Cost-Benefit Analysis

In performing a cost-benefit analysis, each rulemaking entity must provide the information requested for the cost-benefit analysis to be considered a good faith effort. The cost-benefit analysis must be submitted to the Office of Policy, Research and Regulatory Reform at least ten (10) days before the administrative hearing on the proposed rule and posted on your agency's web site. For all questions, please attach all underlying data that supports the statements or figures stated in this cost-benefit analysis.

DEPARTMENT:	Air Pollution Control Division	**AGENCY:**	Colorado Department of Public Health and Environment
CCR:	5 CCR 1001-24	**DATE:**	October 19-20, 2023

RULE TITLE OR SUBJECT:

AIR QUALITY CONTROL COMMISSION

REGULATION NUMBER 20

COLORADO CLEAN CARS RULE

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Per the provisions of 24-4-103(2.5)(a), Colorado Revised Statutes, the cost-benefit analysis must include the following:

1. **The reason for the rule or amendment.**

   The proposed regulatory revisions establish new emission reduction requirements applicable to manufacturers of new light and medium-duty vehicles sold in Colorado commencing with vehicle model year 2027.

   The federal Clean Air Act establishes a framework for adoption and implementation of emission standards applicable to vehicles. Under this framework, the US Environmental Protection Agency (EPA) is responsible for establishing new vehicle emission standards for vehicles sold across the United States. In general, under the Clean Air Act, states are pre-empted from establishing their own emission standards for new vehicles. However, the act creates an exception to this general pre-emption, allowing California to adopt its own new vehicle emission standards. Pursuant to Section 177 of the Clean Air Act, if California adopts its own new vehicle standards, other states can then adopt the California standards to apply in their states.

Prior to 2018, Colorado relied solely on the federal vehicle standards that EPA adopted. In 2018, the Air Quality Control Commission (AQCC) adopted California's Low Emission Vehicle (LEV) standards applicable to light duty vehicles commencing with model year 2022. These standards established more stringent greenhouse gas emission requirements than those set forth in the federal rules. In 2019, the AQCC adopted requirements for the Zero Emission Vehicle (ZEV) program. Under this program, manufacturers of light duty vehicles sold in Colorado must sell a specified credit percentage of zero emission vehicles commencing with Model Year 2023.

The proposed revisions update and extend those rules. These proposed rule revisions are intended to reduce emissions from light-duty and medium-duty vehicles sold and operated in Colorado. The rules are needed to support the state in reaching its statutorily established greenhouse gas reduction goals, bring the Denver Metro/North Front Range area back into attainment with the federal National Ambient Air Quality Standards for ozone, and accomplish reductions of pollutants in disproportionately impacted communities in support of Colorado's commitment to Environmental Justice.

Over the past several years Colorado has taken a multitude of steps, both regulatory and non-regulatory, to help achieve the broader goal of achieving an inherently lower emitting vehicle fleet including rapidly transitioning to zero emission vehicle technology. These proposed revisions represent an important next step in these efforts and will bring Colorado Clean Cars regulations current with existing California standards.

The proposed revisions consist of two distinct strategies directed at achieving these broader goals. They are:

1) The Low Emission Vehicle program that establishes emission standards for new light and medium-duty vehicles sold in Colorado commencing with model year 2027. The rule incorporates California vehicle emission standards as required under section 177 of the federal Clean Air Act. These standards establish criteria and procedures for the manufacturing, testing, distribution and sale of new on-highway light and medium-duty vehicles in Colorado. This portion of the rule will supersede the current Low Emission Vehicle standards that are now in place.
2) The Zero Emission Vehicle program that requires manufacturers of light-duty vehicles that offer such vehicles for sale in Colorado, to sell a specified percentage of zero emission vehicles (ZEV). Specifically, beginning with the 2027 model year. This updates and replaces the current Zero Emission Vehicle standards that are now in place.

In addition to creating these rule components, the proposed revisions include updating existing incorporations by reference related to Colorado's Low Emission Vehicle and Zero Emission Vehicle programs so that these provisions are aligned with the most recent version of California's regulations. Finally, the proposed revisions reorganize the regulation, clarify existing provisions, and make typographical corrections.

Adoption of the proposed revisions to Regulation 20 serves to advance Colorado's three most critical air quality priorities: 1) reduction of greenhouse gas emissions in support of Colorado's ambitious climate change goals; 2) reduction of ozone precursors in support of efforts to bring the Denver Metro/North Front Range area into attainment with ozone National Ambient Air Quality Standards (NAAQS); and 3) promotion of Environmental Justice through the reduction of harmful pollutants that directly impact Colorado residents living and working in disproportionately impacted communities. While no one set of strategies will solve these critical problems, adopting the proposed revisions would be an important step in addressing all three, bringing both important near term benefits in the form of reduced impact from new light and medium-duty vehicles, and helping Colorado transition to a zero emission vehicle fleet, which is among Colorado's most important long term efforts to fight climate change, significantly reduce ozone concentrations, and ensure that all Coloradoans have clean, healthy air to breathe.

Vehicle emissions are a critical part of Colorado's overall greenhouse gas emissions. Based on the most recent Colorado inventory, vehicles are the second largest source of greenhouse gas emissions in Colorado.[1] Vehicles are projected to remain the second largest sector of GHG emissions in the state through 2035.[2] And while vehicle GHG emissions in Colorado are expected to dramatically decline by 2050, that expectation is premised on the assumption that there will be a rapid transition from fuel burning vehicles to electric and other zero emission vehicles.[3] Colorado has previously taken action to reduce GHG emissions from the light duty fleet through the adoption of its existing LEV and ZEV program (predecessor programs to today's proposal). More recently, at their April 2023 hearing, the Commission adopted new requirements and standards for the heavy-duty fleet. These vehicles emit approximately 22% of the overall fleet emissions, while making up only 9% of the total number of vehicles in the state.[4]

In addition to being an important source of GHG emissions, vehicles play an extremely significant role in the formation of dangerous levels of ozone pollution within the Denver Metro/North Front Range nonattainment area. Based on recent source apportionment modeling, vehicles are the largest in-area contributor to ozone concentrations at ozone monitors that register the highest measured eight-hour ozone concentrations in the nonattainment area. For example, vehicles contribute approximately 31% of the in-area ozone formation at the NREL monitor.[5] This includes important emissions of nitrogen oxides as well as VOC emissions, both of which are a significant contributor to Colorado's summertime ozone issues.

[1] 2021 Colorado Greenhouse Gas Inventory Update at pg. 4.
[2] Id.
[3] Colorado Greenhouse Gas Pollution Reduction Roadmap at pp. 53-62.
[4] Colorado Clean Truck Strategy at pg. 9.
[5] State Implementation Plan for the Denver Metro/North Front Range Nonattainment Area (Ozone SIP) at pg. 5-28

Finally, the adoption of the proposed new vehicle emissions standards and ZEV requirements can play an important role in addressing environmental injustice in Colorado. While a number of source sectors contribute to the disproportionate impacts from pollution that certain communities face, vehicle pollution is a key contributor to this injustice. A myriad of health studies show that communities that are located near busy roadways face significant negative health consequences from exposure to vehicle pollution in general[6],[7],[8],[9]. If Colorado wants to truly address these direct exposure problems, it must move forward with strategies to reduce emissions from the light and medium-duty vehicle sector.

The rule implements manufacturer fleet emissions averages that while maintaining the standards that will be implanted under the LEV III rules in MY2025, will phase-out the manufacturer's use of zero emission BEVs and emissions adjusted plug-in hybrids to lower overall manufacturer's fleet emissions. Currently, manufacturers are permitted to incorporate these vehicles into their corporate fleet averages which lowers the overall averages. Average fleet emissions by MY2029 will only represent conventional vehicles subject to the LEV IV standards, representing true (non-ZEV) fleet emissions.

