REGULATORY ANALYSIS

Proposed Revisions to
Colorado Air Quality Control Commission
Regulation Number 20
5 CCR 1001-24

Pursuant to C.R.S. § 24-4-103(4.5)

Hearing Date: August 13-16, 2019

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INTRODUCTION

The proposed amendment to AQCC Regulation Number 20 ("Proposal"), Colorado Low Emission Automobile Regulation (also known as "CLEAR"), was developed to address ongoing air quality concerns in Colorado regarding motor vehicle emissions and in response to Governor Polis' Executive Order B 2019 - 002 "Supporting a Transition to Zero Emission Vehicles." In his executive order, the Governor directed the Colorado Department of Public Health and Environment to:

> *Develop a rule to establish a Colorado Zero Emission Vehicle program, pursuant to Colorado's authority under section 177 of the Clean Air Act, 42 U.S.C. § 7507, and [] propose that rule to the Air Quality Control Commission no later than May 2019 for possible adoption into the Code of Colorado Regulations before October 30, 2019.*

The purpose of the Proposal is to ensure ongoing criteria pollutant and greenhouse gas emissions reductions from new vehicles entering Colorado's fleet even while the fleet continues to grow with population. The recent Executive Order and this Proposal are taken in furtherance of Executive Order D 2017 – 015, establishing a goal of reducing greenhouse gas emissions statewide by 2025, and Executive Order D 2018 – 006, establishing a Low Emission Vehicle program.[1]

[1] Even before Governor Polis' Executive Order, the AQCC had independently directed the Division to develop a proposed ZEV rule for its consideration after substantial interest for the ZEV standards was expressed as part of the LEV rulemaking.

Transportation is one of the principal contributors to air pollution in Colorado, including greenhouse gas emissions[2] and precursors to the formation of ozone, a major summer-time air quality issue that the state has been grappling with for decades.[3] Moreover, the transportation sector is the nation's largest source of greenhouse gas emissions and will soon be Colorado's as the state's energy sector becomes cleaner.[4] As stated in Executive Order B 2019 - 002, the Proposal "will empower more Coloradans to choose a cleaner future".

This proposed amendment to Regulation Number 20 adds ZEV provisions to CLEAR by incorporating by reference the California Code of Regulations, Title 13, Sections 1962.2 and 1962.3 *Zero-Emission Vehicle Standards for 2018 and Subsequent Model Year Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.* This part of the regulation will set a minimum ZEV credit percentage requirement for each vehicle manufacturer, depending on their size. Each manufacturer that produces and delivers for sale in Colorado for model year 2023 and beyond will have to meet the requirement by selling a percentage of their vehicles as ZEVs.

ZEVs expected to be offered in Colorado in model year 2023 through 2030 are Battery Electric Vehicles (BEVs) and Plug in Hybrid Electric vehicles (PHEVs). For simplicity, this analysis assumes that only BEVs and PHEVs will be used for compliance with the Proposal through model year 2030. However, the Proposal does not discriminate against other types of ZEVs, such as fuel cell electric vehicles, which could also be used for compliance. The number of vehicles that the credit percentage ZEV requirement is applied to for the given model year is based on the three-year average of the manufacturer's volume of passenger cars (PCs) and light-duty trucks (LDTs) produced and delivered for sale in Colorado in the prior second, third, and fourth model year.[5] For example, 2023 model year ZEV requirements will be based on Colorado production volume average of PCs and LDTs for 2019 to 2021 model years. This production averaging is used to determine ZEV requirements only.

The Colorado Department of Public Health and Environment, Air Pollution Control Division (Division) hereby submits this Regulatory Analysis (RA) pursuant to the requirements set forth in the Colorado Administrative Procedures Act (APA) C.R.S. § 24-4-103(4.5). This RA is formatted such that each requirement for an RA under C.R.S. §§ 24-4-103(4.5)(a)(I) - (VI) is addressed as its own section.

[2] Heald, S., Colorado Department of Public Health and Environment, *Draft Colorado Greenhouse Gas Inventory 2019 Including Projections to 2020 & 2030* (July 5, 2019).
[3] Moderate Area Ozone SIP for the Denver Metro and North Front Range Nonattainment Area, *State Implementation Plan for the 2008 8-Hour Ozone National Ambient Air Quality Standard*, at 4-11.
[4] Governor Jared S. Polis, Executive Order B 2019-002, *Supporting a Transition to Zero Emissions Vehicles* (2019).
[5] 13 Cal. Code Regs § 1962.2(b).

QUANTIFICATION OF DATA

APA § 24-4-103(4.5)(b) calls for, to the extent practicable, a quantification of the data for both short-term and long-term consequences underlying the regulatory analysis. This quantification is provided, as applicable, in the context of sections (I) - (VI) below. For further quantification of the data for both the long- and short- term consequences of the proposed rule, refer also to the Cost Benefit Analysis and Final Economic Impact Analysis prepared as part of this proceeding. These documents include additional detail on the direct and indirect costs and benefits of the Proposal.

(I) A DESCRIPTION OF THE CLASSES OF PERSONS WHO WILL BE AFFECTED BY THE PROPOSED RULE, INCLUDING CLASSES THAT WILL BEAR THE COSTS OF THE PROPOSED RULE AND CLASSES THAT WILL BENEFIT FROM THE PROPOSED RULE

The Proposal sets minimum ZEV credit percentage requirements for each vehicle manufacturer that sells automobiles in Colorado for model years 2023 - 2030. Credit requirements in the Proposal vary, depending on the size of a manufacturer. Therefore, the primary persons directly affected by the Proposal are the automobile manufacturers that provide vehicles for sale in the state.

The Colorado Automobile Dealers Association (CADA), which is a party to this rulemaking, represents 260 franchised motor vehicle dealers. According to CADA, its members provide more than 43,000 jobs throughout Colorado and contributed $1.1 billion in total compensation to Colorado residents in 2016. Through sales and service of vehicles and the sales of parts for vehicles, Colorado's auto industry makes up approximately 22% of Colorado's sales tax base.[6] Automobile dealers may bear indirect costs of the Proposal in the form of lost revenue from vehicle maintenance and repair that would have been otherwise realized from the sale of conventional gasoline powered vehicles. Those costs to the auto dealers, described in Section II below, are realized as savings to the consumer. Auto dealers may also see related costs in advertising and training due to the expansion in ZEV availability at dealerships. No information has been provided on the potential economic incentives manufacturers may provide dealers to incentivize ZEV sales.

Colorado's new vehicle consumers who take advantage of the increased availability of ZEVs for sale in Colorado will see benefits in the form of overall cost savings on fuel and vehicle maintenance and repair. It is also expected that the Proposal will result in the greater availability of ZEV models to interested consumers. Providers of ZEVs and EV infrastructure stand to gain economically from the Proposal. The Division's estimated cost savings to consumers are described in Section II below. The public will also benefit from the Proposal due to substantial reductions in ozone forming and greenhouse gas emissions from new motor vehicles in the state. Vehicle tailpipe emissions from Colorado's fleet are expected to decrease, and decreased fuel sales will result in an added benefit of reduced evaporative emissions at the pump. The Division's estimated emission reductions resulting from the Proposal are also described in Section II.

[6] *See* CADA REB at 1.

(II) TO THE EXTENT PRACTICABLE, A DESCRIPTION OF THE PROBABLE QUANTITATIVE AND QUALITATIVE IMPACT OF THE PROPOSED RULE, ECONOMIC OR OTHERWISE, UPON AFFECTED CLASSES OF PERSONS

This section describes the probable quantitative and qualitative impact of the Proposal upon the aforementioned classes of persons. The Division's estimated costs and benefits were already qualified and quantified in the Final Economic Impact Analysis and the associated Cost Benefit Analysis; therefore, the information in this section is largely duplicative of what is presented in those documents.

