

# **REGULATORY ANALYSIS**

**for Proposed  
Colorado Air Quality Control Commission  
Regulation Number 20  
5 CCR 1001-24**

**November 9, 2018**

The Colorado Department of Public Health and Environment, Air Pollution Control Division (Division) hereby submits this Regulatory Analysis pursuant to the requirements set forth in the Colorado Administrative Procedures Act (“APA”) § 24-4-103(4.5)(a), C.R.S.

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## Introduction

The proposed Regulation 20 establishes a low emission vehicle (“LEV”) program for Colorado, referred to as the Colorado Low Emission Automobile Regulation or (“CLEAR”). CLEAR maintains light and medium-duty vehicle standards currently in place in Colorado pursuant to the directive set forth in Governor Hickenlooper’s Executive Order B 2018-06 "Maintaining Progress on Clean Vehicles". CLEAR prevents a rollback in these standards due to a federal proposal that would weaken the standards for these vehicles when sold in Colorado.<sup>1</sup> CLEAR maintains Colorado’s current standards by basing the standards for these vehicles on the California vehicle standards instead of the federal standards. Light and medium-duty vehicles make up the second largest source of greenhouse gas emissions (“GHG”) in Colorado.<sup>2</sup> Maintaining Colorado’s vehicle standards is an important step in the state’s continued progress toward addressing GHG emissions.

Section 177 of the federal Clean Air Act allows states the option of requiring compliance with either the federal or California standards for vehicles sold within their borders.<sup>3</sup> States must utilize one of these two standards and are not allowed to develop their own standards. Vehicles currently sold in Colorado comply with the federal standards. Colorado would utilize the option to no longer base compliance on the federal standards through the adoption of CLEAR. States that choose to require compliance with the California standards are often referred to as “Section 177 States”. Section 177 States make up over a third of the U.S. new car market. With the adoption of CLEAR, new vehicles sold in Colorado would be certified to California vehicle standards starting with model year 2022.

The current California vehicle standards are referred to as the “LEV III” standards. The increased cost of technological compliance and other related costs of a new LEV III-compliant

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<sup>1</sup> *Safer Affordable Fuel Efficient (SAFE) Vehicle Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, 83 Fed. Reg. 42,986 (Aug. 24, 2018) (hereinafter “SAFE Rule”).

<sup>2</sup> Colorado Greenhouse Gas Inventory—2014 Update Including Projections to 2020 & 2030.

<sup>3</sup> 42 U.S. Code Section 7507.

vehicle is assumed to be passed from the manufacturer and borne by the vehicle purchaser. The increased cost, however, will be repaid in most cases by the co-benefit of fuel cost savings achieved through GHG emissions reduction.

- (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 Air Quality Control Commission's adoption of CLEAR would commence a two year clock for automobile manufacturers to comply.<sup>4</sup> Manufacturers will need to anticipate the increased demand for 2022 model year ("MY2022") LEV III vehicles based on Colorado's approximately 225,000 new vehicle sales annually and adjust their production capacity accordingly. It is important to note that approximately 1/3 of all new vehicle sales currently in the US are LEV III-compliant already, and the addition of Colorado to this market represents an increase of roughly 1.6% LEV III-compliant vehicle demand on the manufacturers. There will be a corresponding decrease in demand for federal Tier 3-compliant vehicles, so passage of Regulation Number 20 would represent a shift in production capacity, rather than an increase. Although there are no auto manufacturers headquartered here, nor are there vehicle assembly plants in Colorado, some manufacturers maintain offices here and there are sub-assembly and parts suppliers located in Colorado.

In anticipation of the 2022 model year introduction, new car dealers will need to prepare to comply with LEV III requirements in Colorado. Marketing and advertising efforts may need to shift in order to meet the needs of customer curiosity and address potential skepticism regarding slightly different products. Training of both sales and service staff at dealerships is an ongoing process with any new model year introduction, but that training will need to reflect slightly different product characteristics and service needs. When a new car sale is closed, the dealer sends sales information and a title application to the appropriate County Clerk for processing and issuance of a title and registration in the county of residence of the new owner. The dealer must ensure that these documents attest to the LEV III-compliant status to the county clerk in every case. County Clerks will be responsible for ensuring the LEV III compliance status documentation exists with the sales and title application documentation before issuing a title and registration.

Automobile repair technicians and auto parts suppliers will be affected by the aftermarket catalytic converter rule, which is a part of this proposal. According to industry sources, there are approximately 30,000 aftermarket catalytic converters installed in Colorado each year. The proposal does not impact that number, but parts and installers will need to ensure that the products they sell and install meet the more stringent California aftermarket catalytic converter regulations. The Division will provide outreach and training to these classes of persons in advance of implementation at no cost to them. The two year implementation lead time, which was recommended by the trade association, will allow for selldown of existing inventories and buildup of new inventory. In practice, ordering, stocking, and installing California compliant

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<sup>4</sup> Pursuant to § 177, states adopting the California vehicle standards must do so at least two years in advance of the standards becoming effective.

aftermarket catalysts is no different than that of a federal catalyst, other than the unit cost, which will be borne by the customer, as detailed below.

New car purchasers in the general public and commercial-vehicle fleet operators will be impacted by the adoption of CLEAR. New vehicle sales numbered approximately 200,000 in 2017. Assuming a 3% annual growth in sales, this number should stand at about 225,000 sales in 2022. The increased cost of technological compliance and other related costs of a new LEV III-compliant vehicle will be borne by the purchaser, whether the vehicle is purchased outright in a cash sale, financed, or leased. However, that increased cost will be offset in most cases by the savings in fuel costs as a co-benefit of GHG emissions reduction.

The Division has considered but cannot definitively determine how the Proposal will affect vehicle sales in the event that the federal Tier 3 standards are rolled back as proposed in SAFE. Buyer elasticity is difficult if not impossible to predict. According to EPA's Technical Assessment Report, "It is difficult, if not impossible, to separate the effects of the Standards on vehicle sales and other characteristics from the impacts of macroeconomic forces on the auto market".<sup>5</sup> Fuel economy and vehicle price are only two of the many variables consumers factor into making decisions on vehicle purchases. Because the LEV standards and the Tier 3 standards are national in scope, it is impossible to compare vehicle sales in one area where the standards are in place and in another very similar area where the standards are not in place over the same period of time. Despite the admitted uncertainty, EPA and NHTSA posited in the SAFE proposal that vehicle sales will increase from the roll back in the standards, and by extension, vehicle sales in states with LEV standards will be negatively impacted.

In addition to the potential impacts that CLEAR may have on new vehicle sales in Colorado, it will likely also result in reduced motor vehicle fuel sales. Fuel sales over the period from 2022-2031 will be reduced by approximately 1.6 billion gallons relative to fuel sales under the federal government's rolled back vehicle standards. While this will provide benefits to fuel consumers it will have a negative impact on fuel retailers and could possibly have an impact on the Suncor Refinery in Commerce City.

The proposed rule will reduce CO<sub>2</sub> emissions into the ambient air, which tend to accumulate rather than dissipate or decay, as do other types of emissions. Ambient CO<sub>2</sub> levels are increasing over time, exposing all Coloradoans to elevated CO<sub>2</sub> concentrations. While not a direct health threat, elevated ambient CO<sub>2</sub> is the primary agent of increasing temperatures. With increasing temperatures come shifts in snowmelt runoff, water quality concerns, stressed ecosystems and transportation infrastructure, impacts to energy demands, and extreme weather events that can impact air quality and recreation. The challenges facing Colorado will affect everyone, and they require collaborative and comprehensive solutions. By extension, the proposal will benefit all Coloradoans.

- (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;

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<sup>5</sup> Draft Technical Assessment Report: Mid-Term Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025 (July, 2016) at 6-1.

Consistent with the analyses for the EPA’s 2017 Final Determination and the SAFE Rule Regulatory Impact Analysis (RIA)<sup>6</sup>, the Division assumes that the per-vehicle technology and compliance costs borne by the vehicle manufacturers and the new car dealers discussed above will be passed along to new vehicle purchasers. As discussed above, the Division has considered but cannot definitively determine how the Proposal will affect vehicle sales in the event that the federal Tier 3 standards are rolled back as proposed in SAFE. This is because fuel economy and vehicle price are only two of the many variables consumers factor into making decisions on vehicle purchases.

