-cleaner-air/default.aspx>

<sup>135</sup> Smith, Conner. Xcel Energy Investing \$110 Million in Transportation Electrification in Colorado. Atlas EV Hub, 19 Jan. 2021, [www.atlasevhub.com/weekly\\_digest/xcel-energy-investing-110-million-in-transportation-electrification-in-colorado/](http://www.atlasevhub.com/weekly_digest/xcel-energy-investing-110-million-in-transportation-electrification-in-colorado/)

Xcel's Colorado TEP is divided into 5 portfolios:

- 1) Residential,
- 2) Multi-unit Dwelling,
- 3) Commercial,
- 4) Partnerships, Research, and Innovation (PRI), and
- 5) Advisory Services.

The program also includes additional funding for education and awareness campaigns to highlight the benefits of EVs to customers. With respect to MHDVs, the most relevant programs are the commercial portfolio, the PRI, and the Advisory Services. Through the commercial portfolio, Xcel will offer to “install, own, and maintain EV supply infrastructure, which represents one of the most significant costs to providing EV charging for fleets or workplaces.”<sup>136</sup> Commercial customers and fleets will have the choice to purchase their own EV chargers or to choose from Xcel-approved options that the utility would own and operate for a monthly bill charge. Additional rebates to reduce the costs of charging infrastructure would be offered for fleets that service income-qualified individuals. Lastly, the commercial portfolio will include partnerships to develop community charging hubs and support for the further buildout of public fast-chargers.<sup>137</sup> Xcel's initiatives laid out in their TEP will help to accelerate EV adoption and charging infrastructure deployment across Colorado, which will provide an estimated \$43 billion in benefits to fleets and residents in the form of reduced vehicle operating costs, electric bills, and GHG emissions.<sup>138</sup>

Prior to the approval of the TEP, Xcel's commercial customer offerings included: A pilot EV Supply Infrastructure Program, which provided technical expertise, buildout, and maintenance of charging infrastructure (and is no longer accepting applications), a Fleet Electrification Advisory Program that uses telematics to provide detailed analyses of estimated fleet needs, costs, and suggested charging locations, and an EV Critical Peak Pricing Program with rates designed to shift fleet charging away from high demand times in exchange for electric bill savings. These programs are included in the table below.

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<sup>136</sup> *Transportation Electrification Plan*. Xcel Energy, 2021,

[xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023\\_TEP\\_Updated.pdf](https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf)

<sup>137</sup> *Transportation Electrification Plan*. Xcel Energy, 2021,

[xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023\\_TEP\\_Updated.pdf](https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/20A-0204E-2021-2023_TEP_Updated.pdf)

<sup>138</sup> Muller, Miles, and Max Baumhefner. *Colorado Approves \$110M Transportation Electrification Plan*. NRDC, 12 Jan. 2021,

<https://www.nrdc.org/experts/miles-muller/colorado-approves-110m-transportation-electrification-plan>

Our EV programs are evolving to support non-residential operations with advisory services, and no- and low-cost services needed to evaluate and establish a smart EV charging path.

	FLEET ELECTRIFICATION ADVISORY PROGRAM	EV SUPPLY INFRASTRUCTURE PROGRAM	EV CRITICAL PEAK PRICING
State electric territory	All	Colorado	Colorado
Best for	Businesses or organizations wanting to develop an electrification plan for their fleets: including EV procurement, infrastructure needs and project optimization using real world data.	Businesses or organizations that are shovel-ready to build its EV charging infrastructure for electric fleet, workplace or visitor charging.	Businesses or organizations looking to save money on EV charging by curtailing charging during peak hours in exchange for low-cost rate.
Eligibility	<ul style="list-style-type: none"> <li>Private businesses</li> <li>Municipalities</li> <li>Public organizations</li> </ul>	<ul style="list-style-type: none"> <li>Private businesses</li> <li>Municipalities</li> <li>Organizations in public sector</li> </ul>	<ul style="list-style-type: none"> <li>Commercial customer</li> <li>Has secondary voltage service</li> <li>EV charging is metered separately</li> </ul>
Vehicle or charging port minimums?	Five, light duty, internal combustion engines that will be assessed.	No	No
Financial benefits	No/low cost assessment of EV opportunities and charging infrastructure needs. Participants receive access to an online planning tool that includes all the latest EV models, customizable financial analytics and GPS data for infrastructures needs.	Xcel Energy provides costs for engineering advisory, construction and maintenance of make-ready infrastructure, as well as low, off-peak pricing.	Xcel Energy's dedicated EV charging rate supports participants in this program and allows us to manage the grid in your community.
Cost to participate	Cost-sharing fees determined at project start.	No cost for pilot services. Participants will be responsible for the line extension for EV charging; and may be eligible for construction allowance for the line extension.	No cost
Enrollment period	Ongoing through 2023	Application period open May 26, 2020, through June 25, 2020.	Ongoing
More information and to enroll	<a href="https://www.xcelenergy.com/FleetEVs">xcelenergy.com/FleetEVs</a>	<a href="https://www.xcelenergy.com/EVSupplyInfrastructure">xcelenergy.com/EVSupplyInfrastructure</a>	<a href="https://www.xcelenergy.com/EVCPP">xcelenergy.com/EVCPP</a>

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From Xcel Energy's limited commercial offerings noted above (prior to the approval of the TEP), it was clear Xcel could do much more to incentivize and accelerate the deployment of electric MHDVs, as well as the charging infrastructure needed to power them in its service territories. With the recent release of their Transportation Electrification Plan, Xcel will begin to aid in addressing this vital transition.

## PORT PROGRAMS

Although Colorado does not have any seaports, Denver International Airport (DEN) utilizes large numbers of trucks and other airport equipment that can be efficiently transitioned to electric and zero-emission models. Additionally, Colorado should consider options for upgrading non-road vehicles and warehousing equipment and trucks to electric to reduce the state's industrial and manufacturing industries' contributions to global warming and local air pollution. Such prospective vehicle applications can benefit from the case studies in this section and could prospectively be used as options to help mitigate emissions from warehouses and other facilities along the I-270 corridor.

### Collaborative International Efforts

<sup>139</sup> *Electric Vehicle Commercial Programs*. Xcel Energy, 2020, [www.xcelenergy.com/staticfiles/xcel-responsive/Programs%20and%20Rebates/Business/CO-EV-decision-tree-chart.pdf](https://www.xcelenergy.com/staticfiles/xcel-responsive/Programs%20and%20Rebates/Business/CO-EV-decision-tree-chart.pdf)

To improve the sustainability of ports across the world, 12 ports formed the World Ports Climate Action Program ([WPCAP](#)) on September 13, 2018 at the Global Climate Action Summit. The participating ports include: Antwerp, Barcelona, Gothenburg, Hamburg, Le Havre, Long Beach, Los Angeles, New York and New Jersey, Rotterdam, Valencia, Vancouver, and Yokohama. WPCAP has 5 initiatives:

- 1) Increasing the efficiency of supply chains,
- 2) Supporting local public policies for emissions reductions,
- 3) Promoting developments of power-to-ship technologies and other strategies for reducing emissions from ships at port,
- 4) Promoting development of below 50% global warming potential (GWP) fuels for port transit and ship electrification, and
- 5) Accelerating full decarbonization of cargo handling operations at ports.