Along with this, the rule implements new lower emitting vehicle "bins" that motor vehicles may be certified to allowing these cleaner vehicles to be used to lower fleet emission averages, as well as the elimination of higher emission "bins" that will disallow vehicles to be certified to those high emission standards. Table 1 gives the emission standards used for each emission "bin". Table 2 gives the actual manufacturer's light-duty fleet NMOG+NOx emissions standards that each manufacturer must meet when averaging the emissions from all their vehicles produced from all the emissions bins. Table 3 is the manufacturer's fleet average NMOG+NOx emissions standards for medium-duty vehicles. Figure 4 shows the required minimum sales requirements for electric vehicles.

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[6] Kim, et al., *Traffic-related Air Pollution near Busy Roads*
The East Bay Children's Respiratory Health Study, American Journal of Respiratory Critical Care Medicine, May 31, 2004. https://doi.org/10.1164/rccm.200403-281OC

[7] Kim, et al., *Residential Traffic and Children's Respiratory Health*, Environmental Health Perspectives, September 1, 2008. https://doi.org/10.1289/ehp.10735

[8] HSU, et al., *The effects of traffic-related air pollutants on chronic obstructive pulmonary disease in the community-based general population*, - PMC, Respiratory Research, 2021. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8336021/pdf/12931_2021_Article_1812.pdf

[9] CHANG, et al., *Electric vehicle fleet penetration helps address inequalities in air quality and improves Environmental Justice*, Communications, Earth and the Environment, 2023https://www.nature.com/articles/s43247-023-00799-1

Table 1. New Vehicle Emissions "Bin" Standards

Vehicle Type	Bin/ Emissions Std	NMOG+NOx (low/high alt) g/mi	CO g/mi	PM* mg/mi	HCHO mg/mi
cars, light-duty trucks, and medium-duty passenger vehicles	ULEV125	0.125/0.160	4.2	1	4
	ULEV70	0.070/0.105	2.1	1	4
	ULEV60	0.060/0.090	1.7	1	4
	ULEV50	0.050/0.070	1.7	1	4
	ULEV40	0.040/0.060	1.7	1	4
	SULEV30	0.030/0.050	1.0	1	4
	SULEV25	0.025/0.050	1.0	1	4
	SULEV20	0.020/0.030	1.0	1	4
	SULEV15	0.015/0.030	1.0	1	4
medium-duty vehicles 8,501 -10,000 lbs GVW	ULEV250	0.250	6.4	8	6
	ULEV200	0.200	4.2	8	6
	SULEV170	0.170	4.2	8	6
	SULEV150	0.150	3.2	8	6
	SULEV125	0.125	3.2	8	6
	SULEV100	0.100	3.2	8	6
	SULEV85	0.085	3.2	8	6
	SULEV75	0.075	3.2	8	6
medium-duty vehicles 10,001 - 14,000 lbs GVW	ULEV400	0.400	7.3	10	6
	ULEV270	0.270	4.2	10	6
	SULEV230	0.230	4.2	10	6
	SULEV200	0.200	3.7	10	6
	SULEV175	0.175	3.7	10	6
	SULEV150	0.150	3.7	10	6
	SULEV125	0.125	3.7	10	6
	SULEV100	0.100	3.7	10	6

* For PM, all cars, light-duty trucks, and medium-duty passenger vehicles must meet a phased-in standard of 1 mg/mi, with the exception that during the phase-in period, 25% of MY2027 vehicles may be certified to 3 mg/mi. Commencing with the 2028 model year, all of these category vehicles must meet the 1 mg/mi standard.

Table 2. Fleet Average NMOG+NOx Standards for Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles

Model Year	NMOG+NOx g/mi	Incl. Max Amount of ZEVs
2027	0.030	30%
2028	0.030	15%
2029-2032	0.030	0%

Table 3. Fleet Average NMOG+NOx Standards for Medium-Duty Passenger Vehicles

Model Year	NMOG+NOx g/mi	
	Medium-Duty Vehicles 8,501-10,000 lbs. GVW	Medium-Duty Vehicles 10,001-14,000 lbs. GVW
2027	0.174	0.232
2028	0.166	0.212
2029	0.158	0.193
2030-2032	0.150	0.175

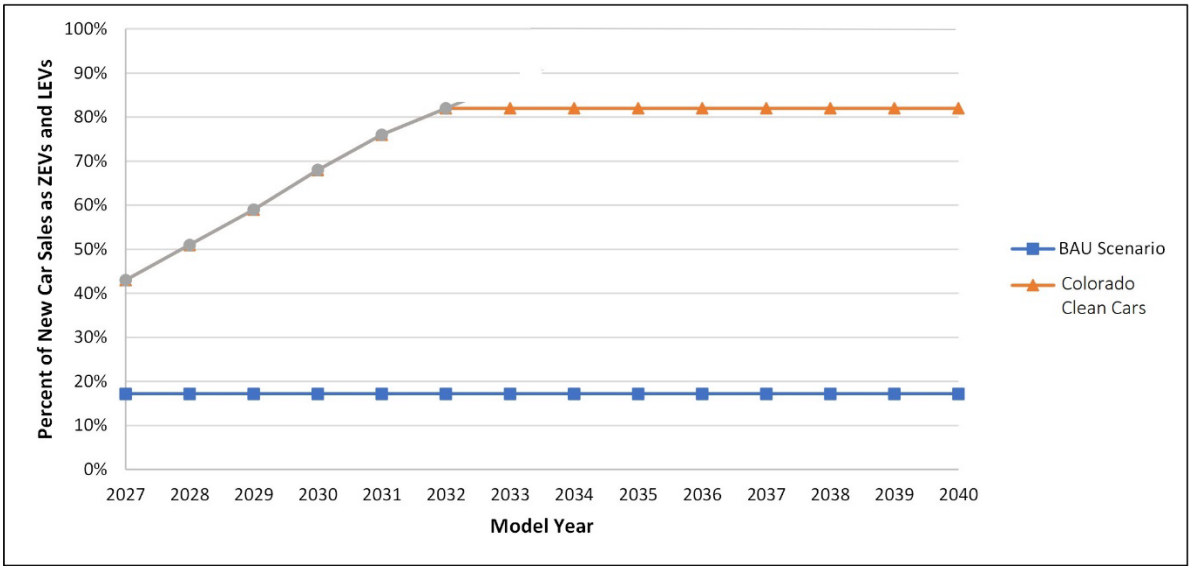
Table 4. Percent of BEV and PHEV New Vehicle Sales (2027-2040)

Colorado Clean Cars versus No Program

Calendar Year	Business as Usual (existing rule)		Colorado Clean Cars (as adopted)	
	BEV	PHEV	BEV	PHEV
2027	16.6%	0.6%	38.8%	4.2%
2028	16.6%	0.6%	46.9%	4.1%
2029	16.6%	0.6%	55.1%	3.9%
2030	16.6%	0.6%	64.1%	3.9%
2031	16.6%	0.6%	72.6%	3.4%
2032	16.6%	0.6%	78.6%	3.4%
2033	16.6%	0.6%	78.6%	3.4%
2034	16.6%	0.6%	78.6%	3.4%
2035	16.6%	0.6%	78.6%	3.4%
2036	16.6%	0.6%	78.6%	3.4%
2037	16.6%	0.6%	78.6%	3.4%
2038	16.6%	0.6%	78.6%	3.4%
2039	16.6%	0.6%	78.6%	3.4%
2040	16.6%	0.6%	78.6%	3.4%

Figure 1 below, follows Table 4 in a graphical form.

Figure 1. Forecasted Percent of New Car Sales as ZEVs in Colorado's Vehicle Fleet (2027 to 2040)



2. **The anticipated economic benefits of the rule or amendment, which shall include economic growth, the creation of new jobs, and increased economic competitiveness.**

The adoption of the proposed Colorado Clean Cars rule will have a substantial overall positive economic benefit for Colorado. It will generate new opportunities and prospects in the state. The rule will result in economic growth, the creation of new jobs, and increased economic competitiveness.