As a result of the increased vehicle technology costs, vehicle purchasers will likely incur additional direct costs in the form of increased sales tax at the time of the purchase and ongoing increases in the price of vehicle insurance and vehicle maintenance costs over the life of the vehicle. In addition to these costs, vehicle owners will realize ongoing fuel savings over the life of the vehicle as a result of CLEAR. EPA and NHTSA analyzed these costs in the analyses supporting the 2017 Final Determination and in the SAFE Rule RIA. The Division has further analyzed these costs and benefits in a Cost Benefit Analysis (“CBA”) developed pursuant to §24-4-103(2.5), and a Final Economic Impact Analysis (“FEIA”) under §25-7-110.5(4). Those documents are attached to this Regulatory Analysis as Exhibits A and B.

### **CLEAR Consumer Costs Based on 2017 Determination Analyses**

EPA reports the per-vehicle consumer costs and fuel savings benefits of maintaining the MY 2022-2025 GHG standards on pages 41-43 of the Proposed Determination document. Table IV.10 of the Proposed Determination document lists costs and fuel savings benefits for a cash purchased MY 2025 vehicle on a yearly basis during the first 8 years of vehicle ownership. The information from Table IV.10 is displayed in Table 1 below.

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<sup>6</sup> *Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation* (January 2017) (hereinafter “Final Determination”); EPA, *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks Preliminary Regulatory Impact Analysis* (hereinafter “SAFE Rule RIA”).

**TABLE 1**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO 2016 Reference Fuel Price Case, Cash Purchase (3% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1st	\$863 <sup>7</sup>	\$47	\$16	\$926	\$6	-\$238	\$693
2 <sup>nd</sup>	\$0	\$0	\$15	\$15	\$6	-\$232	\$483
3 <sup>rd</sup>	\$0	\$0	\$14	\$14	\$5	-\$223	\$279
4 <sup>th</sup>	\$0	\$0	\$13	\$13	\$5	-\$213	\$85
5 <sup>th</sup>	\$0	\$0	\$12	\$12	\$5	-\$202	-\$100
6 <sup>th</sup>	\$0	\$0	\$11	\$11	\$5	-\$189	-\$274
7 <sup>th</sup>	\$0	\$0	\$10	\$10	\$4	-\$178	-\$437
8 <sup>th</sup>	\$0	\$0	\$9	\$9	\$4	-\$166	-\$589

Table IV.11 of the Proposed Determination document lists the same information for a MY 2025 vehicle purchased using a 5 year loan.<sup>8</sup> The information from Table IV.11 is displayed in Table 2.

**TABLE 2**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO 2016 Reference Fuel Price Case, 5-year (60 Month) Loan Purchase (3% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1 <sup>st</sup>	\$863 <sup>9</sup>	\$47	\$16	\$217	\$6	-\$238	-\$16
2 <sup>nd</sup>	\$0	\$0	\$15	\$209	\$6	-\$232	-\$32
3 <sup>rd</sup>	\$0	\$0	\$14	\$201	\$5	-\$223	-\$49
4 <sup>th</sup>	\$0	\$0	\$13	\$193	\$5	-\$213	-\$64
5 <sup>th</sup>	\$0	\$0	\$12	\$184	\$5	-\$202	-\$78
6 <sup>th</sup>	\$0	\$0	\$11	\$11	\$5	-\$189	-\$251
7 <sup>th</sup>	\$0	\$0	\$10	\$10	\$4	-\$178	-\$414
8 <sup>th</sup>	\$0	\$0	\$9	\$9	\$4	-\$166	-\$567

<sup>7</sup> The notes to Table IV.10 state the following: 1) “Insurance costs include depreciation effects and all cost metrics shown include vehicle survival rate factors.” and 2) “The \$863 delta cost per vehicle was calculated from the average per-vehicle cost of \$875 discounted at 3 percent to the mid-year point of the first year of ownership.”

<sup>8</sup> In the loan purchase scenarios EPA used a 4.25% loan rate. *Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation* (November 2016) at 42 (hereinafter “Proposed Determination”).

<sup>9</sup> The notes to Table IV.11 contain the same information.

Table 3 shows the same information as Table 1 using a 7% discount rate. Table 4 shows the cost and savings information using a 7% discount rate and a 72-month loan purchase. The figures in Tables 3 and 4 are taken from Table C.66 and Table C.72 in the appendix to the Proposed Determination document.

**TABLE 3**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO Reference Fuel Price Case, Cash Purchase (7% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1st	\$846	\$46	\$16	\$908	\$6	-\$234	\$680
2 <sup>nd</sup>	\$0	\$0	\$15	\$15	\$5	-\$219	\$481
3 <sup>rd</sup>	\$0	\$0	\$13	\$13	\$5	-\$203	\$296
4 <sup>th</sup>	\$0	\$0	\$12	\$12	\$5	-\$186	\$126
5 <sup>th</sup>	\$0	\$0	\$10	\$10	\$4	\$-170	-\$30
6 <sup>th</sup>	\$0	\$0	\$9	\$9	\$4	-\$153	-\$170
7 <sup>th</sup>	\$0	\$0	\$8	\$8	\$3	-\$139	-\$298
8 <sup>th</sup>	\$0	\$0	\$7	\$7	\$3	-\$125	-\$412

**TABLE 4\***

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO Reference Fuel Price Case, 6-Year (72 Month) Loan Purchase (7% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1st	\$862	\$47	\$16	\$187	\$6	-\$232	-\$39
2 <sup>nd</sup>	\$0	\$0	\$15	\$173	\$5	-\$217	-\$78
3 <sup>rd</sup>	\$0	\$0	\$13	\$160	\$5	-\$201	-\$114
4 <sup>th</sup>	\$0	\$0	\$12	\$148	\$5	-\$185	-\$146
5 <sup>th</sup>	\$0	\$0	\$10	\$135	\$4	-\$169	-\$175
6 <sup>th</sup>	\$0	\$0	\$9	\$124	\$4	-\$152	-\$200
7 <sup>th</sup>	\$0	\$0	\$8	\$8	\$3	-\$138	-\$326
8 <sup>th</sup>	\$0	\$0	\$7	\$7	\$3	-\$124	-\$440

\*The figures in Table 4 have been revised slightly from how initially presented in Table 9 of the Final Economic Impact Analysis which inadvertently included the data for a 3% discounting scenario from Table C.71.

Because EPA used the information in Tables 1-4 above to show the payback period for the vehicle owner associated with retaining the MY2022-MY2025 GHG standards, they do not show the full lifetime per vehicle savings. EPA included life-time fuel savings and net savings information for different fuel price scenarios in Table IV.12 of the Proposed Determination document. This information is reflected in Table 5 below.

**TABLE 5**

Lifetime Fuel Savings and Net Savings for the Sales-Weighted Average MY2025 Vehicle Purchased with Cash under Each of the AEO 2016 Fuel Price Cases (2015\$)

Case	3 Percent Discount Rate		7 Percent Discount Rate	
	Lifetime Fuel Savings	Lifetime Net Savings	Lifetime Fuel Savings	Lifetime Net Savings
AEO High Fuel Prices	\$4,209	\$3,054	\$3,223	\$2,145
AEO Reference Fuel Prices	<b>\$2,804</b>	<b>\$1,648</b>	\$2,128	\$1,051
AEO Low Fuel Prices	\$1,899	\$723	\$1,439	\$345

While Tables 1-5 provide directional information on the consumer costs and savings associated with CLEAR, they do not include the additional vehicle technology costs or fuel savings associated with the incremental difference between the MY 2020 standards, which will be the final standards under the SAFE Rule preferred option, and the MY 2021 standards. Nor do these Tables account for the additional vehicle, taxes, insurance, and maintenance costs of an average Colorado vehicle using a 25%/75% car truck mix. At the same time, these tables also do not account for the additional fuel savings that will be achieved by an average Colorado vehicle.



## CLEAR Consumer Costs Based on SAFE RIA Analyses

In the SAFE Rule RIA, NHTSA conducted an analysis of the consumer costs and fuel savings benefits of freezing the existing MY2021-2025 GHG standards at MY2020 levels. This analysis examined the consumer costs and benefits for cars and trucks by model year using a 3% and a 7% discount rate. A summary of impacts, which includes additional information regarding the nationwide impact of the rule on traffic fatalities and total technology costs and societal benefits, along with certain per-vehicle consumer costs and benefits for MY2030 is included in Table 1-78 of the SAFE RIA. The information from Table 1-78 is included in Table 6.