WPCAP has partnerships with the International Association of Ports and Harbors (IAPH) Clean Marine Fuels Working Group, IAPH Environmental Shipping Index Working Group, and Taskforce Port Call Optimization.<sup>140</sup>

## Port Authority of New York and New Jersey

In 2018, the Port Authority of New York and New Jersey, which was the first port authority to reaffirm the Paris Climate Agreement, debuted a plan to reduce GHG emissions by 35% by 2025 and 80% by 2050, with electrification being a major component. As part of the announcement, the Port Authority agreed to fully electrify their airport shuttle bus fleet, one of the largest in the country, by deploying 36 all-electric shuttle buses at John F. Kennedy, Newark Liberty, and LaGuardia airports, with 20 more to be added. The Port also committed to building a fast-charging hub at JFK airport with 10 stations providing 30-minute charging and to pilot a first-in-the-nation program to replace cargo equipment with electric models by working with Maher Terminals - all goals it has now achieved.<sup>141</sup> The Port Authority also runs a truck replacement program to fund up to two 1998-2006 model year class-8 port drayage truck replacements with 2014 or newer engine models per licensed motor carrier or independent owner-operator. Funding for the truck replacement program comes from CMAQ and the EPA's Diesel Emissions Reduction Act (DERA) programs. The program covers up to 50% of the cost of the replacement truck up to a limit of \$25,000 and includes a scrappage requirement.<sup>142</sup> The Port Authority also committed to replacing 100% of the light-duty fleet with electric models by 2030 and 50% of the medium- and heavy-duty fleet by 2035. As of 2021, the Port Authority of NY and NJ had received a Level 3 Airport Carbon Accreditation (ACA), the highest level of the independently assessed carbon

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<sup>140</sup> World Ports Climate Action Program. World Port Sustainability Program, [sustainableworldports.org/wpcap](https://sustainableworldports.org/wpcap)

<sup>141</sup> Port Authority Embraces Paris Climate Agreement, Adopting Aggressive Measures to Reduce Greenhouse Gas Emissions. Port Authority of New York and New Jersey, PANYNJ, 25, Oct. 2018, [www.panynj.gov/port-authority/en/press-room/press-release-archives/2018\\_press\\_releases/port\\_authority\\_embracesparisclimateagreementadoptingaggressiveme.html](https://www.panynj.gov/port-authority/en/press-room/press-release-archives/2018_press_releases/port_authority_embracesparisclimateagreementadoptingaggressiveme.html)

<sup>142</sup> Truck Replacement Program. Port Authority of New York and New Jersey, <https://www.panynj.gov/port/en/our-port/sustainability/truck-replacement-program.html>

management certification standard short of carbon neutrality. According to the agency, the Port initiatives will result in direct emissions reductions equal to 3.6 billion tons of coal burned per year.<sup>143</sup>

The Port Authority of New York and New Jersey also joined two campaigns related to electric vehicle adoption: EV100 and Below50. EV100 brings together companies and investors to push for electric vehicle adoption by 2030 through market pressure. Below50 is a global campaign made up of companies and organizations that provide market pressure for vehicle fuels with at least 50% lower carbon emissions than conventional fossil fuels.<sup>144</sup>

In 2019, Port tenants received \$3.9 million from the Volkswagen Trust for electrifying equipment at Port Newark. In 2021, New Jersey governor Phil Murphy dedicated \$36 million out of the \$100 million granted that year for electrifying MHDVs in port and industrial areas with surrounding communities that had historically suffered disproportionately from air pollution.<sup>145</sup>

## Port of Baltimore

The Port of Baltimore runs a Diesel Equipment Upgrade Program to retrofit, repower, or replace vehicles and equipment that use the Port with more emissions-efficient or fully-electric models. Up to \$30,000 is available per replacement truck to fleet owners or independent contractors that provide proof of service at the Port. To be eligible for the voucher, trucks must have 1996-2006 engines and replacement trucks must have at least a 2013 year or newer engine. Trucks have to be owned for at least one year, be drivable, and in service at the time of applying for the voucher. The program also has a scrappage requirement for the replaced truck.<sup>146</sup>

For cargo handling equipment, replacements purchased with vouchers must have a 2018 or later year engine, meet EPA Tier 4 emissions standards, be operable on the date of application, and operate at least 500 hours per year. As with the truck program, the replaced equipment must be scrapped.<sup>147</sup>

## Port of Long Beach and the Port of Los Angeles

In 2017, the Ports of Long Beach and Los Angeles adopted the Clean Air Action Plan (CAAP), for which one of the strategies was to reduce greenhouse gas emissions from on-road drayage trucks. The first step of this strategy was for each port to ban trucks model year 2013 or earlier from being added to the Port Drayage Truck Registry (PDTR) beginning in 2018. Trucks MY 2013 or earlier already on the registry would not be affected. Increasing port fees on all trucks, with the exemption of zero- and

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<sup>143</sup> *Clean Air - Environmental Initiatives: Port Authority of New York and New Jersey*. Port Authority of New York and New Jersey, [www.panynj.gov/port-authority/en/about/Environmental-Initiatives/clean-air-environmental-initiatives.html](http://www.panynj.gov/port-authority/en/about/Environmental-Initiatives/clean-air-environmental-initiatives.html)

<sup>144</sup> *The Port Authority of New York and New Jersey*. We Are Still In, [www.wearestillin.com/organization/port-authority-new-york-and-new-jersey](http://www.wearestillin.com/organization/port-authority-new-york-and-new-jersey)

<sup>145</sup> Hakirevic, Naida. *Port of NY and NJ Secures Funding for Electrification Initiatives*. Offshore Energy, 9 Mar. 2021, [www.offshore-energy.biz/port-of-ny-and-nj-secures-funding-for-electrification-initiatives](http://www.offshore-energy.biz/port-of-ny-and-nj-secures-funding-for-electrification-initiatives)

<sup>146</sup> *Dray Truck Replacement Program Frequently Asked Questions*. Port of Baltimore Diesel Equipment Upgrade Program, <http://www.dieselupgrades.org/drayage-truck-frequently-asked-questions>

<sup>147</sup> *Cargo Handling Equipment Replacement and Repower Program Frequently Asked Questions*. Port of Baltimore Diesel Equipment Upgrade Program, <http://www.dieselupgrades.org/cargo-handling-faq>



near-zero-emission models, provides an incentive for ZEVs, resulting in a projected date of 2035 when only ZE trucks would be exempted from these fees. The ports also house the first hybrid tug-boat in the world and require all harbor craft equipment to plug in while onshore.<sup>148,149</sup>

On June 12, 2017, Los Angeles Mayor Eric Garcetti and Long Beach Mayor Robert Garcia released a joint declaration to commit to a zero-emission (ZE) goods movement and port industry. The ZE Large-Scale Drayage Truck Pilot Program was created as part of this joint declaration. Since the Clean Trucks Program (CTP) was implemented by the Port of Long Beach and the Port of Los Angeles in 2012, total truck emissions have been reduced by more than 90%. Currently, over 22,000 drayage trucks operate at the Port of Long Beach, more than half of which are 2010 or newer emission-compliant engines. These programs were completed as voluntary early action on California state policy for emissions of port operations put forth by CARB. The programs aim to monitor and evaluate at least 50 class 8 on-road ZE drayage trucks operating in routine duty cycles at both ports. The program plans to analyze these trucks on short, medium, and long-haul drayage runs. The roll-out process outlined in San Pedro Bay Ports Zero- / Near-Zero-Emissions Drayage Truck Testing & Demonstration Guidelines were used as a template for the two ports. Partners on this project include agencies, such as the South Coast Air Quality Management District, LA County Metropolitan Transportation Authority, electric utilities, licensed motor carriers and trucking associations, ZE incubators, OEMs, technology developers, and others. The two ports currently estimate this ZE Large-Scale Truck Pilot Program to cost tens of millions of dollars for funding at least 50 ZE trucks and charging infrastructure. From a survey distributed to fleets in 2018, 43% of respondents were interested in large-scale ZE demonstrations and the primary barriers to purchasing ZE trucks were the cost of the trucks and the associated charging infrastructure.<sup>150,151</sup>