In development of the Division's Final Economic Impact Analysis and the associated Cost Benefit Analysis, the Division developed an Excel spreadsheet (CO ZEV Calculator) that predicts total new ZEV sales required to comply with the proposed ZEV regulation for model years 2023-2030. The Colorado ZEV Calculator was developed based on the California ZEV Calculator.[7] Several scenarios were evaluated. These scenarios are based upon the minimum level of compliance necessary to meet the ZEV program requirements based on today's technological assumptions and trends. The Division developed an additional Excel spreadsheet calculator (Cost and Benefit Calculator) that estimates air quality benefits and monetary costs of the Proposal for each compliance scenario.

A. Zev Regulatory Compliance Assumptions

This section presents the most likely scenario for ZEV compliance in Colorado for model years 2023 to 2030. The scenario is based on assumptions used in CARB ZEV Calculator Scenario 1 – Mid-Range ZEV Technology Advancement Case, an evaluation of today's (2019) electric vehicle technology, and adjustments based on Colorado-specific conditions.

The Colorado ZEV compliance scenario represents a Colorado-specific vehicle mix of BEV and PHEVs that could be used to meet ZEV program credit requirement for model years 2023 through 2030.[8] The Division used this compliance scenario to determine the costs for original equipment (vehicle) manufacturers to meet the regulatory requirements, based on Colorado's new vehicle sales.

The total new vehicle sales figures for model year 2018 were obtained from data provided by IHS Markit (Polk). For this analysis, annual sales were predicted to increase by one percent each year.

[7] *See* California Air Resources Board, ZEV Regulatory Calculator (2019), https://ww2.arb.ca.gov/resources/documents/zev-regulatory-calculator.

[8] Per 13 Cal. Code Regs § 1962.2, the requirement for model year 2026 and beyond is the same as for model year 2025.

The electric vehicle range assumptions used in the Colorado compliance scenario are adjusted based on assumptions in CARB's Scenario 1, today's technology of the available ZEVs, and what has been announced for the future BEV and PHEV models. This scenario assumed 5% annual growth in electric range for BEVs starting from 192.5 miles per charge[9] in model year 2018. For non-US06[10] PHEVs, the range reaches 55 miles per charge starting at model year 2023. These ranges are in label range which can be converted to UDDS test cycle range by dividing by 0.7. ZEV credits are calculated based on UDDS test cycle range.

This section also assumes that by model year 2023, the majority of Large Volume Manufacturers (LVMs) and Intermediate Volume Manufacturers (IVMs) will focus on BEV technology rather than PHEV technology since BEVs earn more credits than PHEVs.[11] Both LVMs and IVMs are likely to focus on BEV sales for compliance with the proposed ZEV program because many sources predict battery costs will go down significantly in the coming years.[12] Moreover, BEVs are predicted to reach price parity with conventional vehicles by 2024 - 2028.[13] The Colorado ZEV compliance scenario presented in this analysis represents a likely ZEV vehicle mix of 75% BEV and 25% PHEV to be used to meet ZEV program requirements in model year 2023 through 2030.

The Colorado ZEV compliance scenario is not a market forecast of what actual total sales may be or will likely be in any given model year but rather a minimum compliance projection using the best information reasonably available at the time of this analysis.

Table 1 below shows BEV and PHEV sales assumptions for the Colorado compliance scenario and the predicted light-duty vehicles sales for model years 2023-2030. These assumptions are used throughout this section for estimating quantifiable costs and benefits of the ZEV program in Colorado. The costs and benefits for the ZEV program requirements are calculated based on the predicted number of ZEV sales required for compliance with the Proposal. The projected costs and benefits were then compared to determine the cost-effectiveness of the requirements, which are examined later in this analysis and in the Division's Final Economic Impact Analysis.

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[9] EVAdoption, *BEV Models Currently Available in the US as of May 5, 2019*, https://evadoption.com/ev-models/bev-models-currently-available-in-the-us/.

[10] EPA US06 or Supplemental Federal Test Procedures (SFTP) represents aggressive, high speed and/or high acceleration driving, rapid speed fluctuations and driving behavior following startup. Per 13 Cal. Code Regs § 1962.2, TZEVs with US06 all electric range capability (AER) of at least 10 miles shall earn an additional 0.2 allowance. Currently most PHEVs on the market and for future production are not certified to US-06 test cycle (non-US06 PHEVs).

[11] 13 Cal. Code Regs § 1962.2(c)(3)(A).

[12] Nic Lutsey and Michael Nicholas, *Update on Electric Vehicle Costs in the United States Through 2030*, The International Council on Clean Transportation (April 2, 2019), https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf. APCD PHS EX D.

[13] *Id.*

Table 1
Colorado Regulatory Compliance Scenario

Model Year	Light-duty Vehicle Sales	BEV	PHEV	Total	% of Total
2023	264,983	9,248	3,628	12,876	4.86%
2024	267,633	10,836	4,014	14,851	5.55%
2025	270,309	12,455	4,377	16,833	6.23%
2026	273,012	12,587	4,272	16,859	6.18%
2027	275,742	12,720	4,168	16,887	6.12%
2028	278,500	12,854	4,073	16,926	6.08%
2029	281,285	12,989	4,113	17,103	6.08%
2030	284,097	13,126	4,154	17,280	6.08%

B. Fuel Savings

Electrified vehicles, such as PHEVs and BEVs, are more energy-efficient than conventional vehicles. While the LEV III conventional vehicle standards assure that Colorado's fleet continues to see lower emissions and improved fuel economy, conventional vehicles are still significantly less efficient than electrified vehicles, particularly BEVs.

Expected fuel economy was determined using LEV III standards for gasoline powered vehicles. U.S. EPA fuel economy data was used for the gasoline fraction of plug-in hybrid operation.[14] This analysis assumes that PHEVs operate 75% of the time on electric batteries and 25% on gasoline power, based on the U.S. EPA fuel economy calculation. It also assumes that most PHEVs and BEVs will charge at home using a level 2 charging system and at residential electric rates of $0.1214 per kWh (Colorado average).[15] This analysis assumes that ZEV owners will use public fast charging stations ten percent of the time with a charging rate of $0.28 per kWh, based on fast charge rates quoted by Tesla. Other data sources such as Smart Charge America reference similar rates.

[14] The Annual Energy Outlook 2019, Appendix A Reference Case was used for the price of gasoline. U.S. Energy Information Administration, *Annual Energy Outlook 2019* (January 24, 2019) https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf. APCD PHS EX H.
[15] U.S. Energy Information Administration, *Electric Power Monthly with Data for December 2018* (March 15, 2019), https://www.eia.gov/electricity/monthly/archive/february2019.pdf, at Table 5.6.B. APCD PHS EX I.

Fuel cost savings, shown in Table 2, are split between program lifetime benefits for combined BEVs and PHEVs and the first five years of ownership, representing a hypothetical first owner. Assuming a vehicle lifespan of 150,000 miles, estimated fuel benefits are shown in millions of dollars by model year from 2023 through 2030.

Table 2
Fuel Cost Savings (in million $)

Model Year	Lifetime	First Five Years
	All Vehicles	All Vehicles
2023	$66.01	$33.05
2024	$76.13	$37.28
2025	$87.37	$42.51
2026	$89.57	$43.91
2027	$91.66	$45.23
2028	$93.68	$46.46
2029	$96.32	$47.96
2030	$98.85	$49.36
Total	**$699.59**	**$345.77**

Fuel cost savings are also shown as net present value in Table 3. Present value represents what the future savings are and converts this savings into what the cost of money represents today. Table 5 shows the current value for fuel savings utilizing a 3% discount rate.