**TABLE 6**

Table 1-78 – Preferred Alternative, Summary of Impacts, CO<sub>2</sub>

Category	Light Truck	Passenger Car	Combined Fleet
Required MPG for MY 2026+	31.3	43.7	37.0
Achieved MPG for MY 2025+	33.2	45.1	38.9
Achieved MPG for MY 2020	31.2	42.4	36.4
Per Vehicle Price Increase	-\$2,450	-\$2,080	-\$2,260
MY 2030 Lifetime Fuel Savings (per vehicle), Discounted at 3%	-\$2,460	-\$1,560	-\$1,830
MY 2030 Lifetime Fuel Savings (per vehicle), Discounted at 7%	-\$2,000	-\$1,310	-\$1,510
Consumer Per Vehicle Savings, Discounted at 3%	-\$290	\$360	\$290
Consumer Per Vehicle Savings, Discounted at 7%	\$280	\$680	\$690
Payback Period Relative to MY 2016 (Years), Values Discounted at 3%	3	4	4
Payback Period Relative to MY 2016 (Years), Values Discounted at 7%	4	5	5
Total Lifetime Fuel Savings (bGallons)	-41	-38	-79
Total Lifetime CO <sub>2</sub> Reductions (million metric tons)	-451	-422	-872
Fatalities (Excluding Rebound Miles)	-4,650	-3,700	-8,350
Fatalities (Rebound Miles)	-3,490	-3,800	-7,300
Total Technology costs (\$b), Discounted at 3%	-\$137	-\$123	-\$260
Total Technology Costs (\$b), Discounted at 7%	-\$103	-\$92	-\$196
Total Net Societal Benefits (\$b), Discounted at 3%	\$113	\$88	\$201
Total Net Societal Benefits (\$b), Discounted at 7%	\$80	\$60	\$141

## **CLEAR Consumer Costs Based on Colorado Specific Fuel Savings Analysis**

The Division conducted an independent calculation of the fuel savings per vehicle expected from adoption of CLEAR using Colorado specific data. In conducting this analysis, the Division first calculated the expected real world per mile fuel savings benefit for both cars and trucks for every model year between 2022 and 2031 based on the difference between the LEV III standards for MY2022-2031 and the final standard under the SAFE Rule preferred option (current Tier 3 MY2020 standard). To account for real world driving, the difference for each model year was multiplied by 0.8.<sup>10</sup> The per mile fuel savings for cars and trucks were then converted into a Colorado specific weighted average per mile savings per vehicle using the 25%/75% car/truck mix.

To calculate the gallons of fuel saved per Colorado weighted average vehicle for each year of vehicle life, the Division used standard annual values of VMT by vehicle age used in Colorado mobile source emissions modeling and assumed that the vehicles will operate for 150,000 miles.

The Division then multiplied this VMT by vehicle age and by the per mile fuel savings discussed above. Finally, the Division calculated dollar savings per vehicle using the calculated fuel savings and a \$3.012 price per gallon of gas. This price represents the average price per gallon in Colorado for the week ending October 1, 2018. This is a conservative estimate given the Energy Information Administration's prediction that price per gallon of gasoline will increase from 2018 through 2050 under all scenarios, and will be over \$3.01 from 2022 onward for all scenarios except the low oil price scenario, as reflected in Chart 1.<sup>11</sup>

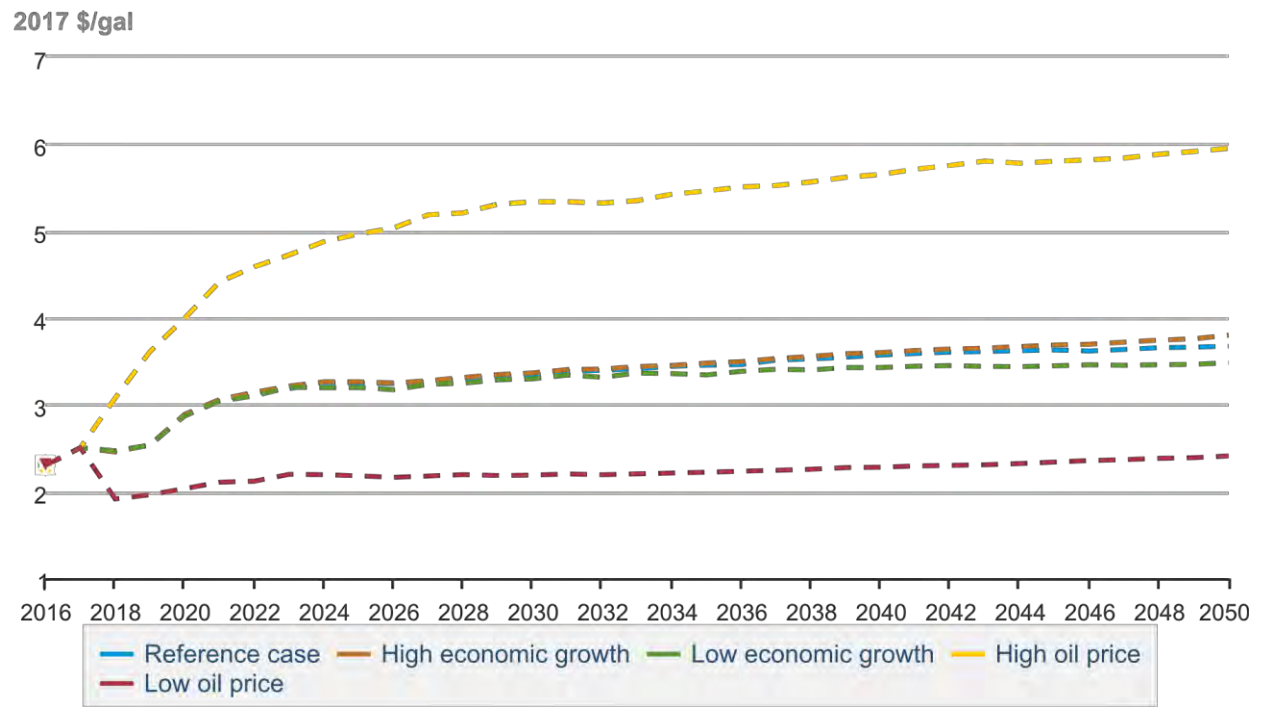
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<sup>10</sup> This is consistent with the methodology employed by NHTSA in the SAFE Rule RIA. *See* SAFE Rule RIA at 11.

<sup>11</sup> U.S. Energy Information Administration AEO Energy Outlook 2018.

# CHART 1

## Real Petroleum Prices: Transportation: Motor Gasoline



 Source: U.S. Energy Information Administration

Note that the values in Chart 1 are in 2017 dollars so the values would be slightly higher using 2018 dollars.

Table 7 shows the non-discounted dollar fuel savings per vehicle by model year and vehicle age, as well as a total lifetime savings per vehicle by model year assuming \$3.01 per gallon gas. The lifetime savings assumes a useful life of the vehicle of 150,000 miles. If vehicles are driven for more than 150,000 miles there will be additional savings that are not included in this table.

**TABLE 7**

Per vehicle dollar fuel savings, non-discounted

Model Year	Vehicle Age											Total
	1	2	3	4	5	6	7	8	9	10	11	
2022	187	183	179	174	168	163	159	153	146	142	64	1,718
2023	257	252	246	240	232	225	220	211	202	196	89	2,370
2024	324	317	310	302	292	283	276	266	254	247	112	2,983
2025	391	382	374	364	352	342	333	320	306	298	135	3,597
2026	391	382	374	364	352	342	333	320	306	298	135	3,597
2027	391	382	374	364	352	342	333	320	306	298	135	3,597
2028	391	382	374	364	352	342	333	320	306	298	135	3,597
2029	391	382	374	364	352	342	333	320	306	298	135	3,597
2030	391	382	374	364	352	342	333	320	306	298	135	3,597
2031	391	382	374	364	352	342	333	320	306	298	135	3,597

Based on these numbers the Division calculated discounted savings based on a 3% and 7% discount rate. These discounted number are reflected in Tables 8 and 9 below.