## Port of Oakland Seaport

The Port of Oakland covers 20 miles of the eastern San Francisco Bay, with approximately 2,600 acres for aviation, 900 acres of commercial real estate, and about 1,200 acres used for maritime. The Port is the 3rd busiest container port on the west coast and 5th in the nation. It is the principal maritime pathway for cargo shipping in Northern California and serves both international and domestic cargo transportation moving between the inland United States and the Pacific Basin, as well as worldwide, and has an estimated average of 2,000 trucks that regularly use the facility.<sup>152</sup>

In 2008, CARB, the Port, UP Railroad, and the Bay Area Air Quality Management District, completed a health risk assessment study to understand the impacts of diesel particulate matter (DPM) emissions on West Oakland residents. The results determined that West Oakland residents live with DPM air pollution levels 3 times higher than the national average; for which, DPM emissions accounted for

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<sup>148</sup> *San Pedro Bay Ports Clean Air Action Plan*. Port of Long Beach and The Port of Los Angeles, [cleanairactionplan.org/](http://cleanairactionplan.org/)

<sup>149</sup> *Clean Trucks - Port of Long Beach*. Polb.com, [polb.com/environment/clean-trucks/#program-details](http://polb.com/environment/clean-trucks/#program-details)

<sup>150</sup> *Clean Trucks - Port of Long Beach*. Polb.com, [polb.com/environment/clean-trucks/#program-details](http://polb.com/environment/clean-trucks/#program-details)

<sup>151</sup> *Clean Truck Program: Air Quality: Port of Los Angeles*. Clean Truck Program | Air Quality | Port of Los Angeles, [www.portoflosangeles.org/environment/air-quality/clean-truck-program](http://www.portoflosangeles.org/environment/air-quality/clean-truck-program)

<sup>152</sup> *Maritime Comprehensive Truck Management Program*. Port of Oakland, 16 June 2009, [https://www.oaklandseaport.com/files/PDF/CTMP\\_final\\_090616.pdf](https://www.oaklandseaport.com/files/PDF/CTMP_final_090616.pdf)

1,400 cancer cases per million residents. DPM emissions from seaports specifically contributed to 13.5% (190) of those cancer cases per million and drayage trucks from seaports accounted for 21% (40) of the cancer cases in connection with seaport DPM emissions. West Oakland has a black majority population surrounded by freeways and port operations with higher rates of asthma and cardiovascular disease compared to the rest of Oakland and the Bay Area. Average life expectancy has been found to be up to 24 years lower than for residents in the wealthier Lower Oakland Hills.<sup>153</sup>

With respect to trucks, the Port works to actively inform vehicles of state anti-idling restrictions and fines. The Port of Oakland also runs a Maritime Comprehensive Truck Management Program (MCTMP), which includes a Clean Trucks component. In October 2009, the Port instituted a ban on all drayage trucks that could not meet the 2010 CARB requirements for emissions unless the drayage truck had been granted an exemption or extension from the 2010 requirements. The 2010 CARB rule prevented drayage trucks with pre-1994 engines from entering ports, and trucks with 1994-2003 engines from entering ports or rail stations (if they did not have the required CARB-verified retrofit filter that reduced particulate matter emissions by 85%). In 2012, the Port required all trucks with 2004 engines using their facilities to install the filter, and in 2013, extended the requirement to trucks with 2005 and 2006 engines. By 2014, all trucks were required to meet PM emissions standards put forth by CARB. To properly enforce these requirements, the Port implemented a registry program to verify that all trucks using port services adhered to these requirements.<sup>154</sup> These rules merely follow the state minimum provisions and do not go beyond them. Instead, lawyers and advocates at Earthjustice recommend:

- 1) Electrifying all port equipment and trucks and following the lead of the electrification timeline of the Ports of Long Beach and Los Angeles,
- 2) Requiring all ships to slow down when approaching the port to reduce emissions,
- 3) Supporting operations must remain inside the Port,
- 4) Vehicles inside the Port should be required to be zero-emission, and
- 5) All decisions should involve stakeholder engagement with the surrounding communities.<sup>155</sup>

## Port of San Diego

The Port of San Diego, which spans 5 cities and 34 miles of coastline, was awarded a \$5.9 million grant from the California Energy Commission via the San Diego Port Tenants Association. The money was used to purchase electric-powered semi-trucks, forklifts, drayage trucks, refrigerated trailers, buses, and yard tractors as part of their Maritime Clean Air Strategy (MCAS). The electric vehicles, manufactured by BYD, are expected to reduce greenhouse gas emissions by 940 metric tons over the timeline of the project. Later in October 2020, the Port of San Diego also became one of several US ports that received

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<sup>153</sup> Haley, Amber D., et al. *Neighborhood-Level Determinants of Life Expectancy in Oakland, CA*. Center on Human Needs Virginia Commonwealth University, Sept. 2012, [https://societyhealth.vcu.edu/media/society-health/pdf/PMReport\\_Alameda.pdf](https://societyhealth.vcu.edu/media/society-health/pdf/PMReport_Alameda.pdf)

<sup>154</sup> *Maritime Comprehensive Truck Management Program*. Port of Oakland, 16 June 2009, [https://www.oaklandseaport.com/files/PDF/CTMP\\_final\\_090616.pdf](https://www.oaklandseaport.com/files/PDF/CTMP_final_090616.pdf)

<sup>155</sup> Ghafar, Michelle. *Embracing a Zero-Emissions Future for the Port of Oakland*. Earthjustice, 12 June 2019, [earthjustice.org/blog/2019-june/embracing-a-zero-emissions-future-for-the-port-of-oakland](https://earthjustice.org/blog/2019-june/embracing-a-zero-emissions-future-for-the-port-of-oakland)

funding from the EPA. The EPA grant awarded the San Diego County Air Pollution Control District \$2 million to replace one Tier 2 diesel-powered tugboat with a new electric-powered tugboat.<sup>156,157,158</sup>

## Port of San Francisco

The Port of San Francisco has partnered with the San Francisco Department of Environment and the Charge Across Town organization to install and demonstrate EV ARCT<sup>M</sup> solar-powered electric car charging stations manufactured by Envision Solar. The Port also runs a research and development project called SF Breeze to research hydrogen fuel cell technology for ferries. In 2019, the Port also sent out a request for proposals to expand its EV charging network at 4 port locations with a minimum of 10 DC fast-charging stations planned to be built.<sup>159</sup>

## Port of Virginia

In July 2020, the Governor of Virginia announced \$14 million from the VW Trust to be allocated towards replacing all-diesel cargo handling equipment with zero-emission electric alternatives at the Port of Virginia. An additional \$10 million was also provided directly by the Port to electrify two ship-to-shore cranes, in addition to electric yard-tractors, cargo handling equipment, and associated charging infrastructure. These initiatives are meant to serve as pilot projects to analyze such endeavors for future expansion opportunities at the Port, which currently operates over 160 diesel-powered yard tractors that could eventually be electrified. The funding allocated towards these electrification measures will reduce an estimated 3,000 tons of diesel pollution, 71,000 tons of greenhouse gases, 46 tons of nitrous oxide, 2.2 tons of particulate matter, and upwards of 6 million gallons of diesel fuel.<sup>160,161</sup>

# RECOMMENDATIONS

Based on our research and analysis of existing programs and policies in Colorado, strategies deployed in other states and municipalities, and utility MHDEV initiatives, we have developed the following recommendations for the state of Colorado to advance the electrification of medium- and heavy-duty vehicles and to mitigate associated emissions statewide and along the I-270 corridor.