For each $1 in spending, implementing this rule will generate a benefit worth $6.5 for the motorist and people of Colorado, though this entails reduced revenue for affected businesses. The benefits result from lower vehicle costs, lower fuel and maintenance costs, reduced GHG emissions, and avoided adverse health incidences. The subsections below describe each of these specific benefits in detail.

Job Creation

The employment impact from this rule results from two distinct effects that follow from the rule. First, customers spend less on new cars, fuel costs, and maintenance costs. Whereas that represents savings for consumers, who then spend that money elsewhere, it represents decreased revenues to affected industries, such as car dealers, petroleum producers, gas stations, and vehicle service centers. Measuring the net effect of this effect requires quantifying the potential job gain in businesses that are now patronized by the money the car buyers saved by paying less on new cars, fuel costs, and maintenance costs versus the potential job loss expected in petroleum producers and others seeing their revenue decrease.

Second, considerable investment is made on charging infrastructure in terms of direct spending on different types of chargers as well as grid upgrades. Expenditure is also made on operating and maintaining the chargers. The cost per charger is multiplied by the number of chargers needed over the years to determine the total amount of spending that will be made on chargers. The employment impact resulting from this and other investments made is determined by multiplying the expected total spending by the corresponding multipliers, which are the number of jobs expected to result from a $1 million investment in a given sector. The jobs resulting from this investment can be classified as direct, indirect, and induced effects.

Direct jobs (gained/lost) are those jobs in industries supplying goods and services such as EV manufacturing jobs. Indirect jobs are created in industries that supply goods and services to EV manufacturers and include such jobs as refining raw metals from which EVs are built. Induced jobs represent those jobs supported through broader economic activity stimulated by the creation of direct and indirect jobs, including grocery store workers and health care providers.

Table 5. Employment impact of the rule, including direct, indirect, and induced effects.

Calendar Year	Loss	Gain		Net change (Gain – Loss)
	Car manufacturers, and dealers, petroleum producers and marketers, maintenance facilities, related businesses receiving lower revenue.	Re-investment of monies saved on new cars, fuel, and maintenance.	Investment on charger installation/O&M, grid upgrade.	
2027	-3,958	7,996	1,885	5,923
2028	-6,440	11,413	2,576	7,549
2029	-9,340	15,087	3,309	9,056
2030	-12,644	19,450	4,156	10,962
2031	-16,047	23,880	5,102	12,935
2032	-18,874	27,120	5,955	14,201
2033	-19,887	19,686	6,426	6,225
2034	-20,797	20,466	6,899	6,568
2035	-21,615	21,151	7,322	6,858
2036	-22,234	21,776	7,890	7,432
2037	-22,860	22,410	8,266	7,816
2038	-23,474	23,028	8,576	8,130
2039	-24,229	23,792	8,587	8,150
2040	-25,012	24,588	8,795	8,371
2027-2040	-247,411	281,843	85,744	120,176

The figures estimated are quoted in "job-year" or FTE (Full-time Equivalent), which is equivalent to employing one person for one full year, or two employees for six months each, or any other combination of employees that adds up to one year's worth of labor. The results show that the rule will generate a considerable number of jobs that outstrip the number of jobs that will be lost. Between 2027 and 2040, a total of 120,176 job years are expected to occur as a result of the rule.

Moreover, a considerable share of the revenue and job loss that will be experienced by petroleum producers and car makers will take place outside of Colorado as the state does not have a car making industry and imports two-thirds of the petroleum it consumes. On the other hand, the job creation, which will occur as a result of the reinvestment of the monies car buyers saved, including their spending at local restaurants and other businesses, will occur in the state. Thus, in addition to creating net job gain, taken from the state's perspective, the job gain is that much larger than the job loss.

The skillset necessary to maintain a zero-emission vehicle is different from those required to maintain conventional vehicles. Nonprofits, government agencies, post-secondary education institutions and public workforce development agencies are working with employers and labor unions to create training programs for workers in this and other declining occupations. Such measures will help to mitigate adverse impacts resulting from the shift to zero-emission vehicles.

Under CDOT's ZEV Workforce Development Group, training and skill set needs of technicians involved in electric vehicle repair and maintenance as well as infrastructure development, are being met. This group is identifying and determining the type and kind of programmatic and financial support needed to develop a robust electric vehicle workforce in the state. The group is actively working with parties such as automotive dealerships, repair facilities, fleet managers, as well as involving the cooperation of other government agencies such as CEO and CDPHE[10].

Current cross-cutting initiatives across Departments and Divisions, including CDOT, CEO, and CDPHE are underway. Efforts are being taken to conduct ZEV workforce needs analysis to determine the number of community colleges/technical schools offering ZEV training, identifying gaps in the workforce training system, and supporting community colleges in launching the first EV automotive technology programs[11]. Future plans include taking steps to ensure EV automotive training is available at every community college. Such an effort will help to accelerate the transition to zero emission vehicles, support a broad and resilient ZEV workforce while also offering job opportunities to all Coloradans.

Health Benefits

The rule will result in health benefits that improve the well-being of people in Colorado. As stated previously, light and medium-duty vehicles comprise the largest source of mobile source emissions. Through this rule, harmful vehicle emissions of nitrogen oxides and fine particulate matter will be reduced from these vehicles. The Department estimates that implementation of these rules through 2040 will reduce NOx by 18,657 tons and PM2.5 by 1,317 tons. The below table provides a breakdown of the emission savings by type and by year.

[10] https://drive.google.com/file/d/1R2WEarx6n2_pXXtd68tGV8ou6yrYoPMV/view.
[11] https://drive.google.com/file/d/1R2WEarx6n2_pXXtd68tGV8ou6yrYoPMV/view.

Table 6. Emission savings resulting from this rule

Year	PM2.5	SO2	NOx	NH3	VOC
2027	10	12	222	82	239
2028	17	19	359	139	462
2029	26	29	520	209	753
2030	37	39	682	291	1,089
2031	51	51	895	386	1,568
2032	67	63	1,116	487	2,091
2033	83	73	1,294	575	2,590
2034	98	81	1,427	653	3,072
2035	112	88	1,506	718	3,488
2036	129	94	1,719	792	3,953
2037	146	99	1,929	858	4,398
2038	163	103	2,134	921	4,850
2039	181	107	2,334	978	5,309
2040	198	110	2,522	1,031	5,781
2027-2040	**1,317**	**967**	**18,657**	**8,121**	**39,641**

Note: SO2 and NH3 are tailpipe emission levels whereas NOx, PM2.5 and VOC are well-to-wheel figures.

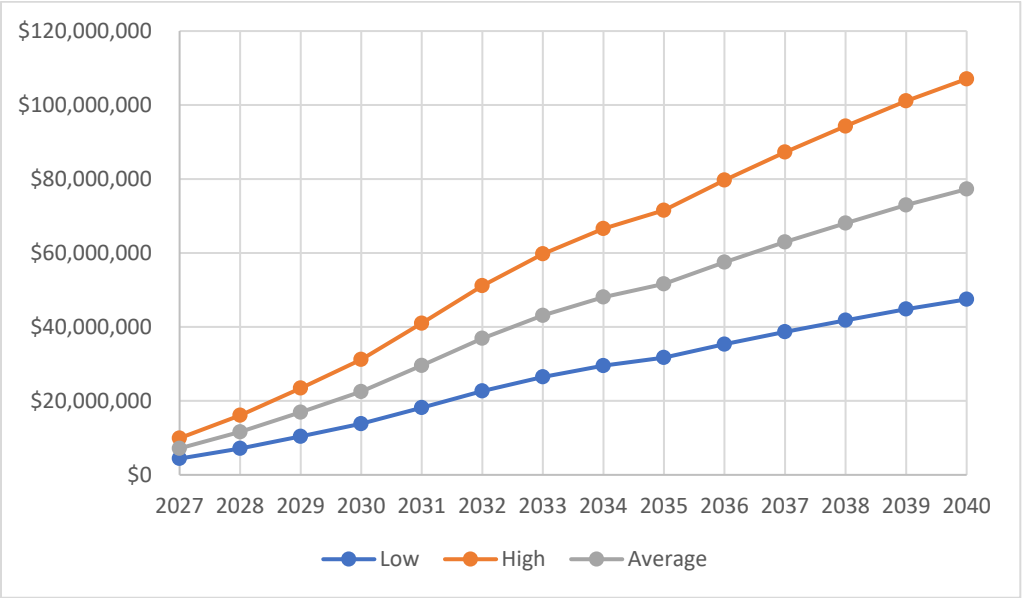
The health benefits from this rule will include avoided premature deaths, avoided hospitalizations for cardiovascular illness, and avoided hospitalizations for respiratory illness. The table below presents the expected reductions by endpoint.