**TABLE 8**

Per vehicle dollar fuel savings, 3% discount rate

Model Year	Vehicle Age											Total
	1	2	3	4	5	6	7	8	9	10	11	
2022	184	175	166	157	147	139	131	123	114	108	47	1,490
2023	254	241	229	216	203	191	181	169	157	148	65	2,055
2024	319	303	288	272	256	241	228	213	198	187	82	2,586
2025	385	366	347	328	308	290	275	257	238	225	99	3,118
2026	385	366	347	328	308	290	275	257	238	225	99	3,118
2027	385	366	347	328	308	290	275	257	238	225	99	3,118
2028	385	366	347	328	308	290	275	257	238	225	99	3,118
2029	385	366	347	328	308	290	275	257	238	225	99	3,118
2030	385	366	347	328	308	290	275	257	238	225	99	3,118
2031	385	366	347	328	308	290	275	257	238	225	99	3,118

**TABLE 9**

Per vehicle dollar fuel savings, 7% discount rate

Model Year	Vehicle Age											Total
	1	2	3	4	5	6	7	8	9	10	11	
2022	180	165	151	137	124	112	103	92	82	75	32	1,253
2023	249	228	208	189	171	155	141	127	114	103	44	1,729
2024	313	287	262	238	215	195	178	160	143	130	55	2,176
2025	378	346	316	287	260	235	215	193	172	157	66	2,624
2026	378	346	316	287	260	235	215	193	172	157	66	2,624
2027	378	346	316	287	260	235	215	193	172	157	66	2,624
2028	378	346	316	287	260	235	215	193	172	157	66	2,624
2029	378	346	316	287	260	235	215	193	172	157	66	2,624
2030	378	346	316	287	260	235	215	193	172	157	66	2,624
2031	378	346	316	287	260	235	215	193	172	157	66	2,624

To calculate cumulative savings, the Division multiplied the per-vehicle savings in Tables 7, 8 and 9 by the projected Colorado new vehicle sales from Table 1 of the FEIA, which is attached as Exhibit B. Based on these calculations the total fuel savings from MY2022 - MY2031 from the adoption of CLEAR will be \$ 9,164,147,992 using non-discounted fuel savings and \$ 7,944,523,137 and \$ 6,684,755,540 respectively using a 3% and 7% discount.

Using the fuel savings shown in Tables 8 and 9, the vehicle technology costs shown in Table 2 and Table 4 of the FEIA, and other consumer costs using the data from the 2017 Final Determination and the SAFE Rule RIA,<sup>12</sup> the Division calculated per-vehicle net costs to consumers using both a 3% and 7% discount rate. Table 10 contains the per-vehicle net costs using the 2017 Final Determination consumer cost numbers for the 2 fuel savings discounting scenarios for MY2025 vehicles,<sup>13</sup> and Table 11 contains the per-vehicle net costs for the highest cost year using the SAFE RIA consumer costs (MY 2029).<sup>14</sup>

<sup>12</sup> These other consumer cost numbers are reflected in Tables 6 and 8 of the FEIA: *2017 Final Determination costs using 3% and 7% discount rates for MY2025*; and Tables 12-15 of the FEIA: *SAFE Rule RIA costs for cars and trucks by model year using 3% and 7% discount scenarios*.

<sup>13</sup> As discussed in the FEIA at 6, the consumer cost numbers from the *2016 Proposed Determination* document do not include the incremental costs of going from the 2020 to 2021 standards. Additionally, the costs are not in 2018 dollars, do not reflect the Colorado specific car/truck mix, and only go out for 8 years rather than the 11-year life that the Division assumed in its fuel savings calculations. To address this, the Division used the MY 2025 vehicle technology costs from Table 2 of the FEIA, which corrected for these deficiencies. To correct the non-vehicle consumer costs, the Division first added three additional years of costs for insurance and maintenance based on the year 8 costs listed in EPA's tables, and then scaled the total taxes, insurance and maintenance costs up using the ratio of the EPA determined vehicle costs in Tables 6 and 8 of the FEIA to the MY 2025 Colorado average vehicle cost from Table 2 of the FEIA.

<sup>14</sup> For the costs the Division used the Colorado average vehicle cost for MY 2029 from Table 4 of the FEIA, and the additional ownership costs/welfare loss from Tables 12-15 of the FEIA adjusted to 2018 dollars and Colorado average vehicle using the 25%/75% car/truck mix.

**TABLE 10**

<b>CLEAR Per-Vehicle Net Cost Based on 2017 Determination Costs Model Year 2025</b>				
Discount Scenario	Vehicle Technology Cost	Taxes, Insurance and Maintenance	Fuel Savings	Net Cost
3%	\$1,138	\$298	\$3,118	<b>-\$1,682</b>
7%	\$1,138	\$270	\$2,624	<b>-\$1,216</b>

**TABLE 11**

<b>CLEAR Per-Vehicle Net Cost Based on SAFE RIA Costs Model Year 2029</b>				
Discount Scenario	Vehicle Technology Cost	Additional Ownership Costs/Welfare Loss	Fuel Savings	Net Cost
3%	\$2,559	\$620	\$3,118	<b>\$61</b>
7%	\$2,559	\$559*	\$2,624	<b>\$494**</b>

\*This number changed slightly from the CBA and FEIA to account for a change from 2016 to 2018 dollars. \*\*This number accounts for the change to 2018 dollars and fixes a typographical error from the FEIA and CBA.

### **Aftermarket Catalytic Converter Cost to Consumers**

The Division assumes that the additional cost of approximately \$100 for a California certified aftermarket catalytic converter will be borne by the vehicle owner of a vehicle requiring an aftermarket catalytic converter. Because of the longer warranty, it is possible that use of a California certified catalyst could result in a net savings if vehicle owners need to replace the aftermarket catalyst. The Division, however, does not have information needed to verify or quantify the potential savings.

### **Emissions Reductions Caused by the Proposal:**

The Division estimates adopting CLEAR would result in an increasing annual emissions benefit of carbon dioxide equivalent (CO<sub>2</sub>e) as the standards become more stringent from MY2022-2025, and an increasing number of new vehicles will be subject to the new standards based on a 3% annual growth assumption.<sup>15</sup>

To calculate the GHG emission reduction benefit, the Division used the same standards comparison methodology as used in calculating annual fuel savings per vehicle, but instead of fuel savings, the Division calculated GHG reductions per vehicle. Then the Division reduced the GHG reductions per vehicle using a 10% and 20% rebound effect to account for the possibility that in response to lower per vehicle fuel costs, vehicle owners will drive more miles. Finally, these calculated per vehicle GHG savings were multiplied by projected vehicle sales listed in

<sup>15</sup> See Table 1 from the FEIA (attached as Exhibit B).

Table 1 of the FEIA to calculate GHG reductions by model year, and a cumulative number of reductions for MY 2022-MY2031. Reductions using a 0%, 10%and 20% rebound effect are shown in Tables 12-14 below.

**TABLE 12**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – No Rebound Effect)</b>	
Model Year	Millions of Tons
2022	1.44
2023	2.05
2024	2.64
2025	3.28
2026	3.38
2027	3.48
2028	3.58
2029	3.69
2030	3.80
2031	3.91
<b>TOTAL</b>	<b>31.24</b>

**TABLE 13**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – 10% Rebound Effect)</b>	
<b>Model Year</b>	<b>Millions of Tons</b>
2022	1.42
2023	2.01
2024	2.58
2025	3.18
2026	3.27
2027	3.37
2028	3.47
2029	3.58
2030	3.69
2031	3.80
<b>TOTAL</b>	<b>30.38</b>



**TABLE 14**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – 20% Rebound Effect)</b>	
Model Year	Millions of Tons
2022	1.41
2023	1.97
2024	2.53
2025	3.10
2026	3.19
2027	3.29
2028	3.39
2029	3.49
2030	3.59
2031	3.70
<b>TOTAL</b>	<b>29.67</b>

The Division conservatively estimates that maintaining the current standards will not result in upstream emission reduction benefits associated with fuel production and refining in Colorado. The Division also conservatively estimates that reducing CO<sub>2</sub> will not reduce tailpipe NO<sub>x</sub>, VOC and CO emissions. Accounting for these emission reductions would lead to additional emission reductions associated with Regulation No. 20.

- (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;

The proposed rule will require the Air Pollution Control Division within the Colorado Department of Public Health and Environment to hire one additional full time equivalent (FTE) to provide for program accountability and to monitor and track credits/debits for each auto manufacturer. This estimate is based on conversations with other Section 177 States regarding implementation costs. This new FTE will also aid in program enforcement. The direct cost to the Division would be approximately \$126,250 for salary, benefits and indirect (overhead). This is an annual cost that will continue as long as the program is operating. The Division expects that the nominal costs will slowly increase from year to year but doesn't have sufficient information

to quantify these increases. Given the rate of salary increases over the last decade, the cost increase in 2018 dollars is likely to be negligible or potentially even negative.

The Division has consulted with Department of Revenue on any possible workload implications of this proposed rule on that agency and on its designees, the County Clerks. The Titles and Registrations Section of the Division of Motor Vehicles and the Auto Industry Section of the Enforcement Division have assured the Air Division that the proposed regulation will not add any significant workload on the Department or the Counties in the processes of ensuring dealer compliance and the titling and registration processes. The anticipated responsibilities can be managed using existing resources.

The only foreseeable change to state revenues would come from changes in tax collections resulting from an increase or decrease in vehicle sales and sales prices. The Division has considered but cannot definitively determine how the Proposal will affect vehicle sales in the event that the federal Tier 3 standards are frozen.