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<sup>156</sup> 2020 Environment Year In Review. Port of San Diego, [www.portofsandiego.org/environment-year-in-review#collection-3195-tab-3188](http://www.portofsandiego.org/environment-year-in-review#collection-3195-tab-3188)

<sup>157</sup> Concepcion, Mariel. Port of San Diego Introduces New Sustainable Vehicles. *San Diego Business Journal*, 29 July 2018, [www.sdbj.com/news/2018/jul/29/port-san-diego-introduces-new-sustainable-vehicles/](http://www.sdbj.com/news/2018/jul/29/port-san-diego-introduces-new-sustainable-vehicles/)

<sup>158</sup> San Diego Port Sustainability Freight Demonstration Project. California Energy Commission, 2021, [www.energy.ca.gov/showcase/driving-cleaner-transportation/san-diego-port-sustainability-freight-demonstration-project](http://www.energy.ca.gov/showcase/driving-cleaner-transportation/san-diego-port-sustainability-freight-demonstration-project)

<sup>159</sup> Berman, Richard. Port of San Francisco. Transportation | Port of San Francisco, [sfport.com/transportation-0](http://sfport.com/transportation-0)

<sup>160</sup> Gordon, Wyatt. 'A Real Opportunity': Virginia Places a Big Bet on Electrifying Port. *Virginia Mercury*, 31 July 2020, <https://www.virginiamercury.com/2020/07/31/a-real-opportunity-virginia-places-a-big-bet-on-electrifying-port/>

<sup>161</sup> Port of Virginia Gets \$14M in Funding for All-Electric Equipment. *The Maritime Executive*, 16 July 2020, [www.maritime-executive.com/article/port-of-virginia-gets-14m-in-funding-for-all-electric-equipment](http://www.maritime-executive.com/article/port-of-virginia-gets-14m-in-funding-for-all-electric-equipment)

- 1) **Adopt the California Advanced Clean Trucks (ACT) Regulation.** Implementing the ACT regulation, which includes an MHD ZEV sales requirement for auto manufacturers and a one-time reporting requirement for qualified fleets registered in Colorado, would help to quickly accelerate the deployment of electric MHDVs across the state. Mandates like the ACT and ZEV regulations have been shown in California and in other states (ZEV regulation) to increase the options available for electric vehicle models, one of the primary barriers to MHDEV adoption. The ACT regulation would also help to grow manufacturing and associated jobs in the state related to MHDEVs and their components.<sup>162</sup> Further, the one-time reporting requirement would provide invaluable information to the state and its agencies regarding MHDV fleet composition, operating characteristics, usage patterns, and duty cycles that would help to more efficiently target future policies, programs, and incentives in a more data-driven approach to transitioning medium- and heavy-duty vehicles to zero-emission going forward.
- 2) **Adopt the Heavy-Duty Low NOx Omnibus Regulation.** Although not touched upon in this report, the heavy-duty low NOx omnibus regulation is a rulemaking that was approved by CARB in August 2020 that will begin to be enforced in 2024 and will reduce allowed NOx emissions by 90% over time.<sup>163</sup> The regulation will significantly improve air quality, particularly in DICs and EJ areas close to warehousing and freight corridors like I-270, where trucks disproportionately emit dangerous NOx and other toxic emissions. The decrease in NOx emissions from the ruling in California are expected to be "the equivalent of taking 16 million light-duty cars off the road," reducing an estimated 3,900 premature deaths and 3,150 hospitalizations, in addition to providing "health benefits of approximately \$36.8 billion" statewide.<sup>164</sup> This would be accomplished by revamping existing exhaust emission standards, testing, warranties, and reporting provisions, in addition to other requirements, and a report has already been commissioned and completed by [NREL](#) demonstrating that the rules are "not only technically feasible, but cost-effective methods of emissions reduction."<sup>165</sup> Considering the immense extent to which heavy-duty vehicles and associated NOx and PM emissions directly impact low-income and minority communities, as well as existing air quality issues along the Front Range, this regulation should be adopted by Colorado to help achieve the state's equity, environmental justice, and clean air goals. Additional information on the heavy-duty low NOx omnibus regulation can be found in the associated [CARB fact sheet](#).
- 3) **Establish a Colorado MHDV Voucher Program.** Based on the most promising aspects of the currently existing CA, MA, NJ, NY, and NYC MHDV voucher programs, as well as the ALT Fuels grant program, we recommend the state of Colorado implement their own MHDV voucher

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<sup>162</sup> Chuang, Tamara. *A First Look at How Colorado Will Become a ZEV State: the Rule, the Cost, the Debate*. The Colorado Sun, 13 May 2019, [coloradosun.com/2019/05/13/colorado-electric-vehicle-state-rules/](https://coloradosun.com/2019/05/13/colorado-electric-vehicle-state-rules/)

<sup>163</sup> Heavy-Duty Low NOx. California Air Resources Board, <https://www2.arb.ca.gov/our-work/programs/heavy-duty-low-nox/about>

<sup>164</sup> Facts about the Low NOx Heavy-Duty Omnibus Regulation. California Air Resources Board, [https://www2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/HD\\_NOx\\_Omnibus\\_Fact\\_Sheet.pdf](https://www2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf)

<sup>165</sup> Portillo, Patricio. *California Omnibus Rule Adds Momentum to Cut Truck Pollution*. NRDC, 27 Aug. 2020, <https://www.nrdc.org/experts/patricio-portillo/california-omnibus-rule-adds-momentum-cut-truck-pollution>

initiative. The funding would ideally come from the SB 21-260 Clean Fleet Enterprise and be managed by CDPHE, essentially serving as ALT Fuels 2.0.

Based on our review of electric MHDV purchase incentive programs in other states and cities, we recommend the following design elements for the Colorado voucher program:

- A) Focus on Zero-Emission Vehicles.** The program should solely provide vouchers for zero-emission and near-zero-emission class 3-8 vehicles (including electric and hydrogen with reduced vouchers considered for RNG and renewable diesel) and a minimum average of 5,000 miles driven per year (for on-road vehicles).
- B) Prioritize Equity.** Based on the equity and access priorities in SB 21-260 and SB 21-1266, as well as drawing from existing programs in MA and NJ, set aside at least 30% of total program funding to prioritize small, minority-, women-, and veteran-owned businesses, fleets that can scrap pre-2010 diesel trucks, and vehicles domiciled in or operating at least 50% of VMT in high emission, disproportionately-impacted, or environmental justice communities for at least 3 consecutive years from the date of voucher receipt.
- C) Exclude a Scrappage Requirement.** From our conversations with sectoral stakeholders, it became clear that scrappage requirements can prevent newer fleets from accessing rebates. Therefore, the program should prioritize scrappage of older diesel vehicles, but not require it, as is currently the case with ALT Fuels, since larger, industry-leading fleets (for example Amazon, UPS, FedEx, and others) have been shown to be the likely first-adopters of MHDEVs and are essential to testing and proving the technology in the field. As a voucher program matures, a scrappage requirement could be reconsidered to redistribute funds away from larger corporations and direct them towards smaller businesses with older vehicles as costs come down and larger businesses become more likely to purchase electric MHDVs without such incentives. In the case that a scrappage requirement is implemented, a “cascading vintage” system should be accommodated where a fleet that lacks an older vehicle is able to sell their newer model to an eligible fleet that can scrap a qualifying diesel vehicle. Resultantly, the likely larger and more equipped fleet can electrify, while the fleet that may not have the capacity to transition to electric yet will be provided with an incentive to retire their older, more polluting diesel vehicle. Fleets willing to participate in a cascading vintage program should also be prioritized, even in the case of scrappage not being a requirement.
- D) Streamline Implementation.** Like the California HVIP, the Colorado voucher program should place the responsibility of obtaining a voucher on the vehicle manufacturer and dealer, rather than the fleet owner, reducing time and administrative paperwork requirements for fleet managers. Dealers and manufacturers should also be trained and approved on program details, helping to further streamline the process. Vouchers should be available directly at the point-of-sale, immediately reducing vehicle purchase prices.