Table 7. Expected reduction in mortality and other health endpoints by 2040

Health Endpoints	Expected reduction (2027-2040)
Mortality	68.67
Nonfatal Heart Attacks	23.63
Infant Mortality	0.275
Hospital Admits, All Respiratory	9.69
Hospital Admits, Cardiovascular	9.08
Acute Bronchitis	70.34
Upper Respiratory Symptoms	1267.32
Lower Respiratory Symptoms	893.12
Emergency Room Visits, Asthma	24.75
Asthma Exacerbation	1325.77
Minor Restricted Activity Days	38,022
Work Loss Days	6,494

Using concentration response functions to link the changes in particulate matter to epidemiological studies along with cost of illness and other statistics, the state determined the economic value of illnesses and deaths avoided resulting from this rule. Between 2027 and 2040, the rule is expected to generate health benefits worth $606,230,198.

Figure 2. Expected health benefits, by year.

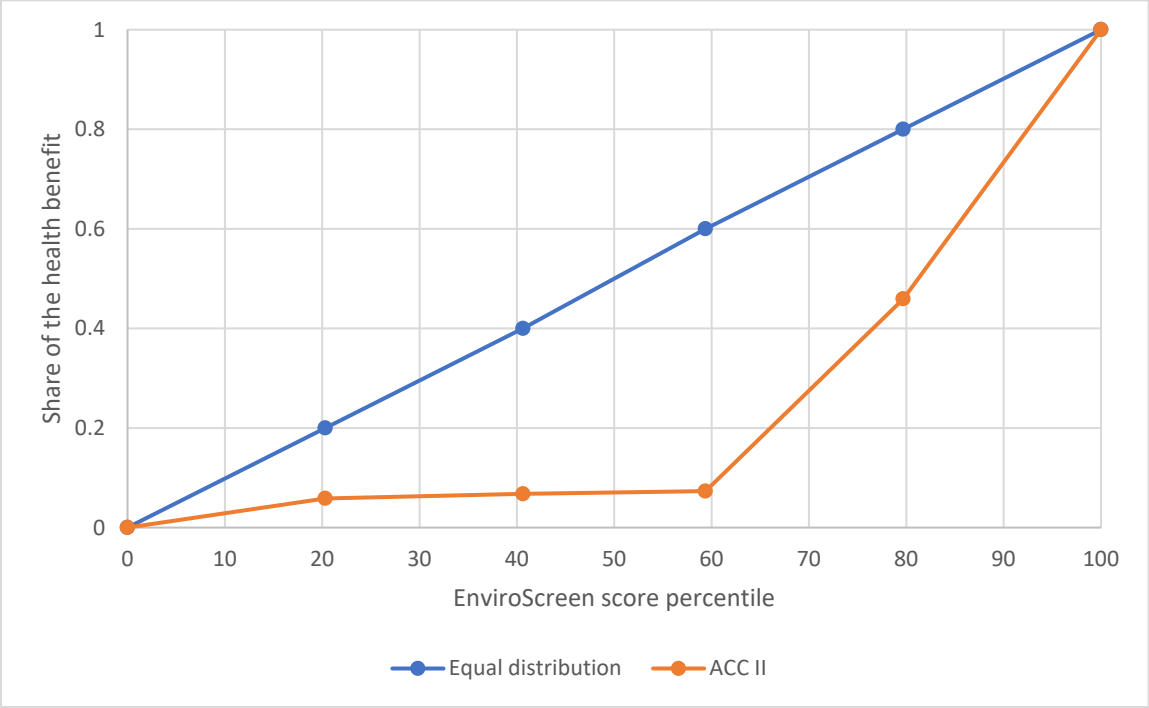


<u>Health benefits accruing to disproportionately impacted communities.</u>

The health benefits from this rule will be distributed statewide, affecting all of Colorado, but especially disproportionally impacted communities, including communities located near major highways and roadways and motor vehicle traffic. The Division's analysis shows that a considerable share of the health benefits will accrue to DI communities. Specifically, it shows that 54% of the health benefits accrue to the 20% of the counties that have EnviroScreen score that is equal to or higher than the 80th percentile, which is used to define disproportionately impacted communities experiencing cumulative impacts[12]. As such, the rule contributes to the protection of DI communities and the advancement of environmental justice.

[12] § 24-4-109(5)(a)(I), C.R.S. (2023).

Figure 3. Distribution of the health benefits of this rule with respect to the EnviroScreen score percentile of the counties in the State.



Greenhouse Gas Reductions and the Social Cost of Carbon

Reductions in greenhouse gas emissions will impact climate change. These implications may be quantified in terms of the social cost of carbon, as derived from the Interagency Working Group on Social Cost of Greenhouse Gases, dated February 2021. The social cost of carbon includes the value of all climate change impacts, including changes in net agricultural productivity, human health effects, property damage from increased flood risk, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services.

Table 8: Social Cost of Carbon per ton of Carbon

Year	Social Cost of Carbon/mtCO2 (2.5% discount rate)
2027	$ 85.56
2028	$ 86.87
2029	$ 88.18
2030	$ 89.48
2031	$ 90.84
2032	$ 92.21
2033	$ 93.57
2034	$ 94.93
2035	$ 96.30
2036	$ 97.66
2037	$ 99.02
2038	$ 100.39
2039	$ 101.75
2040	$ 103.11

Adoption of this rule will result in considerable reductions in GHG emissions. The Department estimates that implementation of the rules through 2040 will reduce GHG emissions by 109,096,948 metric tons. Using the social cost of carbon detailed in Table 9, the monetary value of this reduction in GHG emissions is $8.72 billion.

Table 9. Yearly breakdown of the emission savings and the corresponding avoided cost of climate change (in million dollars).

Calendar Year	Colorado Clean Cars (in million dollars)	Avoided social cost of climate change (in million dollars)
2027	1,122,015	$102.0
2028	1,930,776	$172.8
2029	2,866,650	$252.8
2030	3,937,092	$341.2
2031	5,204,250	$444.8
2032	6,571,025	$553.8
2033	7,766,565	$645.5
2034	8,871,865	$727.2
2035	9,819,473	$791.8
2036	10,766,362	$855.2
2037	11,578,182	$905.9
2038	12,290,154	$947.2
2039	12,913,874	$980.4
2040	13,458,665	$1,004.5
2027-2040	109,096,948	**$8,725.2**

Sources: Colorado Legislature (2021), Houk et al. (2023), IWG (2021), and BLS (2023)

Incremental Vehicle Cost Savings

Electric vehicles are expected to reach price parity with conventionally fueled vehicles by 2028, with some longer-range (bigger battery pack) vehicles and pickup trucks reaching parity by 2030. The exception to this is the longest ranged pickup trucks that reach cost parity by 2033. As stated earlier, plug-in electric hybrid vehicles continue to show a cost disadvantage of a few thousand dollars throughout the analysis period. Light-duty conventionally fueled vehicles under this proposal are expected to be similar in price as current models under the business-as-usual case, and so a minimal cost difference is reflected in this analysis, less than $3 per vehicle[13],[14]. There is a cost associated for medium-duty conventionally fueled vehicles that is included. CARB estimates that this cost is less than $500 per vehicle for all gasoline and diesel-powered vehicles averaged together[15].