**(IV) A comparison of the probable costs and benefits of the proposed rule to the probable costs and benefits of inaction;**

Based on the detailed analysis contained in the FEIA, the proposed rule would reduce CO2 emissions by 29.67 million tons to 31.24 million tons, at a per-vehicle savings under all Final Determination scenarios and at a slight cost under the SAFE scenarios. These calculations are detailed in the FEIA, which is attached as Exhibit B, and are summarized below.

The Division calculated a range of costs per ton using the net per-vehicle cost figures for the 4 scenarios in Tables 10 and 11. These cost numbers were divided by 11.89 tons, which is the calculated per vehicle lifetime GHG benefit for both model years 2025 and 2029 using the 10% rebound scenario.<sup>16</sup> These results are set forth in Table 15.

**TABLE 15**

<b>CLEAR Cost Per Ton of GHG Reduced</b>	
<b>Scenario</b>	<b>Cost Per Ton</b>
2017 Final Determination Costs 3% Discount	<b>-\$142/ton*</b>
2017 Final Determination Costs 7% Discount	<b>-\$102/ton**</b>
SAFE RIA Costs 3% Discount	<b>\$5/ton</b>
SAFE RIA Costs 7% Discount	<b>\$42/ton***</b>

\*This number fixes a typographical error from the FEIA and CBA. \*\* This number is slightly different than what is in the CBA and FEIA due to the change to a 10% rebound scenario. \*\*\* This number accounts for the changes in Table 11 identified above.

The aftermarket catalytic converter rule adoption will reduce ozone precursors up to one ton per day, at a cost of \$9,041 per ton.

<sup>16</sup> This per-vehicle benefit is based on a useful vehicle life of 150,000 miles.

Given the various options in the proposed federal rule and the outcomes of that rulemaking, the probable costs and benefits of the no action scenario in the Colorado proposed rulemaking is difficult to ascertain. As a baseline assumption, however, no action on the proposed Colorado low emissions vehicle rule would have no direct costs, with a corresponding increase of approximately 30 million tons of CO2 emitted.

- (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 GHG from new motor vehicles. States must adopt either federal or California emissions standards.<sup>17</sup> There is no ‘Third car’ method to achieve these reductions.

- (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 GHG from new motor vehicles since states must adopt either federal or California emissions standards. There is no ‘Third car’ method to achieve these reductions.

A number of individuals and entities have advocated that along with the California LEV III requirements the Commission also adopt California’s Zero Emission Vehicle (“ZEV”) program. Under the ZEV program, manufacturers must sell a certain percentage of zero emission vehicles. That percentage grows through model year 2025. According to one analysis adopting the ZEV program in conjunction with LEV would add \$72 million annually to Colorado’s GDP and result in 1,700 additional jobs.<sup>18</sup> The Division is currently conducting a stakeholder process to gather information on the potential costs and benefits of adopting a ZEV program and additional work needs to be done before it can quantify these costs and benefits.

Although 12 states have adopted California LEV standards, and nine of those states have also adopted California ZEV standards, no state has ever adopted ZEV without LEV.

### **Quantification of the 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 provided in sections (I) through (VI) above. To provide further quantification of the data for both the long- and short-term consequences of the proposed rule, the Division is including the Cost Benefit Analysis and Final Economic Impact Analysis prepared as part of this proceeding. These analyses are attached as Exhibits A and B. These documents include additional detail on the direct costs and benefits of the proposed rule. Additionally, the Cost Benefit Analysis has further information on possible indirect costs regarding potential decreases in vehicle and fuel sales as a result of the rule.

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<sup>17</sup> 42 U.S. Code Section 7507.

<sup>18</sup> Hall, J. and Allison, A., Synapse Energy Economics, Inc., *Macroeconomic Analysis of Clean Vehicle Scenarios for Colorado* (June 12, 2018)

## CERTIFICATE OF SERVICE

This is to certify that I have duly served the within APCD REGULATORY ANALYSIS upon all petitioners herein by email this 9th day of November, 2018, addressed as follows:

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*s/ Barbara Dory*  
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## **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:** Public Health and Environment      **AGENCY:** Air Quality Control Commission

**CCR:** 5 CCR 1001-24      **DATE:** November 4, 2018

**RULE TITLE OR SUBJECT:**  
**AIR QUALITY CONTROL COMMISSION REGULATION NUMBER 20 COLORADO LOW EMISSION**  
**AUTOMOBILE REGULATION**

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;**

This new rule is proposed to protect the environment and public health of Coloradans. The proposed Regulation 20, Colorado Low Emission Automobile Regulation ("CLEAR"), maintains light and medium-duty vehicle standards currently in place in Colorado. These vehicles make up the second largest source of greenhouse gas ("GHG") emissions in Colorado. Maintaining Colorado's vehicle standards is an important step in the state's continued progress toward addressing GHG emissions.

CLEAR prevents a roll back in these standards due to a federal proposal that would weaken the standards for these vehicles when sold in Colorado. Regulation 20 maintains Colorado's current standards by basing the standards for these vehicles on the California LEV III vehicle standards instead of the federal standards (LEV stands for low emission vehicles).

Currently, the federal and California vehicle standards establish essentially the same greenhouse gas and criteria pollutant (non-methane organic gas plus oxides of nitrogen) emission limits for vehicle model years 2017-2025. These current standards have been extensively reviewed and there is a substantial body of evidence demonstrating the feasibility and cost-effectiveness of these standards. Nonetheless, the current federal administration has proposed to weaken the federal GHG standards for model years 2021-2025 and beyond.

Section 177 of the federal Clean Air Act allows states the option of requiring compliance with either the federal or California standards for vehicles sold within their borders. States must utilize one of these two standards and are not allowed to develop their own standards. Vehicles currently sold in Colorado comply with the federal standards. Through the adoption of CLEAR, Colorado would utilize the option to no longer base compliance on the federal standards.

States that choose to require compliance with the California standards are often referred to as "Section 177 States". Section 177 States make up over a third of the U.S. new car market. With

the adoption of CLEAR, new vehicles sold in Colorado would be certified to California vehicle standards starting with model year 2022.

In addition to adopting the California LEV III new vehicle standards, CLEAR would adopt provisions requiring that new aftermarket catalysts sold in Colorado be certified to California standards. Currently these catalysts must meet a less rigorous federal standard, and adoption of the California standards will increase the effectiveness of Colorado's vehicle inspection and maintenance program by ensuring that replacement catalysts perform as designed.

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

In the event that the federal new vehicle GHG standards are rolled back as currently proposed, adoption of CLEAR will provide significant fuel savings for motor vehicle owners. As part of its Final Economic Impact Analysis ('FEIA') in this proceeding, the Colorado Department of Public Health and Environment, Air Pollution Control Division ("Division")<sup>1</sup> calculated the fuel savings from adopting CLEAR. Based on these calculations the total fuel savings from MY2022-MY2031 from the adoption of CLEAR will be \$9,164,147,992 using non-discounted fuel savings and \$7,944,523,137 and \$6,684,755,540 respectively using a 3% and 7% discount. These cost savings could provide economic benefits to Colorado businesses by increasing consumer discretionary income. However, as discussed below, part of these fuel savings will be offset by increased vehicle prices and other costs associated with complying.

To better understand the magnitude of any economic effects, the Division projected out fuel sales in Colorado for calendar years 2022-31. Based on these projections total fuel sales in Colorado over that time will be 23.91 billion gallons. The fuel savings over that period time as a result of cleaner vehicles under CLEAR is projected to be 1.56 billion gallons, which is approximately 6.5% of total expected fuel sales in Colorado during that time period.

Apart from providing fuel savings to motorists, moving to a cleaner vehicle fleet could have other economic benefits to Colorado. Based on an analysis performed by Synapse Energy Economics, Inc. moving to a cleaner light duty vehicle fleet in Colorado, which would include adoption of both the LEV III rules and the related Zero Emission Vehicle ("ZEV") requirements, would add \$72 million annually to Colorado's GDP and result in 1,700 additional jobs.<sup>2</sup>

**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;**

A) Direct Costs to Government

If CLEAR is adopted, the Air Pollution Control Division within the Colorado Department of Public Health and Environment will need one additional full time equivalent (FTE) to monitor and track credits/debits for each auto manufacturer. This estimate is based on conversations with other Section 177 States on their costs in implementing the program. This new FTE will also aid in

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<sup>1</sup> The FEIA is attached as Exhibit A.

<sup>2</sup> This report is attached as Exhibit B.

program enforcement. The direct cost to the Division would be approximately \$126,250 for salary, benefits and indirect (overhead). This is an annual cost that will continue as long as the program is operating. The Division expects that the nominal costs will slowly increase from year to year but doesn't have sufficient information to quantify these increases. Given the rate of salary increases over the last decade the cost increase in 2018 dollars is likely to be negligible or potentially even negative.