- E) Include Limits.** Vouchers should be capped at 110% of the incremental cost of the new vehicle compared to an equivalent diesel alternative. Although shipping, taxes, and other increased fees are not included in other programs, we recommend they be considered, since they are also a part of the additional cost associated with electric MHDVs, sometimes inhibiting the business case for fleets to purchase them. While other state initiatives do not have voucher reductions over time, another consideration is to reduce the base voucher amount by 10% after the 4th year of the program, an additional 5% after the 8th year, and another 5% on the 10th and final year of the program. This would help to incentivize fleets to apply for vouchers as soon as possible in exchange for a larger rebate. Vehicle manufacturers should be limited to 100 unredeemed vouchers at any one time, as in the California program, to provide equitable opportunities for smaller OEMs in the market and to encourage competition amongst the MHDEV manufacturing industry.
- F) Incorporate Bonuses.** Based on the CA, MA, and NJ programs, vehicles showing proof of domicile or at least 50% operation in high emission, DfCs, or EJ areas, such as the I-270 corridor, should receive a 10-25% plus-up of their voucher amount, as would small businesses, school districts, and transit agencies. This would also apply to vehicles with at least 25% of parts and labor spent within Colorado, helping to incentivize state vehicle manufacturers, component producers, and assembly plants. Minority-, veteran-, and women-owned entities should also be awarded an additional \$4,000 bonus with another \$2,000+ for the scrappage of a fully operable and in-use pre-2010 diesel vehicle, as in the NJ program. As would organizations that provide proof of offering annual MHDEV educational programs with all such bonuses able to be stacked.
- G) Expand to Infrastructure and Non-Road Equipment.** The Colorado MHDV voucher program should expand upon currently existing MHDV offerings by synergizing an infrastructure component modeled off of Alt Fuels, which is not currently a part of any other state or city MHDV measure. Naturally, fleets that will be acquiring electric MHDVs will also need to install associated charging infrastructure. Therefore, EVSE incentives should be offered with MHDV vouchers for vehicles that are awarded funding. Associated charging infrastructure incentives can be based on AFC amounts, which offers up to \$9,000 for level 2 EVSE or \$30,000 for level 3 EVSE, not to surpass total equipment and installation costs.<sup>166</sup> Additionally, none of the other voucher initiatives offer rebates for non-road equipment, such as railroad switchers, aviation ground support equipment, agricultural equipment, forklifts, or transport refrigeration units (TRUs), all of which are more easily electrified than on-road vehicles. Therefore, also similarly to Alt Fuels, the Colorado voucher initiative should incorporate such equipment into the program offerings. A floor and cap can be included (for instance a 5% minimum and 10-15% maximum) to ensure such equipment is not awarded more funding than desired.

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<sup>166</sup> *Beneficiary Mitigation Plan Volkswagen, Audi, and Porsche Clean Air Act Settlements*. Colorado Department of Transportation, 16 Sept. 2019, <https://www.codot.gov/programs/planning/assets/grants/2019btmp>



Non-road vouchers should also solely be awarded to equipment located in DICs or EJ areas; for example, TRUs and forklifts along the I-270 corridor.

- H) Require Reporting.** Reporting or telematics for at least one year after vehicle replacement should also be required as a part of the program. Such information should include depot locations, number of vehicles, weight classes, type, VMT, and any additional information CO state agencies determine as necessary for data collection and emissions reduction analyses to certify and improve voucher program results.

**Table: Recommended Base Voucher Amounts by Weight Class for CO Voucher Program Based on HVIP**

Weight Class	Voucher Amount
Class 3	\$45,000
Class 4	\$60,000
Class 5	\$60,000
Class 6	\$85,000
Class 7	\$85,000
Class 8	\$120,000

**Table: Recommended Bonus Criteria for CO Voucher Program Based on the CA, MA, and NJ Programs**

Bonus Criteria	Plus-Up (Per Vehicle)
Proof of Domicile or 50%+ Operation in High Emission, DICs, or EJ Areas	10-25%
Small Businesses, School Districts, and Transit Agencies	10-25%
25% of Vehicle Cost Spent Within Colorado	10-25%
Minority-, Veteran-, or Women-Owned Entities	\$4,000
Scrappage of Fully Operable and In-Use Pre-2010 Diesel Vehicle	\$2,000
Annual MHDEV Educational Programs	\$2,000

#### 4) **Expand Xcel's TEP to Include a Fleet MHDEV Make-Ready Charging Infrastructure Program.**

Designed based on existing IOU programs that have already been approved in California for PG&E, SCE, and SDG&E, Xcel's Colorado TEP should be expanded to incorporate a fleet MHDEV make-ready charging infrastructure program. While the entirety of Xcel's TEP is for \$110 million over three years and spans residential, multifamily, commercial, research, and advisory portfolios, the CA make-ready initiatives are for \$236 million, \$343 million, and \$107.4 million respectively over five years and are specifically designated for fleets and MHDV electrification.<sup>167,168</sup>

Distributed by the number of electric customer accounts, those amounts would be equivalent to \$43 for PG&E (5.5 million accounts), \$68.50 for SCE (5 million accounts), and \$76.50 for SDG&E (1.4 million accounts) invested per electric meter. Using the average cost of these programs and applying them to Xcel's approximately 1.3 million electric customer accounts in Colorado would value such a program at about \$81.5 million total over five years.<sup>169,170,171,172</sup>

Xcel's make-ready program should similarly offer to design, build, and maintain all utility-side make-ready infrastructure (up to the customer electrical meter) at no cost to qualified fleets with requirements including, but not limited to:

- 1) Be an Xcel Energy customer,
- 2) Install an Xcel-approved charger and participate in an Xcel charging rate,
- 3) Commit to deploying at least 2 MHDEVs or participating non-road equipment,
- 4) Be approved to install and operate EVSE at the location and guarantee the operation and maintenance of the EVSE for at least 10 years,
- 5) Submit an electrification plan, and
- 6) Report utilization data for at least 5 years following charger installation.

In connection with the make-ready initiative, Xcel should also provide any required technical support to assist with the electrification of participating fleets. If a higher funding amount is considered, Xcel could also include installation of (or up to 80% funding for) the customer-side infrastructure. This would fund up to, but not including, the purchase, maintenance, or operation of the charging equipment itself, nor the vehicles or equipment, as is the case with SCE and SDG&E's programs. Additional rebates for up to 50% of EVSE costs could also be offered for customers in eligible DICs and for school and transit bus operators.

Conditions that should be considered for the program based on the CA IOU initiatives include:

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<sup>167</sup> *Summary of Decision on Transportation Electrification Program Proposals from the Investor-Owned Utilities May 31, 2018*. California Public Utilities Commission, 31 May 2018,

<https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457607-summary-of-te-decision-may-31-2018.pdf>

<sup>168</sup> *Application of San Diego Gas & Electric Company (U902E) For Approval of Senate Bill 350 Transportation Electrification Proposals Regarding Medium and Heavy-Duty Electric Vehicles and a Vehicle-To-Grid Pilot*. California Public Utilities Commission, 15 Aug. 2019,

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M311/K114/311114709.pdf>

<sup>169</sup> *Company Profile*. Pacific Gas and Electric, [https://www.pge.com/en\\_US/about-pge/company-information/profile/profile.page](https://www.pge.com/en_US/about-pge/company-information/profile/profile.page)

<sup>170</sup> *About SCE*. Southern California Edison, <https://www.edisoncareers.com/page/show/about-sce/>

<sup>171</sup> *About Us*. San Diego Gas & Electric, <https://www.sdge.com/more-information/our-company/about-us>

<sup>172</sup> *Xcel Energy*. Colorado Nonprofit Association, <https://coloradononprofits.org/knowledge/nonprofit-consultant-directory/consultant/10046>

- 1) 25-40% of funding spent in DICs,
- 2) At least 10-15% allocated to school districts and transit agencies,
- 3) A maximum of 10% for program administration, and
- 4) A designated % for warehouses and airports (with no more than 10% for electric forklifts), which will help to support the pilot programs noted in recommendation #4 below.