When all vehicles are averaged together as an aggregate combined fleet cost, there is an overall cost savings after calendar year 2028 (the second year of the program). Under this proposal, there will be a continued availability of conventionally fueled cars and trucks for sale to the motoring public.

Table 10 lists the consumer vehicle cost impacts for the program from its start in 2027 past full implementation through 2040. Both discount rates of 3% and 7% are given to reflect the time value of money. Under the 3% discount rate scenario, a total vehicle cost savings of $8.77 billion is reached through 2040. Only calendar years 2027 and 2028 show a net new vehicle cost impact (negative numbers shown).

[13] CARB Staff, *Advanced Clean Cars II Proposed Amendments to the Low Emission, Zero Emission, and Associated Vehicle Regulations - Standardized Regulatory Impact Assessment (SRIA)*, CARB, January 26, 2022.

[14] CARB Staff Report, *Appendix E. Final Environmental Analysis for the Proposed Advanced Clean Cars II Program*, CARB, August 24 2022.

[15] CARB Staff, *Advanced Clean Cars II Proposed Amendments to the Low Emission, Zero Emission, and Associated Vehicle Regulations - Standardized Regulatory Impact Assessment (SRIA)*, CARB, January 26, 2022.

Table 10. Estimated Consumer Savings on New Vehicle Sales in Colorado (Millions of 2022$)

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	-$157.1	-$145.5
2028	-$37.0	-$33.0
2029	$133.6	$114.7
2030	$331.6	$274.1
2031	$533.6	$424.6
2032	$707.3	$541.7
2033	$799.3	$589.3
2034	$876.0	$621.7
2035	$938.4	$641.1
2036	$936.0	$615.6
2037	$933.1	$590.7
2038	$929.5	$566.4
2039	$925.5	$542.9
2040	$921.1	$520.1
2027-2040	**$8,770.9**	**$5,864.3**

To be conservative, the impacts of state or federal tax credits were not included in the analysis. If federal EV tax credits, which were extended in the Inflation Reduction Act, were included, it is estimated Colorado consumers would see an additional cumulative benefit over the analysis time frame of $4.1-$4.9 billion depending on the discount rate used. While the Colorado legislature recently extended and increased the state ZEV tax credit through HB23-1272 for this analysis the impact is assumed to be neutral since the credits are a benefit to consumers but a cost to the state.

Fuel Cost Savings

Electric vehicles are fundamentally more efficient than internal combustion powered motor vehicles. This increased efficiency directly translates into improved fuel economy. The net effect of this increased fuel efficiency allows electric vehicles to travel further on the same amount of energy as conventionally fueled vehicles. Moreover, electricity costs can be significantly lower priced than gasoline or diesel fuel, especially at home, where the vast majority of charging is estimated to take place.

Direct current fast charging (DCFC) stations tend to be higher in cost than residential charging stations utilizing simple Level 1 or Level 2 chargers, negating some of the cost advantages of operating an electric vehicle. However, the continuing fuel efficiency of electric operation will still result in overall fuel cost savings. Additionally, DCFC stations have the operational advantages of fast charging electric vehicles away from home, or for motorists that do not have access to home or business charging.

Plug-in hybrids have similar advantages to that of battery-electric vehicles when operated on their electric motor only. And, with plug-in hybrid vehicles required to go 43 miles between charges through MY2028 for partial credit, and 70 miles thereafter, for full credit, most in-town travel can be made strictly on electric operation. Table 11 lists the fuel prices used in this analysis in 2022 dollars.

Table 11[16],[17] Annual Fuel Costs for ICE Vehicles and EVs

Calendar Year	Fuel Type		
	ICE- $/gal[18]	EV - $/kW[19]	DCFC - $/kW[20]
2027	$2.94	$0.12	$0.38
2028	$2.93	$0.12	$0.37
2029	$2.93	$0.12	$0.37
2030	$2.94	$0.12	$0.36
2031	$2.95	$0.12	$0.35
2032	$2.94	$0.12	$0.35
2033	$2.96	$0.12	$0.34
2034	$2.97	$0.12	$0.34
2035	$2.99	$0.12	$0.33
2036	$3.00	$0.12	$0.33
2037	$3.04	$0.13	$0.32
2038	$3.04	$0.13	$0.32
2039	$3.06	$0.13	$0.31
2040	$3.07	$0.13	$0.31

[16] *Annual Energy Outlook 2023*, Table: Table 3. Energy Prices by Sector and Source, Case: Reference case | Region: Mountain, EIA, March 16, 2023.
[17] EVgo. 2023. Discover pricing on the go. Colorado region.
[18] https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2023&region=1-8&cases=ref2023&start=2021&end=2050&f=A&linechart=ref2023-d020623a.28-3-AEO2023.1-8&map=&ctype=linechart&sourcekey=0
[19] electricity: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2023&region=1-8&cases=ref2023&start=2021&end=2050&f=A&linechart=~ref2023-d020623a.6-3-AEO2023.1-8&map=&ctype=linechart&sourcekey=0
[20] https://www.evgo.com/pricing/

Vehicle miles traveled (VMT) assumptions used are based on EPA data of population and activity of on-road vehicles from the Motor Vehicle Emissions Simulator (MOVES3) model. These are the same assumptions described and utilized in the emissions analysis. It assumes a 15-year vehicle ownership period for consumer spending on fuel and other operational costs.

The analysis utilizes the inputs documented in ICCT 2022 for home versus public charging, the share of electric versus gasoline driving for PHEVs, and the estimated operational efficiency and cost impacts of towing. Their report assumes that about 95 percent of charging for a 300-mile range BEV is assumed to be completed at home, with the remainder at public Direct Current Fast Charger (DCFC). For 50-mile range PHEVs, the assumed fraction of annual miles traveled on electricity is in the range of 69 percent. The report also accounts for additional DC fast charging to support a proportion of towing miles associated with longer-distance trips, including the efficiency losses anticipated during towing.

The fuel cost savings resulting from this rule is expected to be worth $12.7 billion with a 3% discount rate and $9.2 billion with a 7% discount rate. Table 12 lists these cost savings by calendar year.

Table 12. Estimated Consumer Savings on Fuel in Colorado (Millions of 2022$)

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	$544.7	$504.7
2028	$690.7	$616.1
2029	$822.9	$706.6
2030	$948.8	$784.2
2031	$1,049.2	$834.8
2032	$1,096.2	$839.6
2033	$1,036.6	$764.3
2034	$976.7	$693.2
2035	$918.4	$627.4
2036	$921.5	$606.0
2037	$924.6	$585.3
2038	$925.0	$563.7
2039	$925.9	$543.1
2040	$927.6	$523.8
2027–2040	**$12,708.7**	**$9,192.8**

Maintenance Savings

As well as being more fuel efficient, battery electric vehicles are also much simpler mechanically than conventional vehicles with far fewer moving parts to wear out or that need to be serviced or adjusted. Due to this, maintenance costs will be lower on these vehicles.

For conventional gasoline or diesel fueled vehicles sold under this proposal, costs are expected to remain comparable to current vehicles. They are assumed to have similar maintenance costs to the business-as-usual fleet, fundamentally being the same as current vehicles, though because of the increased engine/vehicle life and extended warranty requirements, these vehicles may be more durable than existing vehicles with savings from that. On the other hand, there may be certain minor increased costs associated with their more robust warranties, parts, and electronics[21].

Plug-in hybrid electric vehicles will have higher maintenance costs than battery electric vehicles since they have both an electrical as well as mechanical internal combustion system. Table 13 lists the values in terms of cost per mile utilized in this analysis.