Table 3
Fuel Cost Savings – Net Present Value (in million $)

Model Year	Lifetime	First Five Years
	All Vehicles	All Vehicles
2023	$57.23	$30.83
2024	$65.81	$34.69
2025	$75.45	$39.50
2026	$77.39	$40.81
2027	$79.24	$42.04
2028	$81.03	$43.20
2029	$83.35	$44.60
2030	$85.57	$45.92
Total	**$605.07**	**$321.59**

C. Maintenance and Repair Savings

Costs and benefits associated with reduced maintenance and repair costs were also examined. Operating costs of $0.06 per mile for cars and $0.076 per mile for SUVs were assumed for conventional vehicles. Maintenance and repair costs for BEVs were assumed to be $0.024 per mile for cars and $0.03.6 per mile for SUVs. Maintenance and repair costs for PHEVs were assumed to be $0.042 per mile for cars and $0.055 per mile for SUVs.

Using these values, BEVs and PHEVs as a group have significant operational and maintenance savings associated with ownership compared to conventional vehicles. As Table 4 below shows, total maintenance savings to consumers of $666 million are estimated to occur from 2023 through 2030 model year vehicles. During the first 5 years of ownership, consumers would save $344.90 million under this scenario.

Table 4
Maintenance Savings (in million $)

Model Year	Lifetime	First Five Years
	All Vehicles	All Vehicles
2023	$65.12	$33.72
2024	$75.59	$39.14
2025	$86.16	$44.62
2026	$86.61	$44.85
2027	$87.07	$45.09
2028	$87.56	$45.35
2029	$88.48	$45.82
2030	$89.41	$46.30
Total	**$666.00**	**$344.90**

As with fuel savings, there is a current value placed on future maintenance and repair savings. Table 5 shows the maintenance and cost savings represented in current value utilizing a 3% discount rate.

Table 5
Maintenance Savings – Net Present Value (in million $)

Model Year	Lifetime	First Five Years
	All Vehicles	All Vehicles
2023	$56.58	$31.40
2024	$65.67	$36.44
2025	$74.85	$41.54
2026	$75.24	$41.76
2027	$75.64	$41.98
2028	$76.08	$42.22
2029	$76.87	$42.66
2030	$77.68	$43.11
Total	**$578.61**	**$321.10**

Table 6 shows a summary of the expected cumulative costs and savings of the Proposal. As shown in Table 6, greater vehicle costs for BEVs and PHEVs are offset by the fuel cost savings and maintenance savings. The total cost of the Proposal for model years 2023-2025 results in a lifetime savings of $235.78 million to consumers. The cost savings for model years 2026-2030 is $832.98 million. The total cost savings from model years 2023-2030 is expected to be $1.07 billion.

Table 6
Cumulative Cost Savings of the Proposal (in million $)

Model Year	Incremental Vehicle Cost			Fuel Cost Savings		Maintenance Savings	
	BEV	PHEV	Total	Lifetime Average	First 5 Years Average	Lifetime Average	First 5 Years Average
2023	-$58.30	-$23.01	-$81.30	$66.01	$33.05	$65.12	$33.72
2024	-$50.25	-$24.42	-$74.67	$76.13	$37.28	$75.59	$39.14
2025	-$39.06	-$25.56	-$64.63	$87.37	$42.51	$86.16	$44.62
2026	-$22.41	-$23.97	-$46.38	$89.57	$43.91	$86.61	$44.85
2027	-$7.05	-$22.49	-$29.54	$91.66	$45.23	$87.07	$45.09
2028	$7.17	-$21.16	-$13.99	$93.68	$46.46	$87.56	$45.35
2029	$20.35	-$20.59	-$0.23	$96.32	$47.96	$88.48	$45.82
2030	$33.98	-$20.05	$13.93	$98.85	$49.36	$89.41	$46.30
Total 2023-2025	-$147.61	-$72.99	-$220.60	$229.51	$112.83	$226.87	$117.49
Total 2026-2030	**$32.04**	**$-108.26**[16]	**-$76.23**	**$470.08**	**$232.93**	**$439.13**	**$227.41**

In this analysis, current value, representing today's value of money has been applied to both fuel savings, as well as maintenance and repair cost savings. Table 7 below shows a summary of the expected cumulative costs and savings of the proposal. Table 7 further shows that the greater vehicle costs for BEVs and PHEVs are offset by the fuel cost savings and maintenance savings, even after assuming the current value for fuel and maintenance savings. The payback period for model years 2023-2025 vehicles averages slightly over five years. For model years 2026 through 2030, the payback period is reduced to under one year, with battery electric vehicles having immediate savings, including purchase price, as a group. A 3% discount rate for current value was used.

[16] The -$108.26 value is correct as shown here. In this same table in the Cost Benefit Analysis (Table 6), and in the Final Economic Impact Analysis (Table 8), this value is shown as a positive $108.26.

Table 7
Cumulative Cost Savings of the Proposal – Net Present Value (in million $)

Model Year	Incremental Vehicle Cost			Fuel Cost Savings		Maintenance Savings	
	BEV	PHEV	Total	Lifetime Average	First 5 Years Average	Lifetime Average	First 5 Years Average
2023	-$58.30	-$23.01	-$81.30	$57.23	$30.83	$56.58	$31.40
2024	-$50.25	-$24.42	-$74.67	$65.81	$34.69	$65.67	$36.44
2025	-$39.06	-$25.56	-$64.63	$75.45	$39.50	$74.85	$41.54
2026	-$22.41	-$23.97	-$46.38	$77.39	$40.81	$75.24	$41.76
2027	-$7.05	-$22.49	-$29.54	$79.24	$42.04	$75.64	$41.98
2028	$7.17	-$21.16	-$13.99	$81.03	$43.20	$76.08	$42.22
2029	$20.35	-$20.59	-$0.23	$83.35	$44.60	$76.87	$42.66
2030	$33.98	-$20.05	$13.93	$85.57	$45.92	$77.68	$43.11
Total 2023-2025	-$147.61	-$72.99	-$220.60	$198.49	$105.02	$197.10	$109.38
Total 2026-2030	$32.04	-$108.26	-$76.23	$406.59	$216.57	$381.51	$211.72

D. Emissions Benefits

While estimating the economic benefits of improved public health is not explored in detail in this analysis, the associated emission reductions are discussed in this section. The Proposal is expected to result in the reduction of ozone precursors and greenhouse gas emissions, with the largest emission benefit being greenhouse gas reductions, specifically from carbon dioxide and methane. The Proposal, if adopted, would build upon current efforts to reduce these emissions. The benefits are expected to increase over time as the power grid becomes increasingly cleaner through decarbonization of energy production.

Extensive efforts are underway in Colorado to lower human-made greenhouse gas emissions. State laws and regulations have been adopted to mandate certain levels of renewable energy use in the future. Colorado electric power providers are investing in renewables and are positioned to meet their statutorily mandated renewable energy requirements in 2020.[17] Colorado's largest public utility, Xcel Energy, has publicly committed to reducing its greenhouse gas emissions statewide by 60% by 2026 compared to 2005 levels.[18] These efforts were considered in CDPHE's power plant emission data that was relied on for this analysis.

[17] In 2004, Colorado passed the first voter-led Renewable Energy Standard (RES) in the nation, requiring electricity providers to obtain a minimum percentage of their power from renewable energy sources. The legislature has increased the amount of renewable energy required three times since 2004, including HB10-1001 which required investor-owned utilities to generate 30% of their electricity from renewable energy by 2020, of which 3% must come from distributed energy resources. The most recent update, SB 13-252, requires cooperative utilities to generate 20% of their electricity from renewables.