B) Direct and Indirect Costs to Businesses and Other Entities to Comply

In order to meet the GHG standards under the LEV III program (incorporated in CLEAR) manufacturers will need to utilize additional advanced technologies. Employing these advanced technologies will increase the costs of manufacturing vehicles relative to what would be required under the SAFE Rule preferred option. While the LEV III program, and the current federal Tier 3 program establish GHG standards by model year they do not prescribe the technologies that must be used in order to meet these standards. Rather they provide the manufacturers with flexibility on which technologies to employ to meet the standards. This allows manufacturers to identify the most cost effective options that can be employed for different vehicles to meet the standards. The LEV III program (and the current Tier 3 rules) provide various other compliance flexibilities, including separate standards for trucks and cars, sliding compliance standards based on the size of the vehicles that a manufacturer sells, banking of credits, and trading of credits between manufacturers.

Based on an analyses conducted by EPA in 2016 and applied to the Colorado new vehicle market, once fully implemented, the new vehicle standards under CLEAR could increase average new vehicle costs in Colorado by \$1,158. Table 1 shows the cumulative costs for model years 2022-2031 under this analysis.



**TABLE 1**

<b>CLEAR Vehicle Technology Costs Based on 2017 Determination Analysis (Cumulative Compliance Costs)</b>			
<b>Year</b>	<b>Cars (millions of dollars)</b>	<b>Trucks (millions of dollars)</b>	<b>Fleet (millions of dollars)</b>
2022	17.3	70.5	87.9
2023	30.7	125.2	156.1
2024	44.9	183.3	228.2
2025	60.0	244.5	304.4
2026	61.8	251.9	313.5
2027	63.6	259.4	322.9
2028	65.5	267.2	332.6
2029	67.5	275.2	342.6
2030	69.5	283.5	352.8
2031	71.6	292.0	363.4
<b>TOTAL</b>	<b>552.5</b>	<b>2252.6</b>	<b>2804.3</b>

Separately, the National Highway Traffic Safety Administration (“NHTSA”) did an analysis of the cost of complying with the standards for MY 2021-2025. Applying this analysis to the Colorado fleet the average increase in new vehicle costs in Colorado once CLEAR was fully implemented would be \$2,599 per vehicle.

**TABLE 2**

<b>CLEAR Vehicle Technology Costs Based on SAFE Rule RIA Analysis (Cumulative Compliance Costs)</b>			
<b>Year</b>	<b>Cars (millions of dollars)</b>	<b>Trucks (millions of dollars)</b>	<b>Fleet (millions of dollars)</b>
2022	77.5	322.2	399.7
2023	99.2	366.1	465.3
2024	112.6	393.6	506.4
2025	124.5	418.3	542.9
2026	145.8	488.0	633.9
2027	156.2	520.7	677.1
2028	164.8	569.0	733.8
2029	169.7	600.5	770.2
2030	174.8	618.5	793.3
2031	180.1	637.0	817.1
<b>TOTAL</b>	<b>1405.2</b>	<b>4933.8</b>	<b>6339.5</b>

It is assumed that the increased vehicle costs will be passed on to Colorado new vehicle purchasers. In addition, vehicle owners will incur additional costs for insurance, taxes and vehicle maintenance. Based on the Division's analysis in the FEIA, these additional consumer costs will range from \$298 to \$528 on average depending on the analysis method used. Tables 4 and 5 show the net costs to vehicle owners based on 4 different analytical scenarios (negative net costs represent a savings to consumers).

**TABLE 3**

<b>CLEAR Per-Vehicle Net Cost Based on 2017 Determination Costs Model Year 2025</b>				
<b>Discount Scenario</b>	<b>Vehicle Technology Cost</b>	<b>Taxes, Insurance and Maintenance</b>	<b>Fuel Savings</b>	<b>Net Cost</b>
3%	\$1,138	\$298	\$3,118	<b>-\$1,682</b>
7%	\$1,138	\$270	\$2,624	<b>-\$1,216</b>

**TABLE 4**

<b>CLEAR Per-Vehicle Net Cost Based on SAFE RIA Costs Model Year 2029</b>				
<b>Discount Scenario</b>	<b>Vehicle Technology Cost</b>	<b>Additional Ownership Costs/Welfare Loss</b>	<b>Fuel Savings</b>	<b>Net Cost</b>
3%	\$2,559	\$620	\$3,118	<b>\$61</b>
7%	\$2,559	\$525	\$2,624	<b>\$525</b>

The Colorado Automobile Dealers Association (“CADA”) and their expert in this rulemaking have indicated that auto dealers may incur additional transportation costs and delays in trading vehicles with out-of-state dealers since dealers in surrounding states will not be required to sell LEV III compliant vehicles.<sup>3</sup> The Division acknowledges that this is a possibility, but does not have any information on how many trades Colorado dealers engage in with dealers in surrounding states, whether the out of state dealers that engage in these trades would stock LEV III compliant vehicles in order to serve the Colorado market, whether current out-of-state trades could be replaced with in-state trades, or the increased cost associated with obtaining a vehicle from a LEV III state dealer, the manufacturer or an in-state dealer. Accordingly, the Division cannot reasonably quantify this potential cost.

In addition to these direct costs in meeting the new vehicle standards, concerns have been raised about the possibility that increased upfront vehicle costs may reduce new car sales. This issue is discussed at length in Section 4.

Regarding CLEAR’s requirement for California certified aftermarket catalytic converters, the sales of aftermarket catalytic converter are approximately 33,000 per year in Colorado according to market sources. Based on the Division’s firsthand experience, the retail cost differential between a currently-available federal- and California certified aftermarket converter is approximately \$100. Based on this the estimated total annual cumulative cost of the aftermarket catalytic converter provision is approximately \$330,000.

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

In addition to the costs discussed in number 3 above, and the potential impact of these costs on consumers, there is the possibility that vehicle price increases could negatively impact new vehicle sales. The automotive sector in Colorado is primarily composed of automobile dealers and their employees. According to CADA in their 2017 annual report, new automobile dealerships account for 15.25% of total retail employment in Colorado. They directly employ 21,060 people at new car dealerships in Colorado, with an additional 19,900 indirect jobs

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<sup>3</sup> It is not clear how manufacturers will react to having two separate GHG emission standards under the Tier 3 and LEV rules. One possible outcome is that manufacturers will produce two sets of vehicles, one for sale in LEV states and one for sale in the rest of the country. It is also possible, however, that manufacturers will produce one set of vehicles that meets both the LEV standards that will be sold in all 50 states.

according to CADA. New automobile dealerships sell over \$17.8 billion a year at their dealerships, with \$2.26 billion earnings from dealership operations going to people employed in the industry in Colorado. They contribute \$750.4 million in state and local taxes. A new automobile franchise averages 1780 new and used vehicle sold each year on \$68.8 million in sales. Another 19,500 vehicles are serviced at dealerships. These dealerships are an important part of Colorado's economy.

The Division has considered but cannot definitively determine how the Proposal will affect vehicle sales in the event that the federal Tier 3 standards are frozen. Buyer elasticity is difficult if not impossible to predict. According to EPA's Technical Assessment Report, "It is difficult, if not impossible, to separate the effects of the Standards on vehicle sales and other characteristics from the impacts of macroeconomic forces on the auto market".<sup>4</sup> Fuel economy and vehicle price are only two of the many variables consumers factor into making decisions on vehicle purchases. Because the LEV standards and the Tier 3 standards are national in scope, it is impossible to compare vehicle sales in one area where the standards are in place and in another very similar area where the standards are not in place over the same period of time. Despite the admitted uncertainty, EPA and NHTSA posited in the SAFE proposal that vehicle sales will increase from the rollback in the standards, and by extension, vehicle sales in states with LEV standards will be negatively impacted.