Table 13. Per-Mile Vehicle Maintenance Costs[22]

Vehicle Model	Vehicle Type		
	ICE	BEV	PHEV
Car	$0.07	$0.036	$0.05
Crossover	$0.07	$0.036	$0.05
SUV	7	$0.036	$0.05
Pickup	$0.09	$0.036	$0.05

Assuming driving patterns do not change between vehicle types, there will be a net benefit or costs savings of $10.1 billion for this program when assuming a 3% discount rate, $7.2 billion cost saving at the 7% discount rate. Table 14 summarizes the projected maintenance savings/benefits of the program by calendar year through 2040.

[21] *Advanced Clean Cars II Proposed Amendments to the Low Emission, Zero Emission, and Associated Vehicle Regulations, Standardized Regulatory Impact Assessment (SRIA)*, California Air Resources Board, Updated: March 29, 2022.

[22] Peter Slowik, et., al., *Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Time Frame*, ICCT, October 2022.

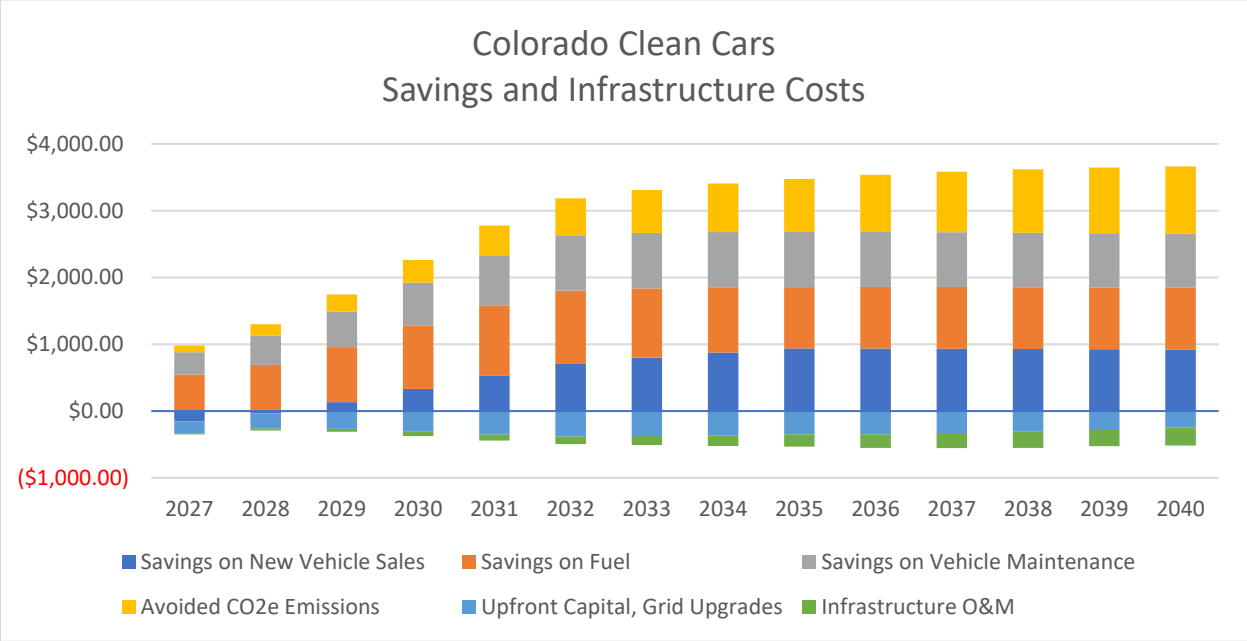
Table 14. Estimated Consumer Savings on Vehicle Maintenance in Colorado (Millions of 2022$)

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	$335.3	$310.7
2028	$437.7	$390.4
2029	$535.8	$460.1
2030	$641.7	$530.4
2031	$750.1	$596.8
2032	$829.3	$635.2
2033	$829.4	$611.5
2034	$828.7	$588.1
2035	$827.0	$565.0
2036	$824.2	$542.0
2037	$820.9	$519.7
2038	$817.1	$497.9
2039	$812.8	$476.8
2040	$808.1	$456.3
2027–2040	$10,098.2	$7,181.0

Summary of Savings

The savings from this rule include savings on new vehicle sales, fuel, vehicle maintenance, health savings, and the avoided cost of climate change from CO2e Emissions. These savings add up to $41 billion. The cost that impact these savings include charging infrastructure upfront capital and grid upgrades as well as infrastructure O&M, adding up to $6.3 billion. Taken together, the rule has a benefit-to-cost ratio of 6.5, meaning that for each dollar in cost, there will be at least $6.5 in benefits when comparing program savings to infrastructure costs. These figures do not include other potential benefits of the rule, such as the utilization of federal tax credits, and the potential for reduced electric utility rates due to increased utilization of the electric grid. State fees and taxes are also not included.

Figure 4. Savings and Infrastructure Costs, 3% discount rate (figures in million $)



3. **The anticipated costs of the rule or amendment, which shall include the direct costs to the government to administer the rule or amendment and the direct and indirect costs to business and other entities required to comply with the rule or amendment.**

Direct Costs to Government

Direct costs to the government are reduced since Colorado is incorporating through reference California's Clean Cars requirements. This permits Colorado to share general administration and enforcement of the program with the State of California, much like states do with federal new car standards. This lessens the regulatory burden on the state.

The Division will require an additional 1.0 FTE to assist in administering the Colorado Clean Cars Rule. The additional staff will be necessary to monitor environmental justice (EJ) requirements, coordinate with dealers for the financial assistance program, and oversee the community-based clean mobility program, as well as other duties as assigned. The cost to the state is expected to be approximately $105,250 for the first year, of which $87,600 would be for staff salary and benefits. Associated support equipment and administrative costs will be $18,150 in computer equipment and office supplies.

Infrastructure Costs

To support the growing population of battery electric vehicles and plug-in electric hybrids, additional charging and infrastructure is necessary. While there has been tremendous growth in support infrastructure in the recent past due to the continued adoption of electric vehicles and investments by the federal government, State of Colorado, electric utilities, and private entities, such infrastructure will need to be expanded to even a larger extent than under this rule. For the conventionally fueled portion of the fleet subject to this rule, it is expected that the existing infrastructure already in place will be adequate for any new production conventionally fueled vehicles produced under this rule.

It is projected that infrastructure costs under this rule are expected to be between $3.1 and $4.3 billion with operational and maintenance costs of between $1.4 and $2.0 billion through 2040, depending on discount rates utilized. In deriving these costs, the analysis looked at the number of needed recharging installations, their average cost, attendant maintenance costs, and grid upgrade per recharging installation.

Charging Infrastructure

A study commissioned by the Colorado Energy Office in 2021 that estimated the type, number, and cost of various types of chargers needed to meet the state's 2030 EV sales goals was updated to reflect the EV adoption scenarios examined for this rule[23]. Data from this updated analysis was then used to determine the capital and grid upgrade costs as well as the operation & maintenance cost.

The number of new charger installations required by the proposal is estimated to be 1.6 million by 2040. This compares to 315,000 new installations under the business-as-usual scenario.

[23] Chih-Wei Hsu, et. Al., *Colorado Charging Infrastructure Needs to Reach Electric Vehicle Goals*, ICCT, February 25, 2021

Table 15. Number of New Charger Installations

Calendar Year	BAU	Colorado Clean Cars
2027	26,815	68,721
2028	26,291	81,033
2029	25,747	93,357
2030	25,118	107,220
2031	25,039	122,347
2032	24,627	134,369
2033	23,963	136,155
2034	23,055	137,109
2035	21,984	136,399
2036	20,909	135,295
2037	19,589	131,892
2038	18,432	126,919
2039	17,407	114,702
2040	16,412	108,319
2027-2040	**315,388**	**1,633,837**

Source: ICCT (2023)

Home chargers are estimated to cost between $1,082 to $4,084 per unit depending on the charger level (1 or 2). Large direct current fast charging (DCFC) units are projected to cost an average of $125,962 over the study period. The following table lists these costs for the different level chargers by calendar year.