[18] Xcel Energy, *Colorado Energy Plan Fact Sheet* (2018), https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Resource%20Plans/CO-Energy-Plan-Fact-Sheet.pdf. APCD PHS EX J.

During the 2019 Colorado legislative session, a number of additional greenhouse gas reduction measures were passed, including HB19-1261, SB19-096, and SB19-236. These measures direct the state to further reduce GHG emissions in the coming years. SB19-236 specifically requires that a qualifying retail utility with more than five hundred thousand customers—which Xcel meets the definition of—along with other utilities that opt in, to reduce CO_2 emissions 80% by 2030. With the passage of the 2019 legislation and the performance standards contained in these new laws, it is expected that the proposed ZEV Program will result in substantial greenhouse gas emission reductions, exceeding those first projected in the Initial Economic Impact Analysis.

E. Greenhouse Gas Emissions

Greenhouse gas emission benefits from a ZEV program are principally in the form of carbon dioxide emission reductions from vehicle tailpipes and some associated methane emission reductions from power plants and refineries. These benefits, mainly from carbon dioxide emission reductions, are tied directly to the improved energy efficiency of electrified vehicles. They are also tied to the power grid becoming cleaner over time and the increased use of carbon-neutral and renewable forms of energy, such as wind and solar. Wind energy has rapidly increased, with energy providers such as Xcel Energy, developing or planning to develop major new wind farms in Colorado. Solar energy development has increased more slowly than wind energy, but greater increases in its use are projected to occur in the future.

For Colorado's compliance scenario, gasoline-powered automobiles and hybrid gasoline derived emissions were calculated using LEV III new vehicle greenhouse gas emission standards. PHEVs were assumed to operate on gasoline 25% of the time. A 150,000 mile useful vehicle life for all motor vehicles was assumed.

For electric vehicles, it was assumed that BEVs and PHEVs have a range of 3.3 miles per kWh and 3.6 miles per kWh, respectively. Electrical usage was obtained from U.S. EPA/DOE fuel economy data.[19] A 16% energy loss from charging electric vehicles was also assumed, based on U.S. DOE's Office of Energy Efficiency & Renewable Energy findings. The power generation make-up was derived from CDPHE data sources and was projected to change over time as there is an increase in renewable energy usage and a reduction in coal-fired power generation. It was also assumed that natural gas-fired power generation will remain significant through 2030.

The greenhouse gas emissions from conventional vehicles and PHEVs were calculated using assumptions described above. Carbon dioxide emissions from power generation were determined, and emission reductions from upstream sources located in Colorado were projected and included in this analysis.

The Division used a Global Warming Potential value of 28 for methane in this calculation. The final greenhouse gas emissions estimates from the power sector were used to determine final benefits by comparing those emissions with emissions that might have occurred because of more conventional vehicles on the road.

[19] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, https://www.fueleconomy.gov/feg/bymake/bymanuNF.shtml.

F. GHG Emission Reductions

The proposed ZEV program is projected to result in the reduction of 3.2 million metric tons (3.5 million short tons) of total greenhouse gas emissions from the reductions of MY2023 through MY2030 vehicles. Table 8 shows the cumulative greenhouse gas emission reductions for each individual model year, as well as the program's overall total cumulative benefit. Emission reductions for each model year are calculated for the useful life of the vehicle, which is assumed to be 150,000 miles.

Table 8
Greenhouse Gas Benefit
(metric tons/year CO2e)

Model Year	Cumulative GHG Reduction (All Vehicles by Model Year)
2023	298,390
2024	336,607
2025	376,069
2026	402,886
2027	424,339
2028	440,739
2029	455,248
2030	464,875
Total	**3,199,154**

G. Ozone Precursor Emission Benefits

The primary benefits of the ZEV program stem from a significant reduction in greenhouse gas emissions. But it will also result in reductions of ozone precursor emissions and the associated formation of ozone. Ozone precursors are pollutants that directly contribute to, or assist in, the formation of tropospheric (ground-level) ozone. In the atmosphere, ozone is formed from the reaction of nitrogen oxides (NOx) and volatile organic gases (VOCs) in the presence of sunlight (UV radiation). Carbon monoxide also contributes to ozone formation, but to a lesser extent.

Adoption of the ZEV program will result in reduced ozone precursors. Importantly, greater use of ZEVs shift emissions away from conventional vehicle tailpipes to power sources that are generally more spread out geographically from the urbanized core where most automotive emissions are produced. Shifting ozone precursor emissions away from urban centers has the propensity to reduce ambient ozone concentrations. Upstream emissions may also be reduced as the demand for gasoline is reduced, thus affecting production, delivery, and distribution of gasoline and its resulting ozone forming emissions.

The proposed ZEV program is estimated to result in 307 metric tons (338 short tons) of cumulative ozone precursor emission reductions from model years 2023 through 2030 vehicles. Importantly, it will also spread out emissions geographically, that would otherwise be concentrated in the built-up urbanized core.

Table 9 shows the cumulative reductions for each individual model year (MY2023 through MY2030), as well as the programs overall total cumulative benefit. Emission reductions for each model year are calculated for the useful life of the vehicle, assumed to be 150,000 miles.

Table 9
Ozone Precursor Benefit
(cumulative metric tons by model year)

Model Year	Cumulative Ozone Precursor Reduction (All Vehicles by Model Year)
2023	31
2024	29
2025	26
2026	34
2027	41
2028	46
2029	49
2030	51
Total	**307**

H. GHG Cost Effectiveness

The ZEV program is estimated to generate a benefit of 3.2 million metric tons of greenhouse gas emissions, and have a cumulative cost savings of $1.07 billion. This would result in a cost savings of $334.07 for each metric ton of greenhouse gas emissions reduction.

I. Ozone Precursor Cost Effectiveness

The ZEV program is estimated to reduce ozone precursor emissions by 307 metric tons and have a cumulative cost savings of $1.07 billion, resulting in a cost savings of $3.5 million for every metric ton of ozone precursor emissions reduction. While the ZEV program is aimed at reducing greenhouse gas emissions, it will have the co-benefit of reducing ozone precursors. There are additional reductions in ozone precursors that are expected as a result of the ZEV program, such as reduced VOC emissions associated with the fueling of conventional vehicles that the Division conservatively has not included as a benefit in its analysis due to uncertainty in determining the extent of the reductions. The potential cost savings for reductions in ambient ozone concentrations are beyond the scope of this analysis.

J. Charging Infrastructure

Manufacturers and providers of electric vehicle charging infrastructure could see increased business and revenue from the Proposal due to the increased demand for charging infrastructure that would result from more ZEV sales in Colorado. With more electric vehicle infrastructure in place, potential consumers of BEVs are likely to feel less anxiety about buying a ZEV knowing that electric vehicle infrastructure is becoming increasingly prominent in Colorado. Moreover, increases in revenue and business would likely result in the creation of new jobs in the sector.

K. Direct Costs to Businesses or Others Required to Comply With the Proposal

The primary costs and benefits associated with the Proposal are the upfront costs of a battery electric or plug-in hybrid electric vehicle, and the associated costs of operation, including fuel or energy used, and maintenance and repair. The costs described in this section are based on meeting the Colorado ZEV regulatory compliance scenario. Impacts on regulated industry include costs of complying with the proposed rule for automobile manufacturers. Loss in service, repair, and maintenance revenue for local automotive repair businesses and dealers, impacts on fuel sales, and increased consumption of electricity were also considered in the context of savings to vehicle owners. It was assumed that insurance costs, registration fees and taxes are equivalent for ZEVs and conventional vehicles.

This vehicle cost (in U.S. dollars) analysis includes ZEV regulatory compliance projections (in total number of vehicles), new vehicle cost, and cost savings, maintenance cost savings and fuel cost savings. For the purposes of the analysis presented in this Section II, the effects of tax credits and other purchase incentives for ZEVs was not included, but the potential effects on state tax revenue are examined in Section III below.