Instituting a make-ready fleet MHDEV program, in addition to Xcel's existing TEP, would considerably accelerate fleet and diesel equipment electrification across Colorado by reducing one of the most significant cost barriers associated with electrification. At the same time, it would balance a shared commitment from businesses and fleets to transition to zero-emission MHDVs. Xcel already was approved for a Fleet EV Service Pilot in Minnesota that "offers free installation of make-ready charging infrastructure, charging equipment options, installation services and payment options, and access to Xcel Energy's low-cost EV charging rate." This program would serve as a way to expand this pilot for fleets in Colorado.<sup>173,174</sup>

**5) Develop and Deploy Pilot Programs.** Pilot program recommendations include:

- 1) A Denver zero-emission zone (ZEZ), low-emission zone (LEZ), and / or smart zone (SZ),
- 2) Commercial EV truck-shares and shared charging depots, and
- 3) A Denver airport and warehousing electrification pilot.

Implementing the initiatives listed above and establishing a conceptual demonstration opportunity for more of such projects across the state would allow for the specific targeting of pollution and GHG mitigation strategies and innovations in DICs and environmental justice areas. This includes case studies specifically along the I-270 freight corridor in North Denver neighborhoods like Commerce City, Elyria Swansea, Globeville, and other regions that will be directly affected by CDOT's planned interstate improvement project and will provide a way to reduce local air pollution and accelerate electrification in the surrounding disproportionately-impacted communities. A Denver ZEZ, LEZ, or SZ modeled off of the ZEDZ pilot in Santa Monica and other such Smart Zone initiatives in [Aspen](#), [Nashville](#), [Omaha](#), and [West Palm Beach](#) (not covered in this report), would help to encourage public-private partnerships and investments, local innovation, start-up demonstrations, stakeholder engagement, community buy-in, and would serve as a real-world example for future smart, low-emission, and zero-emission zones in the state. Such measures should first be catered to the Denver / Front Range area that in December 2019 was reclassified from being in 'Moderate' to 'Serious' nonattainment by the US Environmental Protection Agency (EPA).<sup>175</sup> As a result, federal CMAQ funding would also be available for such an initiative. Further, the development of

<sup>173</sup> *EV Toolkit Where to Start*. Xcel Energy | Partners in Energy, 17 Jan. 2020,

<https://xcelenergycommunities.com/document/ev-toolkit-where-start>

<sup>174</sup> *Minnesota PUC Approves Xcel Energy's \$23.5 Million Fleet and Public Charging Pilot*. Atlas EV Hub,

[https://www.atlasevhub.com/filings\\_alert/minnesota-puc-approves-xcel-energys-23-5-million-fleet-and-public-charging-pilot/](https://www.atlasevhub.com/filings_alert/minnesota-puc-approves-xcel-energys-23-5-million-fleet-and-public-charging-pilot/)

<sup>175</sup> *Colorado Electric Vehicle Plan 2020*. Colorado Energy Office, Apr. 2020,

<drive.google.com/file/d/1-z-INQMU0pymcTOEH8QvnmegTbwQnFhg/view>

commercial EV truck-shares and shared charging depots would serve to increase MHDEV access, awareness, education, utilization, and ultimately, adoption, for smaller businesses that lack EV experience and currently can't afford the higher up-front costs associated with MHDEVs (the cost of the vehicles themselves and the necessary depot upgrades for charging infrastructure).

A Denver International Airport (DEN) pilot for replacing diesel equipment with electric models should also be implemented and based off of existing port programs in other cities and states. While DEN has already made great strides in reducing emissions by introducing electric hybrid and compressed natural gas vehicles into its 1,800 vehicle fleet and has received the National Government Green Fleet award for the past 7 years, as of 2019, DEN still only had 106 electric and hybrid electric vehicles.<sup>176</sup> DEN can lead the nation in achieving fully electrified airport equipment using the Port Authority of New York and New Jersey as a model for the initiative. Transitioning DEN airport equipment and trucks would also help to reduce air pollution along the Front Range, which is already in federal nonattainment. Such a program could be co-managed and administered by a combination of DRCOG, CDPHE, and / or the RAQC, and specifically prioritize the replacement of older diesel vehicles using an increasing scale for funding based on the incremental cost of vehicles and equipment being exchanged with zero-emission alternatives.

Also modeled off of existing port programs and CA IOU pilot initiatives, Colorado can deploy a warehousing equipment electrification pilot in the Denver region. As in the case of Denver International Airport, aviation ground support and warehousing equipment are some of the best-suited applications for electrification due to their relatively short travel distances, stop-and-start duty cycles, and consistent daily home-bases where charging infrastructure can be more easily installed and managed. The warehousing pilot can first be deployed along the I-270 corridor and also co-managed by DRCOG, CDPHE, and / or the RAQC in combination with the DEN pilot. The program could provide subsidies for the replacement and scrappage of diesel vehicles and equipment, such as forklifts, yard tractors, TRUs, and regional haul trucks, as well as associated charging infrastructure upgrades. Similarly to the DEN and ZEZ / LEZ / SZ initiatives, the I-270 area qualifies for multiple avenues of funding (both federal and state) that is reserved for nonattainment areas and DICs. Xcel Energy also has a 15% minimum equity component included in their TEP with which such an initiative would likely qualify. Over time, vehicles and the equipment servicing these major warehousing districts can begin to require registration (as in the Ports of Long Beach, Los Angeles, and Oakland Seaport), eventually requiring verified retrofit filters, emissions standards, a fee, or an outright ban of certain MY and earlier diesel trucks and equipment in the area. Such rules can provide leeway to start, then become more strict year-over-year. These requirements would provide a direct incentive for fleets and warehouse operators to more quickly transition to zero- and near-zero-emission alternatives.

**6) Adopt a Low Carbon Fuel Standard (LCFS) / Clean Fuels Program (CFP).** Although not touched upon in the bulk of this report, since the Colorado Energy Office has already commissioned an

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<sup>176</sup> *Environmental Performance | Denver International Airport*. City & County of Denver Department of Aviation, [https://www.flydenver.com/about/administration/sustainability/environmental\\_performance](https://www.flydenver.com/about/administration/sustainability/environmental_performance)

[LCFS Feasibility Study](#), a Clean Fuels Program or Low Carbon Fuel Standard, is an initiative already in place in California and Oregon with recent approval also in the state of Washington. The idea behind an LCFS is to reduce transportation emissions by putting a price on carbon and therefore, incentivizing lower-carbon fuels. This is achieved by establishing an annual carbon intensity (CI) standard that declines over time. If a fuel is lower than the CI standard, it generates a credit, and if it's higher, it generates a deficit. Producers and distributors of high carbon transportation fuels like diesel and gasoline will need to purchase credits generated by consumers and other entities that utilize low- and zero-carbon fuels to offset the deficits that they accumulate. In doing so, this creates a fuel neutral marketplace for trading carbon credits, the price of which fluctuates with supply and demand. Polluters therefore begin to pay the costs associated with the emissions that they contribute, while low- and zero-carbon fuel producers, consumers, and fleets obtain recurring monetary benefits and operating income by selling their credits to these entities. Over time, the CI standard will be lowered, resulting in market-based emissions reductions by incentivizing investments in lower- and zero-emission fuels and equipment and significantly improving the total cost of ownership and financing / planning considerations for fleets that operate electric and alternative fuel vehicles.<sup>177</sup>