Table 16. Cost of Charging Infrastructure Upfront Capital and Grid Upgrade Costs by Charger Type* (2022$, undiscounted)

Calendar Year	Home Level 1	Home Level 2	Workplace	Public Level 2	DCFC**
2027	$1,111	$4,096	$5,208	$8,068	$116,587
2028	$1,105	$4,090	$5,188	$7,983	$119,245
2029	$1,100	$4,085	$5,169	$7,901	$121,965
2030	$1,095	$4,081	$5,152	$7,823	$123,943
2031	$1,090	$4,078	$5,137	$7,748	$125,221
2032	$1,085	$4,076	$5,122	$7,676	$126,355
2033	$1,081	$4,075	$5,110	$7,607	$127,585
2034	$1,077	$4,075	$5,098	$7,542	$128,180
2035	$1,074	$4,077	$5,088	$7,479	$128,687
2036	$1,071	$4,079	$5,080	$7,420	$129,294
2037	$1,068	$4,083	$5,073	$7,364	$129,907
2038	$1,066	$4,087	$5,067	$7,310	$129,882
2039	$1,064	$4,093	$5,063	$7,259	$128,816
2040	$1,062	$4,100	$5,060	$7,211	$127,806
Average	**$1,082**	**$4,084**	**$5,115**	**$7,599**	**$125,962**

Source: ICCT (2023)
*These estimates include costs for installation, hardware, and grid upgrades.
**The cost for DCFCs represents a mix of 50-, 150-, and 350-kW chargers that changes over time based on the assumed mix of these three different types of fast chargers. For example, in 2025, the DCFC upfront capital and grid upgrade cost represents a mix of 61 percent 50-kW, 37 percent 150-kW, and 2 percent 350-kW DCFCs. In 2030, the DCFC O&M cost represents a mix of 40 percent 50-kW, 57 percent 150-kW, and 3 percent 350-kW DCFCs.

Operation and Maintenance (O&M) costs for electric vehicle charging units are a necessary component in determining total infrastructure costs. They range from $6 annually for a simple Level 1 home charging unit to $8,175 annually for a large DCFC charging unit.

Operational and maintenance costs were provided by ICCT and include data on costs from Avista[24] that include planned and unplanned charger maintenance, network fees, connection restoration, testing, site maintenance, and land use. The costs also include estimates of demand charges based on Xcel Energy (2023)[25] and are about $3.50 per kilowatt per month in 2027. The analysis assumes chargers have a 10-year lifetime. Network fees are included for home Level 2 chargers for multi-family housing to allow for individual billing, as well as for all public chargers. Networking costs as well as site maintenance, land use, and demand charges do not apply to single-family home charging. The following table lists these costs for the different level chargers by calendar year.

[24] Rendall Farley, P.E, et. al., *Electric Vehicle Supply Equipment Pilot Final Report,* Avista, October 18, 2019.
[25] *January 2023 Colorado Business Rate Brochure*, Xcel Energy, 2023.

Table 17. Cost of Charging Infrastructure Operation and Maintenance by Charger Type* (2022$, undiscounted)

Calendar Year	Home Level 1	Home Level 2	Workplace	Public Level 2	DCFC*
2027	$6	$228	$470	$975	$5,813
2028	$6	$228	$476	$982	$6,207
2029	$6	$228	$483	$988	$6,656
2030	$6	$228	$490	$995	$7,059
2031	$6	$228	$497	$1,002	$7,415
2032	$6	$228	$504	$1,009	$7,743
2033	$6	$228	$512	$1,017	$8,122
2034	$6	$228	$519	$1,025	$8,450
2035	$6	$228	$527	$1,032	$8,748
2036	$6	$228	$535	$1,040	$9,097
2037	$6	$228	$543	$1,049	$9,458
2038	$6	$228	$552	$1,057	$9,721
2039	$6	$228	$561	$1,066	$9,892
2040	$6	$228	$569	$1,075	$10,068
Average	**$6**	**$228**	**$517**	**$1,022**	**$8,175**

Source: ICCT (2023)
*The DCFC category represents a mix of 50-, 150-, and 350-kW DCFCs that change over time, as described above in Table 2.

Based upon the number of recharger units needed to meet the proposed rule and the costs associated with these units and their maintenance, a total cost for upfront capital and grid upgrades may be calculated, as shown in Table 18.

Table 18. Estimated Expenditures on Charging Infrastructure Upfront Capital and Grid Upgrades (Millions of 2022$)

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	$181.9	$168.6
2028	$225.6	$201.2
2029	$265.9	$228.3
2030	$309.0	$255.4
2031	$352.8	$280.7
2032	$380.8	$291.7
2033	$371.9	$274.2
2034	$362.5	$257.2
2035	$349.1	$238.5
2036	$347.3	$228.4
2037	$329.8	$208.8
2038	$308.5	$188.0
2039	$268.6	$157.6
2040	$245.9	$138.9
2027-2040	**$4,299.5**	**$3,117.3**

Sources: ICCT (2021), ICCT (2023), and BLS (2023)

Ongoing maintenance of necessary charging units need to meet this proposal (above and beyond those needed in a business-as-usual case), are listed in Table19.

Table 19. Estimated Expenditures on Charging Infrastructure Operation and Maintenance (Millions of 2022$)

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	$11.9	$11.1
2028	$26.8	$23.9
2029	$44.2	$38.0
2030	$64.7	$53.4
2031	$87.9	$69.9
2032	$112.9	$86.4
2033	$137.2	$101.1
2034	$160.7	$114.1
2035	$182.7	$124.8
2036	$204.0	$134.2
2037	$223.9	$141.7
2038	$242.1	$147.5
2039	$257.3	$150.9
2040	$270.7	$152.9
2027-2040	**$2,026.9**	**$1,350.0**

Sources: ICCT (2021), ICCT (2023), and BLS (2023)

For public chargers it is hard to determine how much charging providers will pass on both capital and operation and maintenance costs to consumers through their fees for public charging. As a result, this analysis does not attempt to quantify the proportion of capital or operation and maintenance costs that may be passed on to consumers and reflected in the price of charging. This analysis thus represents a conservative approach, as some of the costs to consumers for public charging may also be represented in the capital and operating costs summarized in this section.

The primary costs to consumers of this rule is anticipated to primarily be for the installation of home chargers (Home Level 1 and 2), which represent a large proportion of the anticipated infrastructure costs. Nevertheless, this analysis takes a conservative approach and estimates the cost of the full network of different types of chargers needed to support the transition to ZEVs, though other state, utility, and federal policies and programs are driving much of the investment, particularly for public charging, independently of this proposed rule.

Direct and Indirect Costs to Businesses and Other Entities to Comply

There are certain direct and indirect costs to businesses that are associated with this rule. Though the rule will result in overall total health and cost savings to the public and society, businesses reliant on the production, repair and maintenance, and services that include providing gasoline and diesel fuel to conventional vehicles will be impacted. Businesses expected to be impacted by this rule include automobile manufacturers and parts suppliers, car dealers and dealerships, vehicle repair facilities, fuel providers, distributors and jobbers, as well as retail fuel and service stations.

Electric vehicles are projected to become less expensive than conventionally fueled vehicles. This will translate into reduced income for new vehicle dealerships, as well as potentially also affecting used vehicle dealers in the longer term. As the bulk of revenues received from the purchasing of new motor vehicles pass to the vehicle manufacturers, much of this reduction in lost vehicle revenue will be borne by out-of-state vehicle manufactures who may be able to adjust their business practices to compensate for this.

Reduced maintenance costs will result from the adoption of battery electric vehicles as well as plug-in hybrid electric vehicles. This will reduce the income seen by dealership maintenance departments as well as independent repair facilities.