Division staff researched costs from several sources. The costs used in this analysis were derived from the 2019 U.S. Department of Energy Annual Energy Outlook (AEO) fuel prices, U.S. DOE Energy Information Administration, internal utility emissions data and rates, U.S. DOE Alternative Fuels Data Center, U.S. EPA, International Council on Clean Transportation (ICCT), and other generally accepted sources.

Table 10 shows vehicle costs[20] by vehicle types (conventional vehicles, BEV, PHEV) and vehicle classes (car, crossover, and SUV[21]). The costs shown in Table 10 for each type and class of conventional vehicle include powertrain, vehicle assembly, and indirect costs. For BEV and PHEV, the costs shown in Table 10 include battery pack, non-battery powertrain, vehicle assembly and indirect cost. Percentages of Colorado market shares of 25% for cars, 37.5% for crossovers, and 37.5% for SUVs were applied to each vehicle class, respectively, to get the average cost by market share. The differences in costs of BEV and conventional vehicles and PHEV and conventional vehicles were used to calculate the incremental vehicle costs.

[20] Lutsey, N. & Nicholas, M., *Electric Vehicle Costs and Consumer Benefits in Colorado in the 2020–2030 Time Frame*, The International Council on Clean Transportation (June 18, 2019) https://www.theicct.org/publications/ev-costs-colorado-2020-2030. APCD PHS EX E.

[21] For the purposes of this analysis, light-duty pickup trucks were not included because the production of ZEV technology applicable to a truck chassis is not anticipated to occur until 2021 at the earliest.

The predicted average costs for conventional vehicles range from $27,916 in 2023 to $28,612 in 2030. This is the reference case. The predicted average cost for a BEV starts at $34,219 in 2023 and trends downward to $26,024 in 2030. PHEV costs average from $34,258 in 2023 to $33,438 in 2030.[22]

Table 10
Vehicle Costs by Vehicle Types and Classes

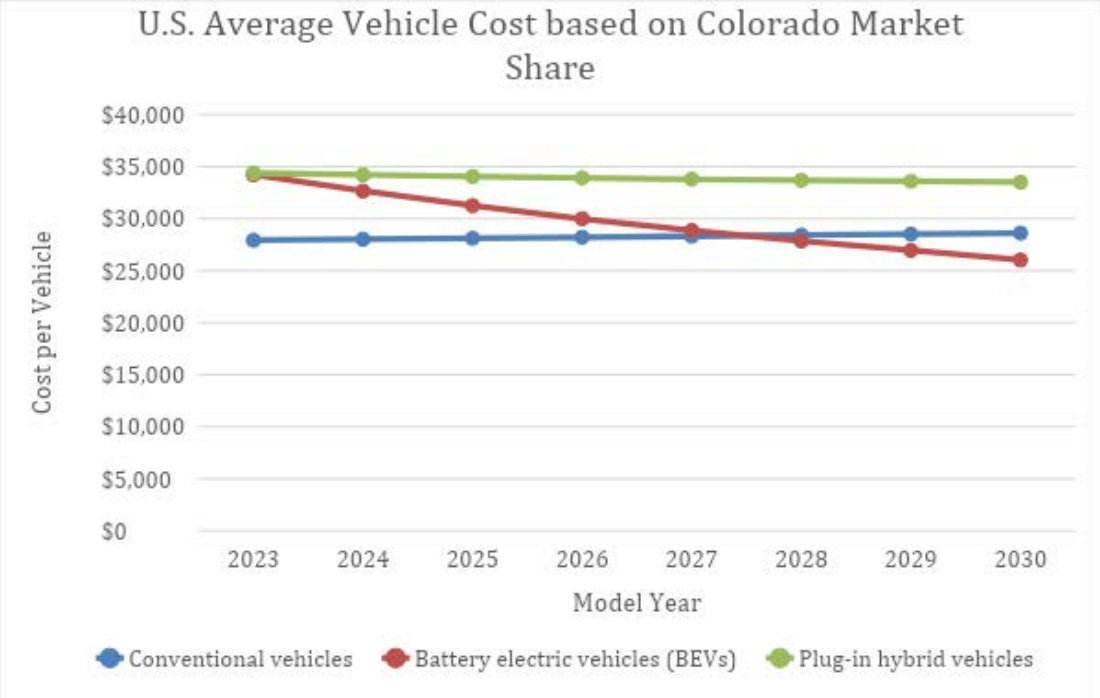
Conventional vehicles	2023	2024	2025	2026	2027	2028	2029	2030
Conventional car	$25,585	$25,672	$25,760	$25,848	$25,936	$26,025	$26,113	$26,203
Conventional crossover	$25,324	$25,413	$25,502	$25,592	$25,681	$25,771	$25,862	$25,952
Conventional SUV	$32,062	$32,177	$32,293	$32,409	$32,526	$32,643	$32,760	$32,878
Average by market share	**$27,916**	**$28,014**	**$28,113**	**$28,212**	**$28,312**	**$28,411**	**$28,511**	**$28,612**
Battery electric vehicles (BEVs)	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Electric car (250 mile)	$29,928	$28,654	$27,516	$26,498	$25,586	$24,768	$24,035	$23,281
Electric crossover (250 mile)	$31,721	$30,278	$28,986	$27,828	$26,788	$25,855	$25,015	$24,163
Electric SUV (250 mile)	$39,579	$37,691	$36,001	$34,488	$33,130	$31,910	$30,814	$29,713
Average by market share	**$34,219**	**$32,652**	**$31,249**	**$29,993**	**$28,866**	**$27,854**	**$26,945**	**$26,024**
Plug-in hybrid vehicles	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
PHEV car (40 mile)	$29,573	$29,545	$29,523	$29,506	$29,495	$29,489	$29,488	$29,491
PHEV car (60 mile)	$31,386	$31,222	$31,075	$30,942	$30,823	$30,718	$30,624	$30,541
PHEV crossover (40 mile)	$30,532	$30,414	$30,308	$30,215	$30,132	$30,061	$29,998	$29,945
PHEV crossover (60 mile)	$31,444	$31,266	$31,105	$30,959	$30,828	$30,709	$30,603	$30,509
PHEV SUV (40 mile)	$39,369	$39,205	$39,059	$38,929	$38,813	$38,711	$38,622	$38,545
PHEV SUV (60 mile)	$40,725	$40,456	$40,213	$39,993	$39,795	$39,617	$39,458	$39,316
Average by market share	**$34,258**	**$34,097**	**$33,953**	**$33,824**	**$33,709**	**$33,607**	**$33,517**	**$33,438**
DIFF BEV vs Conventional	$6,303	$4,638	$3,136	$1,781	$554	-$557	-$1,567	-$2,588
DIFF PHEV vs Conventional	$6,342	$6,083	$5,840	$5,612	$5,397	$5,195	$5,005	$4,826

[22] For this analysis staff assumed a 250-mile BEV range and a 50-mile PHEV range as being representative of the average ZEV ranges in 2023-2030.

Figure 1 shows the predicted cost of a BEV reaching parity with conventional vehicles for all market segments (car, crossover, SUV) around model year 2027 or sooner. The estimated reduction in battery electric vehicle costs are due to multiple factors, including the reduction in battery costs, as shown in many other analyses and reports.[23] As battery manufacturing costs decline, the overall price of electric vehicles declines.