Because the values of changes in fuel economy and other features to potential buyers are not completely understood, the magnitude – and possibly even the direction – of their effect on sales of new vehicles is difficult to anticipate. On balance, the changes in prices, fuel economy, and other attributes expected to result from the proposed action to reduce fuel economy and CO<sub>2</sub> emission standards are likely to increase total sales of new cars and light trucks slightly during future model years.<sup>5</sup>

CADA suggests that the proposal will increase new vehicle costs by \$1,000 – \$2,500, resulting in sales volume decreases of 4% - 9.4%,<sup>6</sup> while others suggest that the fuel savings associated with the more stringent fuel economy standards will prompt consumers to purchase more vehicles than they would under the rolled back federal standards.<sup>7</sup> Note that even the SAFE NPRM only predicts a change in sales between 0.2% and 0.6% nationwide<sup>8</sup>; so, CADA's suggestion of sales volume decreases between 4% and 9.4% seem disproportionately high compared to other estimates. Furthermore, some argue that vehicle price increases do not translate into lower sales. According to David Friedman's analysis:

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<sup>4</sup> APCD PHS Ex. 6, *Draft Technical Assessment Report: Mid-Term Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025* (July, 2016) at 6-1

<sup>5</sup> APCD Rebuttal Ex. 17, EPA, *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks* Preliminary Regulatory Impact Analysis at 943

<sup>6</sup> CADA Rebuttal Statement at 9

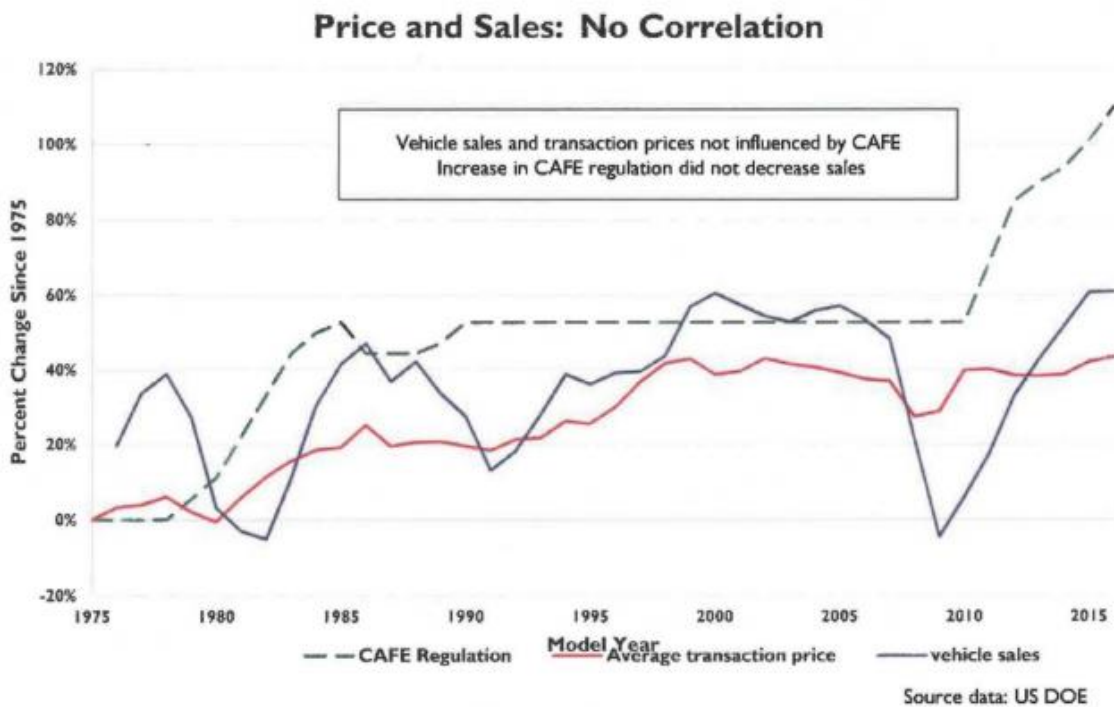
<sup>7</sup> EC-JG-Exhibit 20, Synapse Energy Economics, Inc. *Cleaner Cars and Job Creation: Macroeconomic Impacts of Federal and State Vehicle Standards*, (March 27, 2018). Jamie Hall et al., *Effects of the Draft CAFE Standard Rule on Vehicle Safety*, Synapse, at 23 (Oct. 25, 2018), [http://www.synapse-energy.com/sites/default/files/Effects-of-Proposed-CAFE-Standard-Rollback-Vehicle-Safety\\_18-062\\_2.pdf](http://www.synapse-energy.com/sites/default/files/Effects-of-Proposed-CAFE-Standard-Rollback-Vehicle-Safety_18-062_2.pdf)

<sup>8</sup> APCD Rebuttal Ex. 17, EPA, *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks* Preliminary Regulatory Impact Analysis at 948

Periods of higher vehicle sales occur when prices are rising or flat, and such sales can decrease when prices drop. This means that car sales are primarily influenced by macroeconomic factors, not the price of the vehicles. Similarly, changes in miles per gallon (MPG) requirements do not show any relationship to the number of cars sold. There are multiple times when the MPG requirement climb steeply and new cars sales climb with it. There are periods when the MPG requirements are flat, and new car sales decline sharply.<sup>9</sup>

Friedman demonstrates his point using the following figure comparing CAFE standards, vehicle sales, and vehicle price. Friedman argues there is no correlation between fuel economy standards and sales.

**FIGURE 1**



Conversely, in its comments regarding the Draft Technical Assessment Report, Ford<sup>10</sup> argued that higher costs of future model year cars are likely to decrease sales because future macroeconomic conditions are changing, especially with respect to available credit and interest rates, estimating that total industry volume would drop by 9% - 12% under the assumption that costs would increase on average by \$2,000 - \$2,500. It should be noted that Ford's estimates include volume drops of 19% and 24% in passenger car sales, where the majority of vehicles sold in Colorado are expected to be categorized as light trucks. Therefore, it is likely that Ford's national approximations overstate sales volume drops that could occur in Colorado, as costs for compliance are likely to be cheaper for light trucks than passenger cars. Moreover,

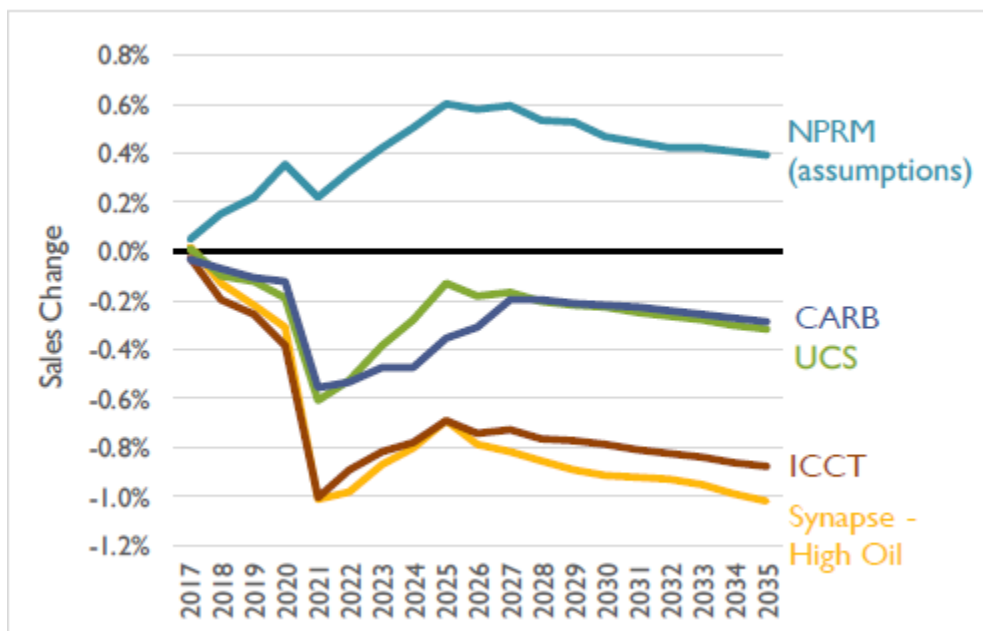
<sup>9</sup> Expert Testimony Summary of David Friedman on Behalf of Environmental Coalition (October 24, 2018)

<sup>10</sup> Ford Comments to Docket ID No. EPA-HQ-OAR-2015-0827

since the 2016 analysis in which it provided these estimates on sales impacts, Ford has subsequently stated it is not asking for the proposed rollback.<sup>11</sup>

The NPRM for SAFE also proposes radically different estimations of the effects that freezing emission and fuel economy standards at 2020 levels will have on vehicle sales nationwide when compared to other models. Synapse Energy Economics, Inc. (“Synapse”) modeled four scenarios which all showed that the federal rollback would likely result in a decrease in overall sales. Figure 2 below shows the estimates of changes in vehicle sales of the SAFE NPRM on vehicle sales compared to four other modeled scenarios, which more accurately accounted for the rebound effect, fuel prices, compliance costs, and high fuel price sensitivity.

**FIGURE 2<sup>12</sup>**



Moreover, according to Synapse, the federal rollback would result in increased consumer spending due to greater aggregated fuel spending. Table 5 shows the total increase in cost when correcting for fuel spending, gross price premiums, net price premiums, and vehicle sales.