A decline in gasoline and diesel fuel demand will result as battery electric and plug-in hybrid vehicles make up a greater proportion of the automotive fleet. It must be noted that this decrease in demand from electric vehicles is just one of several factors that will depress future fuel sales. Increasing fuel efficiency of new vehicles is already impacting fuel demand.

Overall, the loss of business, and/or income, for car dealers and dealerships, repair shops, and refiners and producers, and fuel suppliers, including retail refueling stations, will translate in the reduction in the number of jobs that are dependent on the sale, maintenance and servicing of those vehicles. While businesses may modify their business operations such as convenience store/refueling outlets adding quick charging stations as part of their business, the number of positions needed to produce, sell, and service conventional vehicles will decline. Switching a business' emphasis to catering to electric vehicles could shift some of these jobs to new positions prevalent with the switch to electric vehicles. Already, certain large oil companies, such as BP have been divesting into other energy fields such as renewable energy (*Top Oil Companies Investing in Renewable Energy*, The Motley Fool, May 12, 2023).

As shown in Table 20, depending on the discount rate, the total decrease in spending non affected parities range from $20.1 to $28.7 billion, depending on the discount rate chosen.

Table 20. Total Decrease in Spending on Vehicle Sales and Ownership in Affected Industries in Colorado (Millions of 2022$).

Calendar Year	Colorado Clean Cars	
	3% discount rate	7% discount rate
2027	-$601.5	-$557.4
2028	-$940.8	-$839.2
2029	-$1,316.2	-$1,130.1
2030	-$1,719.2	-$1,421.0
2031	-$2,102.8	-$1,673.1
2032	-$2,385.4	-$1,827.0
2033	-$2,425.6	-$1,788.3
2034	-$2,448.3	-$1,737.6
2035	-$2,456.5	-$1,678.2
2036	-$2,455.4	-$1,614.8
2037	-$2,453.3	-$1,553.1
2038	-$2,447.5	-$1,491.5
2039	-$2,455.0	-$1,440.2
2040	-$2,463.3	-$1,391.0
2027-2040	**-$28,670.7**	**-$20,142.2**

Sources: ICCT (2022), ICCT (2023), EIA (2023), and BLS (2023)

The result of decrease vehicle spending on conventional vehicles does reduce the number of corresponding job positions in support of the vehicles, along with job creation in supporting and servicing electric vehicles. As discussed above, many of the business impacts will be felt by out-of-state vehicle manufacturers and fuel producers and providers, whose operational flexibility could shift vehicles and products to other more profitable regions. Similarly, job positions affected will be felt out-of-state. Affected in-state staffing would occur in vehicle dealerships and other car outlets, local vehicle maintenance facilities, and retail fuel outlets, among other businesses. Table 5 above details these job changes.

4. **Any adverse effects on the economy, consumer, private markets, small businesses, job creation, and economic competitiveness.**

The rule will have overall health and environmental cost benefits, as well as significant economic savings for vehicle owners. As with any new technology, the introduction of electric vehicles will create disruptions in current vehicle sales and usage practices. This rule will speed up these disruptions, but given current manufacturing trends, these disruptions will occur absent the rules. In fact, the adoption of proposed Regulation No. 20 may smooth out the transition to the introduction of electric vehicles into the vehicle fleet through early adoption and prevent more lasting adverse effects later by encouraging the development of vehicle markets, infrastructure, and operational awareness of these vehicles in the near term. This may improve Colorado's economic competitiveness in the future.

The introduction, operation and maintenance of battery electric and plug-in hybrid vehicles will experience certain economic impacts, detailed earlier, when purchasing, operating, and maintaining a vehicle. Necessary infrastructure to support these vehicles will have to be put into place, from recharging units to electrical distribution upgrades. Electric providers will have to expand and upgrade their energy generation and distribution network. Of note is that these changes will occur over an extended period of time, lessening their immediate impacts.

For some owners, the entry into battery electric vehicles may be more burdensome than to others. Under this proposal, owners will still be free to choose traditionally fueled vehicles that meet the more stringent emissions standard averages being proposed. Conventionally fueled vehicles will remain available under this proposal.

Vehicle technicians that are involved in vehicle maintenance may be impacted, though it will take a period of time for fleet turn over to affect a transition to a predominately electric vehicle fleet. While not quantified, additional training may be necessary for those technicians working on electric vehicles. Reduction in the need for maintenance of these vehicles may also have an impact. There will be a motorist savings of $10.09 billion dollars in maintenance costs through 2040, which will translate into a loss of income of roughly the same amount.

Fuel providers, distributors, and marketers will be impacted by the loss of business with the introduction of battery electric vehicles and plug-in hybrid vehicles. As stated above, there will be a motorist savings of $12.7 billion dollars of business through 2040, which will translate into a loss of income of roughly the same amount. Much of this loss will be incurred from products imported into the state, so the localized impact for Colorado may be mitigated to a certain extent.

5. At least two alternatives to the proposed rule or amendment that can be identified by the submitting agency or a member of the public, including the costs and benefits of pursuing each of the alternatives identified.

No action:

Section 177 of the federal Clean Air Act (CAA) allows states to adopt California standards for vehicles sold within their borders.[26] Under the identicality requirements of section 177, states are not allowed to develop their own standards. This identicality standard was adopted to create a very narrow exception to the Federal government's broad jurisdictional preemption of new motor vehicle emission standards.[27]

[26] 42 U.S.C § 7507.

[27] *Id. See also* Washington v. General Motors Corp., 406 U.S. 109 (1972).

The CAA is clear, however, that states must utilize either Federal or California vehicle standards. Given this jurisdictional preemption, Colorado's alternatives with respect to light and medium-duty vehicle standards are very limited. The most obvious alternative is the no-action alternative whereby the Commission would not adopt any new program and instead allow Colorado to be subject to federal vehicle standards. Alternatively, the Commission could adopt pieces of the Division's proposal. While Colorado cannot create its own vehicle standards, it is not prohibited from adopting portions of the California program.

By definition, the no-action alternative will not result in any additional costs or benefits relative to the current state. However, because the package of proposed rules is projected to result in both significant emission reduction benefits and significant cost-savings, the no-action alternative will result in a lost opportunity to achieve the projected benefits and savings. As detailed above, the package of proposed rules is projected to reduce GHG emissions by 109,096,948 metric tons of CO2e, NOx emissions by 18,657 tons, and PM2.5 by 1,317 tons. Overall financial savings from the proposed rules are estimated at approximately $41 billion dollars. These benefits and savings will not be achieved under the no-action alternative.

Adoption of the rule through 2035:

A second alternative would be to adopt California's new vehicle standards through the model year 2035 and beyond.[28] Under this scenario, savings in direct spending by consumers on vehicle sales and ownership in this scenario would range from $25.2 billion to $35.0 billion for the 3% and 7% discount rates. The indirect and induced impacts on economic output would range from $32.6 billion to $45.3 billion for the 3% and 7% discount rates, although this figure would decrease if consumers chose to just save the money not spent on vehicle sales and ownership instead of spending it on other goods and services. Employment impacts would increase annually to a total in 2032 of 27,120 FTEs gains and then decrease in future years due to the projected end of the federal and state tax credits in 2032.

Expenditures on charging infrastructure, including upfront capital, grid upgrades, and ongoing O&M would result in a total economic impact of $9.9 billion to $14.1 billion for the 3% and 7% discount rates. The employment impact from this investment would result in a high number of jobs, peaking at 9,724 FTEs in 2039.

The total economic benefits of avoided GHG emissions of this scenario (2035) range from $6.7 billion to $10.0 billion for the 3% and 7% discount rates. The health benefits from this rule are estimated to be worth $687,997,075.

[28] One of the parties to the rulemaking (Environmental Advocates) has proposed this as an alternative proposal and submitted a Final Economic Impact Analysis (EA_REB_EX-005) in support of that alternative proposal which is incorporated here by reference and linked here.
https://drive.google.com/drive/u/0/folders/13RMiq8d2gxl1-RKyGb8Xipc7Ni9Hetx2