Figure 1

U.S Average Vehicle Cost Based on Colorado Market Share

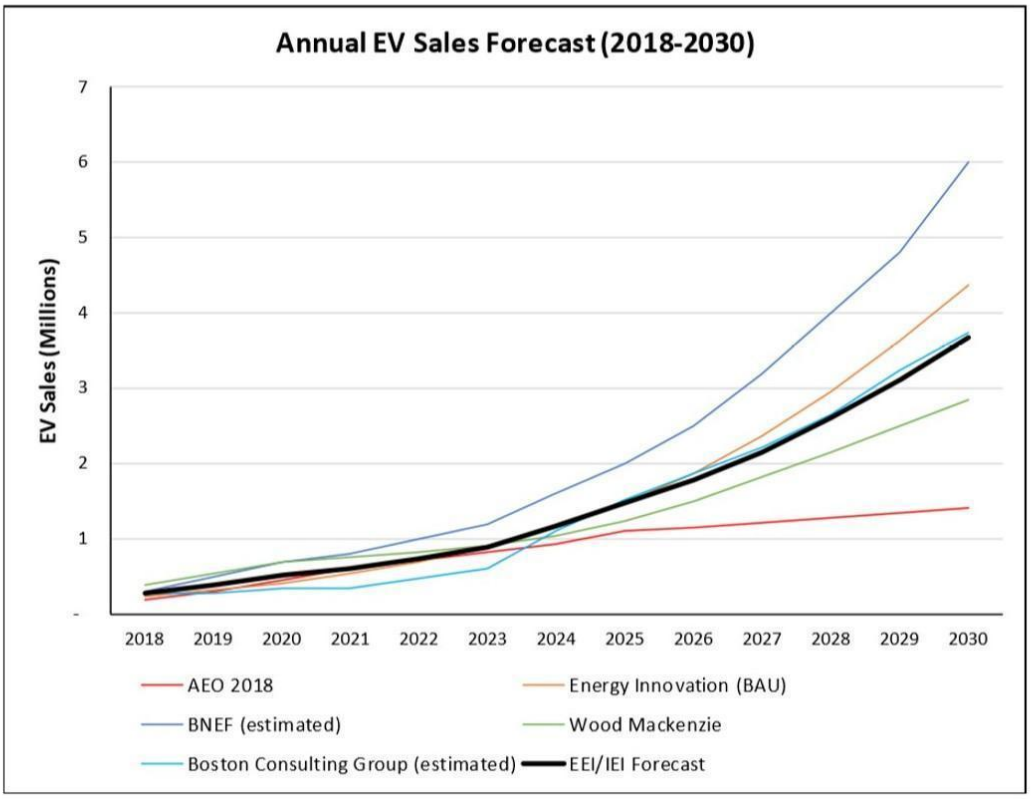


[23] *See* Robert Rapier, *A Battery That Could Change the World* (May 20, 2018), https://www.forbes.com/sites/rrapier/2018/05/20/a-battery-that-could-change-the-world/#1844737b4cf2;
David Stringer and Kevin Buckland, *Race for Next-Generation Battery Supremacy Has an Early Leader* (January 28, 2019), https://www.ttnews.com/articles/race-next-generation-battery-supremacy-has-early-leader;
Business Reporter, *Next Generation Battery Technologies and Trends*, The Battery Show https://www.business-reporter.co.uk/2019/06/04/next-generation-battery-technologies-and-trends/#gsc.tab=0 (last accessed July 8, 2019).

Electric vehicle costs are also affected by the number of vehicles produced. As more electric vehicles are produced, the economy of scale becomes an important factor. Figure 2 from the Edison Electric Institute[24] shows their electric vehicle forecast compared to other forecasts from their study report.

Figure 2
Selected EV Sales Forecasts

EEI/IEI Annual EV Sales Forecast Compared to Selected Forecasts



L. Vehicle Costs and Cost Savings

The Colorado compliance scenario presented in Table 1 was used to calculate new vehicle costs using cost differentials for BEVs versus conventional vehicles and PHEVs versus conventional vehicles. The vehicle costs were determined for each model year from 2023 through 2030.

PHEVs carry higher up-front costs than battery electric vehicles, as shown in Table 10. It is expected that PHEVs will continue to be more expensive than BEVs through 2030, with PHEVs becoming $2,704 more expensive than BEVs in 2025 and $7,415 more in 2030, when BEVs are expected to be less expensive than conventional vehicles on average. In 2030, it is expected that PHEVs will be $4,826 more expensive than their comparable conventional vehicles, and BEVs will cost $2,588 less than comparable conventional vehicles.

[24] *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030*, Edison Electric Institute and Institute for Electric Innovation, (November 2018), http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20EV%20Forecast%20Report_Nov2018.pdf. APCD PHS EX G.

The expected annual program costs and benefits of ZEV vehicle sales are listed in Table 11, with cumulative costs through 2030 being $296.83 million dollars. These costs represent upfront new vehicle incremental costs above corresponding conventional vehicles. The costs are, however, offset by fuel and maintenance savings, as described earlier.

Table 11
New Vehicle Costs (in million $)

Model Year	BEV	PHEV	Total
2023	-$58.30	-$23.01	-$81.30
2024	-$50.25	-$24.42	-$74.67
2025	-$39.06	-$25.56	-$64.63
2026	-$22.41	-$23.97	-$46.38
2027	-$7.05	-$22.49	-$29.54
2028	$7.17	-$21.16	-$13.99
2029	$20.35	-$20.59	-$0.23
2030	$33.98	-$20.05	$13.97
Total	**-$115.58**	**-$181.26**	**-$296.83**

M. Impacts on Industry

A ZEV program would impact new vehicle manufacturers who would have to meet the requirements of the ZEV program. Costs include the new vehicle costs as well as cost savings discussed herein. There may also be potential additional marketing and advertising costs and vehicle incentive costs associated with marketing and selling BEVs and PHEVs to ensure ZEV requirements are met. Such costs have not been determined. A Colorado ZEV program would not affect the ability of manufacturers to continue to manufacture and market conventional vehicles of all types.

Some new vehicle dealers may be under pressure from manufacturers' obligations to meet ZEV sales requirements. However, they too would continue to be free to market and sell all types of conventional vehicles. The primary potential impact on vehicle dealers would be reduced maintenance and repair revenue of new vehicles as shown in Tables 4 and 5 above. Assuming savings to the consumer for vehicle maintenance and repair will result in a direct loss of revenue, auto dealers and independent maintenance shops could see reduced revenue of roughly $578 million over the lifetime of the vehicles sold between 2023 and 2030. It should be noted that lost revenue in maintenance and repair represents savings to the consumer.

Fuel refiners, jobbers, and marketers would presumably be affected by reduced demand for gasoline. The loss in gasoline sales is correlated to the fuel cost savings shown in Tables 2 and 3. The effect on individual marketers and the overall price of gasoline has not been determined but is expected to be negligible when compared to the overall fuel market. Moreover, Colorado is expected to experience continued population growth in the future that would offset any loss in gasoline sales in the near future.

Electricity providers may experience slight increases in electrical sales that would support their growth and utilization of their electrical systems. It may further their reliance on wind, solar, and other renewable sources. The solar industry may experience increases in sales and installation revenue if home-solar demand increases as a result of the Proposal's implementation. Furthermore, quick charge electrical stations would experience greater demand and utilization. It is assumed in this analysis that 10% of vehicle charging would occur at these stations.

N. Impact on the General Public

Members of the general public that are new-vehicle consumers may be affected by the Proposal. It is expected that consumers will be offered an increased choice of battery electric and plug-in hybrid electric vehicles. Consumers would maintain their ability to purchase conventional vehicles of all types, including low cost subcompacts, as well as crossovers, SUVs and vans, and small and large pickup trucks. The majority of vehicles offered and sold in Colorado would likely continue to be conventional vehicles, at least through 2030. The Division is unaware of reliable data to suggest that new conventional vehicle costs will increase directly as a result of this Proposal.