California's LCFS was first adopted in 2009 and recently revised lower in 2018. According to a March 2021 report from CALSTART, "the LCFS program has diversified California's transportation fuel portfolio and reduced petroleum dependency, and is the single largest source of GHG reductions for the state, while also improving air quality."<sup>178</sup> In Oregon, the CFP was also passed in 2009, but was not implemented until 2016 with a target of reducing the carbon intensity of the state's fuel mix to 10% below 2015 levels by 2025; however, doing so with incremental annual reductions (only 2.5% below 2015 levels in 2019).<sup>179</sup> Washington meanwhile only recently signed legislation to enact an LCFS program in May 2021. The CA, OR, and WA programs will eventually be linked, establishing a larger market for low- and zero-carbon transportation fuels and credits with no revenue collected directly by the states. Other states currently studying or considering adopting an LCFS include New York, Minnesota, Michigan, and Colorado.<sup>180</sup> The LCFS feasibility report commissioned by CEO noted specifically that "Colorado could achieve a 10% carbon intensity reduction over a 10-year timeframe with feasible and cost-effective changes to the transportation fuel supply" and "the economic impacts of compliance with a Colorado LCFS are likely to be small, and would have a negligible impact on forecasted growth in the state."<sup>181</sup> Ultimately, implementation of an LCFS in Colorado, especially if focused more specifically on zero-emission fuels (at the expense of other options like biofuels), would promote significant growth in MHDEVs and other zero-emission alternatives and would expand beyond existing and

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<sup>177</sup> Gurman, Robert O. *Taking Commercial Fleet Electrification to Scale*. CALSTART, Mar. 2021,

<https://calstart.org/wp-content/uploads/2021/03/Taking-Commercial-Fleet-Electrification-to-Scale-White-Paper.pdf>

<sup>178</sup> Gurman, Robert O. *Taking Commercial Fleet Electrification to Scale*. CALSTART, Mar. 2021,

<https://calstart.org/wp-content/uploads/2021/03/Taking-Commercial-Fleet-Electrification-to-Scale-White-Paper.pdf>

<sup>179</sup> Sickinger, Ted. *Oregon Climate Change: Governor's New Plan Leans on Supersizing the Clean Fuels Program*. Oregon Live, 15 Mar. 2020,

<https://www.oregonlive.com/politics/2020/03/oregon-climate-change-governors-plan-leans-heavily-on-supersizing-the-clean-fuels-program.html>

<sup>180</sup> Gurman, Robert O. *Taking Commercial Fleet Electrification to Scale*. CALSTART, Mar. 2021,

<https://calstart.org/wp-content/uploads/2021/03/Taking-Commercial-Fleet-Electrification-to-Scale-White-Paper.pdf>

<sup>181</sup> *Low Carbon Fuel Standard Feasibility Study*. ICF Resources, LLC, Sept. 2020,

<https://drive.google.com/file/d/11czj8ieUzNbxMvlob9HJCctyzJGVYF3/view>

prospective voucher, rebate, and grant programs by providing consistent operating revenue in addition to the upfront purchase price reductions delivered by other such incentives. For these reasons and more, an LCFS / CFP would be highly recommended as a valuable strategic action for the state of Colorado to advance electric MHDVs, clean air, and climate justice.

**7) Introduce Transport Refrigeration Unit (TRU) Regulations.** Transport refrigeration units are a major source of toxic emissions in low-income and BIPOC communities, since they are often stationed at distribution facilities near such neighborhoods and are primarily powered by diesel engines. It's estimated that upwards of 19% of toxic air pollution from California's delivery sector arises from TRUs, and TRUs in the state emitted close to 900,000 tons of GHGs, 7,000 tons of NOx, and 277 tons of diesel PM in 2019 alone. TRUs are also more easily electrified than on-road vehicles, since once dropped off at established warehousing facility locations, they remain stationary and require much less energy than traveling vehicles. Colorado should therefore consider implementing an electrification requirement for TRUs in DICs that increases over time based on existing measures adopted by CARB. New regulations currently being considered in California should also be watched for consideration of future updates, which are as follows:

- Starting in 2025, all truck TRU fleets should phase in full zero-emission units at 15 percent each year (over 7 years).
- Starting in 2025, all trailer TRUs, domestic shipping container TRUs, and TRU gensets must use zero-emission operation when parked or stationary for more than 15 minutes at an applicable facility.
- Starting in 2025, all diesel engines in trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU gensets must meet the U.S. EPA Tier 4 final emission standards for 25-50 hp engines.<sup>182</sup>

Grocery corporation Albertsons has already demonstrated that eTRUs result in reduced operating costs in addition to immense environmental benefits. Through a pilot study of eTRUs at one of their facilities, they estimated annual savings of about \$62,000 compared to diesel units, in addition to reduced maintenance and a 77% reduction in GHGs and 98% reduction in NOx.<sup>183</sup> TRU regulations in Colorado can begin with those already in place in CA since 2004. Over time, updated developments on the new CARB regulations can be observed and considered.

**8) Adopt a Warehouse Indirect Source Rule (ISR).** The warehouse indirect source rule (ISR) is a newly passed, first-of-its-kind measure in California pertaining to new and existing warehouses with over 100,000 square feet of space. Rule 2305 was adopted in May 2021 by the South Coast Air Quality Management District (SCAQMD) to offset emissions, particularly NOx and diesel PM, from warehouses, or so-called "indirect sources," by assigning them responsibility for the

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<sup>182</sup> *Frequently Asked Questions (FAQs) for Distribution and Delivery Fleets*. Pacific Gas and Electric, 2020, [https://www.pge.com/pge\\_global/common/pdfs/solar-and-vehicles/clean-vehicles/ev-fleet-program/PGE\\_EV-Fleet\\_FAQ\\_Distribution-Delivery.pdf](https://www.pge.com/pge_global/common/pdfs/solar-and-vehicles/clean-vehicles/ev-fleet-program/PGE_EV-Fleet_FAQ_Distribution-Delivery.pdf)

<sup>183</sup> *National Grocer Reduces Costs and Emissions with ETRUs*. Pacific Gas and Electric, 2021, [https://www.pge.com/pge\\_global/common/pdfs/solar-and-vehicles/your-options/clean-vehicles/charging-stations/ev-fleet-program/albertsons-case-study.pdf?cid=DM\\_Evfleet\\_casestudy\\_20210520\\_ACTNEWS\\_albertsons\\_na\\_na](https://www.pge.com/pge_global/common/pdfs/solar-and-vehicles/your-options/clean-vehicles/charging-stations/ev-fleet-program/albertsons-case-study.pdf?cid=DM_Evfleet_casestudy_20210520_ACTNEWS_albertsons_na_na)



vehicles and transportation equipment that deliver goods to and from these large logistics and distribution facilities, many of which are located in DICs and environmental justice areas. The rule implements a Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program that requires warehouse owners or operators to earn points to mitigate the emissions caused by trucks and equipment that conduct business at their warehouses.<sup>184</sup> Points currently will be assigned based on facility and vehicle size and can be earned by paying mitigation fees, reducing emissions in nearby communities, or “completing actions from a menu that can include acquiring and using natural gas, near-zero-emissions and / or zero-emissions on-road trucks, zero-emission cargo handling equipment, solar panels or zero-emission charging and fueling infrastructure,” amongst other options.<sup>185</sup> The rule will first go into effect on January 1, 2022 beginning with warehouses larger than 250,000 square feet and will continue to roll out over three years, applying to warehouses larger than 150,000 square feet on January 1, 2023, and over 100,000 square feet on January 1, 2024.<sup>186</sup> According to the SQAMD “about half of the air pollutants that contribute to smog come from the goods movement industry, with the largest source being heavy-duty trucks heading to warehouses across Southern California” and “emissions from sources associated with warehouses account for almost as many NOx emissions as all the refineries, power plants and other stationary sources in the South Coast Air Basin combined.”<sup>187</sup> The ISR is a groundbreaking rule that can make a huge impact for low-income, minority, BIPOC communities stuck by transit corridors and warehousing districts like those along the I-270 corridor and other areas around Denver Metro and beyond. As the rule begins to be implemented (and likely challenged) in California, Colorado should watch closely to consider deploying similar measures in the state in the years to come.