As shown in Table 12, the incremental per vehicle cost for a BEV compared to a comparable conventional vehicles decreases over time from a cost of $6,303 in 2023 to a cost savings of $2,588 in 2030. PHEVs are expected to continue to be more expensive than conventional vehicles through 2030. The Total cost column of the incremental vehicle costs section of Table 10 shows the combined BEV and PHEV costs as the weighted average of BEVs and PHEVs at a 75% to 25% ratio, respectively. The incremental cost per vehicle of the regulatory compliance projection for Colorado is a cost of $6,313 per vehicle in 2023 to a cost saving per vehicle of $735 in 2030. Cost savings are seen in reduced fuel consumption and maintenance. These savings offset any incremental costs for BEVs or PHEVs and add to the incremental cost savings for BEVs starting in 2028.

Table 12
Average per Vehicle Impacts by Model Year ($ per vehicle)

Model Year	Incremental Vehicle Cost			Fuel Cost Savings		Maintenance Savings	
	BEV	PHEV	Total	Lifetime Average	First 5 Years Average	Lifetime Average	First 5 Years Average
2023	-$6,303	-$6,342	-$6,313	$5,127	$2,566	$5,057	$2,619
2024	-$4,638	-$6,083	-$4,999	$5,126	$2,510	$5,090	$2,636
2025	-$3,136	-$5,840	-$3,812	$5,191	$2,525	$5,119	$2,651
2026	-$1,781	-$5,612	-$2,738	$5,313	$2,605	$5,137	$2,660
2027	-$554	-$5,397	-$1,765	$5,428	$2,678	$5,156	$2,670
2028	$557	-$5,195	-$881	$5,535	$2,745	$5,173	$2,679
2029	$1,567	-$5,005	-$76	$5,632	$2,804	$5,174	$2,679
2030	$2,588	-$4,826	$735	$5,721	$2,857	$5,174	$2.679

As with cumulative cost savings in net present value shown in Table 12, present values were assigned to average per vehicle cost impacts by model year. These are shown in Table 13. As shown in Table 13, as well as in previous tables, fuel and maintenance savings more than offset any increase in vehicle costs. Battery electric vehicle prices decrease substantially over the period of examination, with average electric vehicle costs becoming less expensive than conventional vehicles after model year 2027.

Table 13
Average per Vehicle Impacts by Model Year – Net Present Value ($ per vehicle)

Model Year	Incremental Vehicle Cost			Fuel Cost Savings		Maintenance Savings	
	BEV	PHEV	Total	Lifetime Average	First 5 Years Average	Lifetime Average	First 5 Years Average
2023	-$6,303	-$6,342	-$6,313	$4,444	$2,394	$4,394	$2,438
2024	-$4,638	-$6,083	-$4,999	$4,432	$2,336	$4,422	$2454
2025	-$3,136	-$5,840	-$3,812	$4,482	$2,347	$4,447	$2,468
2026	-$1,781	-$5,612	-$2,738	$4,590	$2,421	$4,463	$2,477
2027	-$554	-$5,397	-$1,765	$4,692	$2,489	$4,479	$2,486
2028	$557	-$5,195	-$881	$4,787	$2,552	$4,495	$2,494
2029	$1,567	-$5,005	-$76	$4,874	$2,608	$4,495	$2,494
2030	$2,588	-$4,826	$735	$4.952	$2,657	$4,495	$2,494

(III) THE PROBABLE COSTS TO THE AGENCY AND TO ANY OTHER AGENCY OF THE IMPLEMENTATION AND ENFORCEMENT OF THE PROPOSED RULE AND ANY ANTICIPATED EFFECT ON STATE REVENUES

With the adoption of the Proposal, the Division estimates it will need one additional full time equivalent (FTE) to monitor and track ZEV credits/debits for each auto manufacturer. This estimate is based on conversations with other Section 177 states on their costs of implementing the ZEV program. This new FTE will also aid in program enforcement. The direct cost to the Division would be approximately $130,037 for salary, benefits and indirect (overhead). This is an annual cost that will continue as long as the program is operating. The Division's analysis of potential costs indicates minimal, if any, cost impacts on any other agency.

Several parties have pointed out, correctly, that Colorado has a generous income tax credit for the purchase of alternative fueled vehicles (Alt vehicle), including ZEVs.[25] Any increase in ZEV sales would, therefore, result in a loss of state income tax revenue, which could otherwise be used for public goods, such as infrastructure.[26] It should be noted, however, that losses in state tax revenue are distributed (transferred) back to the consumer for expenditure in the general economy; so, quantifying the net economic impact is a far more complicated endeavor than is intended for the scope of this analysis. The direct loss in state tax revenue that might occur due to an increased use of the Alt vehicles tax credit is, however, set forth below for consideration as part of this analysis.

Pursuant to C.R.S. § 39-22-516.7, the income tax credit for the purchase of Alt. vehicles with respect to tax years commencing on or after January 1, 2023, but prior to January 1, 2026, is $2,000.[27,28] With the conservative assumption that the tax credit will again be extended beyond 2025, Table 14 below shows potential reductions in state income tax revenue from the Proposal, based on modeled ZEV sales for the CO Compliance Scenario.

[25] *See* § 39-22-516.7, C.R.S., (2019).

[26] Estimated losses in state tax revenue assume consumers will take advantage of the Alt vehicle income tax credit.

[27] Note that Freedom to Drive, PHS-Exhibit E - *Evaluation of Colorado's Proposed ZEV Regulation*, Energy Ventures Analysis (July, 2019), shows the same analysis with the incorrect credit of $5,000, which was in place prior to 2019.

[28] The tax credit in Calendar Year 2022 is $2500. The Division assumed half of 2023 MY vehicles will be sold in calendar year 2022, with a $2500 tax credit for this 2023 model year tax revenue loss.

Table 14
Avoided State Income Tax Revenue from Alt Vehicle Tax Credit

Model Year	Light-duty Vehicle Sales	BEV Sales	PHEV Sales	Total	Reduced State Tax Revenue
2023	264,983	9,248	3,628	12,876	$28,972,000
2024	267,633	10,836	4,014	14,851	$29,702,000
2025	270,309	12,455	4,377	16,833	$33,666,000
2026	273,012	12,587	4,272	16,859	$33,718,000
2027	275,742	12,720	4,168	16,887	$33,774,000
2028	278,500	12,854	4,073	16,926	$33,852,000
2029	281,285	12,989	4,113	17,103	$34,206,000
2030	284,097	13,126	4,154	17,280	$34,560,000

Note that the above estimations assume that in the absence of the Proposal, no consumers would take advantage of the Alt. vehicles tax credit. In reality, avoided tax revenue from the Proposal would only be tied to the increase in ZEV sales that would result from the adoption of Proposal in excess of ZEV sales that would occur from business as usual (i.e. without a ZEV program).

With greater ZEV adoption in Colorado, as the Proposal aims to achieve, fuel tax revenue will likely be reduced, since ZEVs use less or no gasoline as fuel. Colorado has a flat gas-tax of $0.22 per gallon. Energy Ventures Analysis (EVA) produced the "Evaluation of Colorado Zero Emission Vehicle Regulation" which estimated that Colorado would see an average reduction in fuel tax revenue of $1.3 million per year during the ZEV program time period.[29] As is true for all tax revenue losses, the losses to Colorado in fuel tax revenue are transfers back to the consumer and are not direct costs.

It should also be noted that there is a general recognition in Colorado that the flat $0.22 per gallon gas tax, which has gone unchanged since 1991, is outdated and insufficient for funding transportation infrastructure, especially in light of more fuel efficient vehicles on the road and greater adoption of ZEVs over the past decade.[30] ZEVs use the same infrastructure as conventional vehicles, but owners of ZEVs do not pay for that infrastructure through gas taxes in the same way that owners of conventional vehicles do. The Colorado Department of Transportation has explored the idea of a "Road Use Charge" through a 2016-2017 pilot project, and the Colorado Senate introduced SCR 19-003 in the 2019 legislative session, which would have eliminated the gas tax altogether and replaced it with increased sales tax. The Resolution, however, was postponed indefinitely in committee.

[29] *See* Freedom to Drive, PHS-Exhibit E, at 20.
[30] *See* Colorado Department of Transportation, *Colorado Road Usage Charge Fact sheet*, https://www.codot.gov/programs/ruc/programs/ruc/documents/rucpp-fact-sheet.

(IV) A COMPARISON OF THE PROBABLE COSTS AND BENEFITS OF THE PROPOSED RULE TO THE PROBABLE COSTS AND BENEFITS OF INACTION

Multiple parties to the rulemaking have recommended that the AQCC take no action to adopt the Proposal. One of these parties, Freedom to Drive, filed a motion to continue the rulemaking hearing, which was denied by the Hearing Officer. Taking no action would have no economic effect, since no action is simply the maintenance of the status quo. The status quo, however, has not alleviated the Denver Metro North Front Range Area of its ozone nonattainment status and has not resulted in sufficient criteria pollutant and greenhouse emission reductions from Colorado's fleet overall. There would be no costs or cost savings, as described herein, if the AQCC takes no action.

(V) A DETERMINATION OF WHETHER THERE ARE LESS COSTLY METHODS OR LESS INTRUSIVE METHODS FOR ACHIEVING THE PURPOSE OF THE PROPOSED RULE

The Federal Clean Air Act limits available methods to achieve reductions in harmful emissions from new motor vehicles. States must adopt either federal or California emissions standards.[17] There is no 'third car' method to achieve these reductions. The AQCC has already adopted the California LEV III standards, which is Regulation 20 as it currently exists. Furthermore, the Division estimates the Proposal will provide an overall cost savings, as described in Section II.

In June 2019, the Colorado Department of Transportation (CDOT), Colorado Department of Public Health and Environment (CDPHE), and Colorado Energy Office (CEO) ended negotiations with the Alliance of Automobile Manufacturers (Alliance) and the Association of Global Automakers (Global) to reach an agreement on a voluntary approach that could have been an alternative to the Proposal. One might argue that a voluntary approach would have been less intrusive. On June 4, 2019, Colorado issued the following statement:[31]

> DENVER — Today, Colorado Department of Transportation Executive Director Shoshana Lew, Colorado Department of Public Health & Environment Executive Director Jill Hunsaker Ryan and Colorado Energy Office Executive Director Will Toor issued the following statement:
>
> "We thank automakers and dealers for their commitment to expanding the electric vehicle market in Colorado. Over the past four weeks, we have had numerous conversations about opportunities, challenges, and the intricate nature of the rapidly-evolving electric vehicle market. The depth of these conversations and identification of common objectives will prove invaluable as we work together to provide cleaner options for Coloradans.
>
> "Despite good faith efforts by all parties, we were unable to reach agreement on a voluntary approach that could be considered as a potential alternative to the zero emission vehicle (ZEV) standard. However, we believe the insights we have gained will inform and benefit the rulemaking process, as well as our implementation strategy, so we can see more zero emission vehicles move from the factory floor to dealer showrooms to customers all across Colorado.

[31] Colorado Department of Transportation, *Colorado statement on voluntary proposal working with automakers to bring more electric vehicles to the State*, available at: https://www.codot.gov/news/2019/may/colorado-statement-on-voluntary-proposal-working-with-automakers-to-bring-more-electric-vehicles-to-the-state (August 2, 2019).

> "We appreciate the ongoing collaboration from all parties, and the Alliance of Automobile Manufacturers and Association of Global Automakers' stated commitment to working constructively with the State of Colorado and other parties through the rulemaking process. Under the Clean Air Act, a ZEV rule adopted by Colorado will be effective in Calendar Year 2022. However, we are optimistic that ongoing dialog with automakers through the rulemaking process will make more electric vehicle models available to Coloradans as soon as next year."

Despite failing to come to an agreement on a voluntary approach before the May 10, 2019 Request for Rulemaking, CDOT, CEO, the Alliance and Global agreed on an alternate proposal to the Division's proposal which includes provisions regarding the allowance of limited proportional credits and early action credits. The alternative proposal is described in detail in the joint rebuttal statements of CDOT/CEO and the Alliance/Global.

(VI) A DESCRIPTION OF ANY ALTERNATIVE METHODS FOR ACHIEVING THE PURPOSE OF THE PROPOSED RULE THAT WERE SERIOUSLY CONSIDERED BY THE AGENCY AND THE REASONS WHY THEY WERE REJECTED IN FAVOR OF THE PROPOSED RULE

The Federal Clean Air Act limits available methods to achieve reductions in harmful emissions from new motor vehicles since states must adopt either federal or California emissions standards. There is no 'third car' method to achieve these reductions. Despite limited flexibility, the Division seriously considered whether to include provisions for early action credits and proportional credits, as other ZEV states have done before. Through the prehearing process, however, multiple parties to the rulemaking developed alternate proposals addressing early action credits and proportional credits. Expecting alternative proposals, the Division determined that it would be best to propose a ZEV program to the AQCC without early action credits or proportional credits in order to provide the AQCC with multiple options to choose from.

CDOT, CEO, the Alliance, and Global ultimately reached a consensus on an alternate proposal for revisions to CLEAR.[32] The alternate proposal only differs from the Division's proposal by allowing limited proportional and early action credits to allow automakers to more easily transition into a ZEV program in Colorado. The alternate proposal allows for proportional and early credits but allows only a percentage of those credits to be used for the 2023-2025 model years. Other states adopting the California ZEV standards have also included provisions to allow for proportional credits, early credits, or both.[33] Under the alternate proposal, automakers can choose between two options to use proportional credits: (1) 36%, with no early ZEV credits or (2) 23%, with early ZEV credits for 2021-2022 model year ZEVs delivered for sale in Colorado.

[32] *See* CEO/CDOT Joint Rebuttal Statement and AAM/AGA Joint Rebuttal Statement.

[33] The CEO/CDOT Joint Rebuttal Statement notes that provisions for proportional credits have been included by every state adopting the California ZEV standards over the last fifteen years. CEO/CDOT REB at 4.

Under the first option, an automaker cannot meet more than 36% of its combined 2023-2025 ZEV credit obligation using proportional credits, and will not receive any early action credits for ZEVs produced and delivered for sale in Colorado prior to the 2023 model year. Under the second option, an automaker can meet no more than 23% of its combined 2023-2025 ZEV credit obligation using proportional credits, but will also receive ZEV credits for ZEV vehicles delivered for sale for the 2021 and 2022 model years. CDOT and CEO contend the alternative approach will bring ZEVs into the state in advance of the ZEV program. The Alliance, Global, CEO, and CDOT jointly support the alternate proposal.

If the AQCC adopts the joint alternate proposal described in this section, the costs and benefits assumed in the Division's Final Economic Impact Analysis and Cost Benefit Analysis are still relevant. If automakers choose to comply by using proportional credits, it is possible that the total number of ZEVs sold will be less than if there were no proportional credit program at all. In this scenario, the costs and benefits will be proportionally reduced. Because there are two options, it is not possible to predict how automakers may choose to utilize the options provided in the alternate proposal, and therefore, proportional decreases in costs and benefits cannot be calculated. More information regarding the potential costs and benefits of the alternate proposal have been made part of the record for this rulemaking in the CDOT/CEO Joint Rebuttal Statement and the Alliance/Global Joint Rebuttal Statement.