- 9) **Implement a ZEV and Near-ZEV Weight Limit Exemption for MHDVs.** As noted in the state exemptions and tax credits section of this report, zero- and near-zero-emission vehicles weigh more than ICE vehicles as a result of their heavy batteries and other alternative fuel equipment that can result in them exceeding state weight limitations. For many fleets, these weight restrictions can impact their consideration to transition to alternative fuel vehicles, since the added vehicle weight reduces the amount of cargo that can be legally carried. To overcome these constraints, a weight limit exemption based on the California approach should be put in place in the state of Colorado. The California rule allows for a weight exemption equal to the additional powertrain weight, up to a maximum of 2,000 pounds. Colorado already provides a similar exemption for idle reduction to “compensate for the additional weight of the idle

<sup>184</sup> Sobhani, Casey, et al. *Understanding California's South Coast AQMD Warehouse Indirect Source Rule – Key Points for Warehouse Owners, Operators and Tenants*. DLA Piper, 30 June 2021,

<https://www.dlapiper.com/en/us/insights/publications/2021/06/understanding-californias-south-coast-aqmd-warehouse-indirect-source-rule/>

<sup>185</sup> Whitaker, Bradley, and Nahal Mogharabi. *South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule*. South Coast Air Quality Management District, 7 May 2021, <https://www.aqmd.gov/docs/default-source/news-archive/2021/board-adopts-waisr-may7-2021.pdf>

<sup>186</sup> Sobhani, Casey, et al. *Understanding California's South Coast AQMD Warehouse Indirect Source Rule – Key Points for Warehouse Owners, Operators and Tenants*. DLA Piper, 30 June 2021,

<https://www.dlapiper.com/en/us/insights/publications/2021/06/understanding-californias-south-coast-aqmd-warehouse-indirect-source-rule/>

<sup>187</sup> Whitaker, Bradley, and Nahal Mogharabi. *South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule*. South Coast Air Quality Management District, 7 May 2021, <https://www.aqmd.gov/docs/default-source/news-archive/2021/board-adopts-waisr-may7-2021.pdf>

reduction technology" up to 550 pounds, so that rule could simply be expanded to ZEV and near-ZEV vehicles with the option to increase the weight limit up to CA's 2,000 pound max.<sup>188,189</sup>

**10) Offer Standalone Battery Storage Incentives.** Standalone battery storage incentives are another prospective policy measure that could be considered in the state of Colorado to advance the deployment of electric MHDVs. As noted in the electrification barriers section of this report, infrastructure upgrades associated with adopting electric MHDVs can be cost prohibitive due to increased power requirements for the larger vehicle batteries. Changes in electricity demand and vehicle charging times can also result in highly-inflated electric bills if charging is not optimally managed or if vehicle downtime coincides with peak-pricing periods. Further, if vehicles charge during peak hours, they will likely be utilizing dirtier, fossil-fueled electricity, rather than renewables. Resilience is another key factor to consider. If there is a power outage and fleets have transitioned to MHDVs, they will not be able to fuel their vehicles, resulting in sizable impacts to operations. These issues can begin to be offset with the utilization of battery storage, which can increase resilience and be programmed to reduce electricity bills and demand charges by actively managing charging to coincide with non-peak periods when renewables are plentiful and to discharge when electricity is expensive. Currently there is a federal investment tax credit (ITC) available for solar installations; however, there are no federal incentives for standalone storage unless combined with solar. The state of Colorado should consider filling this gap by offering discounts for standalone battery storage to provide cheaper access to this valuable energy optimization and resilience tool. Research can be conducted into the few existing initiatives, such as the Self-Generation Incentive Program (SGIP) in California, that offers customers discounts for battery storage depending on customer location and whether they are willing to provide critical services to vulnerable communities; for instance, in the event of a wildfire, power shut-off, or other emergency that will likely become more frequent as climate change continues to accelerate.<sup>190</sup> Such incentive offerings could be prioritized based on proximity to critical facilities, high risk wildfire areas, or regions where the electrical system suffers from increased instabilities to dually benefit fleets, utilities, and the electric grid.

**11) Construct a Natural Berm Along the I-270 Corridor.** Construction of a natural berm with trees and plants along the sides of the I-270 freight corridor would both serve as a carbon sink and noise reduction barrier. This would directly assist in decreasing the public health damages to the surrounding DICs from associated air and noise pollution and would serve as a method to offset some of the increased emissions from CDOT's upcoming interstate improvement project. Although not an electrification strategy, substantial transition of the MHD transportation sector will take time to progress, even with the comprehensive policies and initiatives outlined in this white paper. Therefore, additional steps should be taken to reduce the impacts to lower-income and BIPOC communities that call the I-270 freight corridor home in the short term. A natural

<sup>188</sup> *Idle Reduction Weight Exemption*. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/11492>

<sup>189</sup> *Zero Emission Vehicle (ZEV) and Near-ZEV Weight Exemption*. U.S. DOE Alternative Fuels Data Center, <https://afdc.energy.gov/laws/12069>

<sup>190</sup> *Participating in Self-Generation Incentive Program (SGIP)*. California Public Utilities Commission, <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/self-generation-incentive-program/participating-in-self-generation-incentive-program-sgip>

berm that can absorb air and noise pollution, while also serving as a means to increase greenery, reduce heat island effect, and provide a natural habitat for local wildlife, could be constructed quickly while still awaiting the results of state and regional electrification strategies.

**12) Create a Statewide Colorado Electric Vehicle Authority (CEVA).** Currently, various agencies in Colorado state government ranging from CEO, to CDOT, CDPHE, RAQC, and others, are all involved in the distribution of funds and incentives for the deployment of electric vehicles and charging infrastructure. A statewide authority that centralizes this work would serve to streamline the process of MHDV electrification and infrastructure deployment in the state. A similar proposal has recently been passed by the California senate with bipartisan support that was put forward by the Transportation Electrification Partnership. A concept paper on the proposal can be viewed [here](#), with a news release announcing the bill's recent passage [here](#).

## CONCLUSION / NEXT STEPS

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The research and recommendations provided in this report should be iterative and ongoing in nature. With policy initiatives and funding proposals moving especially quickly and a new presidential administration focused on mitigating climate change, surely, there will be more programs and mechanisms that materialize in the near future. Further, the dynamics, technologies, and pricing of EVs and their components are changing rapidly. As more MHDEVs and EVSE are deployed across Colorado and the United States, economies of scale will continue to reduce vehicle and infrastructure costs, more businesses and consumers will become aware of the benefits of MHDEVs, and range anxiety will lessen. Also, the continued deployment of renewable energy generation with zero variable costs and increased grid efficiencies as a result of optimized EV charging will likely reduce the cost of electricity as a fuel even further compared to diesel- and petroleum-powered internal combustion vehicles. We therefore propose for these plans to continually be reviewed, assessed, and revised with changing market dynamics to make certain that it is adaptable to circumstances and conditions. The next few years will be critical in determining our success in reducing pollution and climate-altering GHGs in the transition away from a primarily fossil fuel-based society. We hope our research and recommendations will help to contribute to the state of Colorado's sustainability, resilience, and equity in moving forward towards a cleaner, more just, and healthier future.

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