<sup>11</sup> APCD Rebuttal Ex. 15, Bill Ford, CEO for Ford Motor Company, A Measure of Progress (October 24, 2018)

<sup>12</sup> Hall, J., et al., Synapse Energy Economics, Inc., *Effects of the Draft CAFE Standard Rule on Vehicle Safety*, at 25, Figure 9 (Oct. 25, 2018), [http://www.synapse-energy.com/sites/default/files/Effects-of-Proposed-CAFE-Standard-Rollback-Vehicle-Safety\\_18-062\\_2.pdf](http://www.synapse-energy.com/sites/default/files/Effects-of-Proposed-CAFE-Standard-Rollback-Vehicle-Safety_18-062_2.pdf).

TABLE 5<sup>13</sup>

Cumulative Change (2017-2035)	NPRM Assumptions	Synapse Scenario 1 (UCS)	Synapse Scenario 2 (ICCT)	Synapse Scenario 3 (CARB)	Synapse Scenario 1 (UCS) – High Fuel Price Sensitivity
Aggregated Gross Price Premium <sup>29</sup> (Billions, 2017\$)	-\$520	-\$390	-\$250	-\$380	-\$450
Aggregated Fuel Spending (Billions, 2017\$)	\$400	\$470	\$470	\$470	\$700
Vehicle Sales	1,368,000	-848,000	-2,338,000	-918,000	-2,528,000

The Division acknowledges that buyer elasticity for new motor vehicles is subject to many important variables that are difficult to predict, and the effects of the proposal on new vehicle sales is uncertain. For the reasons discussed in this section, it seems possible that new vehicle sales volumes could decrease under the proposal, and it also seems possible that new vehicle sales volumes could increase. It is clear, however, that the proposal will likely have differing effects on vehicle sales depending on the type of vehicle in question, vehicle costs, consumer confidence in the economy, consumer preference with respect to fuel economy, interest rates, and available consumer credit.

In addition to the potential impacts that CLEAR may have on new vehicle sales in Colorado, it will certainly result in reduced motor vehicle fuel sales. As discussed above, fuel sales over the period from 2022-2031 will be reduced by approximately 1.6 billion gallons relative to fuel sales under the federal government’s rolled back vehicle standards. While this will provide benefits to fuel consumers it will have a negative impact on fuel retailers and could possibly have an impact on the Suncor Refinery in Commerce City. These entities have not participated in the prehearing process or the stakeholder process leading up to the request for hearing, and have not presented information that would help to quantify this impact.

**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.**

A) Establishing an Initial Credit or Debit Balance

An alternative proposal establishing credit/debit balances for the first year of implementation was offered with one of the Prehearing Statements submitted October 9, 2018, and subsequently supported by another Party in Rebuttals. Objections were raised to this alternative proposal by one party in Rebuttals. Credits/debits are established by vehicle manufacturers

<sup>13</sup> *Id.* at 27, Table 7

based on over- or under- compliance with fleet average emissions, and allow for flexibility in meeting requirements with slightly older (or newer) technologies.

Credit/debit balances are calculated using a fairly complex set of variables created by, and options selected by each manufacturer. Credits and debits change from year to year and manufacturer to manufacturer, based on average emissions for the entire 'pool' of § 177 states, or average emissions from California only (at each manufacturer's option), and based on both average criteria emissions and average GHG emissions from the previous year from those states.

If CLEAR is adopted there will be an additional 200,000 new Colorado vehicles in the § 177 "pool" in the 2022 model year, but without average emissions from 2021 model year Low Emissions Vehicle sales here. This will tend to mathematically lower the level of credits and correspondingly raise debits in the pool. The alternative proposal would mathematically adjust existing credit/debit banks for the 2022 model year by proportionalizing all Colorado 2021 model year vehicle sales to California (or California + § 177 pool) sales.

The alternative proposal submitted included regulatory language for each "Establishing Initial Credit/Debit Balance" scenario but it was submitted without the required Economic Impact Analysis and Statement of Basis and Purpose. There is no readily available data to complete a cost-benefit analysis of this alternative proposal. Additionally, California LEV III staff at the Air Resources Board have questioned the legality of this approach as it could affect markets in that state and all other § 177 states.

#### B) Adopting the ZEV Program along with the LEV Program

A number of individuals and entities have advocated that along with the California LEV III requirements the Commission also adopt California's Zero Emission Vehicle ("ZEV") program. Under the ZEV program, manufacturers must sell a certain percentage of zero emission vehicles. That percentage grows through model year 2025. According to one analysis adopting the ZEV program in conjunction with LEV would add \$72 million annually to Colorado's GDP and result in 1,700 additional jobs.<sup>14</sup> The Division is currently conducting a stakeholder process to gather information on the potential costs and benefits of adopting a ZEV program and additional work needs to be done before it can quantify these costs and benefits.

#### C) No Action Alternative

Three Parties to the rulemaking have recommended that the Commission take no action to adopt CLEAR. One of these Parties filed a motion to continue, which was denied. Two parties were critical of the proposed rule but stopped short of recommending no action, while three parties appear to be supportive of moving ahead.

The federal government rolling back the existing new vehicle standards as proposed would eliminate both the costs and the benefits of CLEAR detailed herein. Taking no further action would cause Colorado to lose the opportunity to retain emissions reduction benefit from the 2022 model year, even if the rule was taken up again next year. There would be no cost nor cost savings to the state if the no action alternative is taken, since the one FTE anticipated would not be sought.

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<sup>14</sup> See Exhibit B.



## FINAL ECONOMIC IMPACT ANALYSIS

Per C.R.S. 25-7-110.5(4)(c)(I)

for

### **Proposed AQCC Regulation Number 20: Colorado Low Emission Automobile Regulation**

November 15, 2018

## INTRODUCTION

Proposed AQCC Regulation Number 20 Colorado Low Emission Automobile Regulation (“CLEAR”) was developed in response to Governor Hickenlooper’s Executive Order B 2018-06 “Maintaining Progress on Clean Vehicles”. In his executive order, the Governor directed the Colorado Department of Public Health and Environment to:

*Develop a rule to establish a Colorado LEV program, which incorporates the requirements of the California LEV program; and*

*Propose that rule to the Air Quality Control Commission during its August 2018 meeting for possible adoption into the Colorado Code of Regulations by December 30, 2018.*

The purpose of the executive order is to maintain progress in reducing greenhouse gases from motor vehicles sold in Colorado. This is to ensure continued progress in meeting the governor’s Executive Order D 2017-15, which requires the reduction of greenhouse gases (“GHG”) emitted in the state of Colorado by 26% by the year 2025.

New cars and light duty trucks sold in Colorado are currently subject to the federal Tier 3 emission standards. Under Section 209 of the Clean Air Act, California has the authority to adopt its own new vehicle emission standards.<sup>1</sup> Once California has adopted a specific set of emission standards, other states can choose to adopt those standards in lieu of the federal standards pursuant to section 177 of the Clean Air Act.<sup>2</sup> California has exercised this authority multiple times and is presently implementing the California LEV III standards.<sup>3</sup> Thirteen other states have adopted the LEV III standards.

Currently the Tier 3 and LEV III GHG emission standards are equivalent.<sup>4</sup> Under both sets of rules the GHG emission limits become increasingly more stringent through the 2025 model year

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<sup>1</sup> While California has the general authority to adopt its own emission standards, in order to adopt and implement a specific set of standards they must obtain a waiver from the United States Environmental Protection Agency (“EPA”).

<sup>2</sup> Under section 177, states are not required to obtain EPA’s approval prior to adopting the California standards. However, such standards must be adopted at least two years before becoming effective in order to provide automakers sufficient time to prepare.

<sup>3</sup> EPA granted the waiver for the California LEV III standards in 2013.

<sup>4</sup> MECA, U.S. EPA Tier 3 and California LEV III Rulemakings, available at <http://www.meca.org/regulation/epa-tier-3-and-california-lev-iii-rulemakings>.

(MY). Under both sets of standards manufacturers must meet fleet wide GHG emission standards expressed in grams per mile. There are separate fleet-wide emission standards for cars and light duty trucks. The rules provide further flexibility for manufacturers by utilizing a vehicle foot print based calculation for determining the manufacturer's fleet-wide average. Under this system, the fleet wide average requirement for a manufacturer who sells a higher percentage of larger trucks or cars will be less stringent than if they sold a smaller trucks or cars.<sup>5</sup> In addition to providing separate standards for cars and light duty trucks, and adjusting manufacturers' requirements based on the foot print of the vehicles they sell, both the Tier 3 and LEV III rules provide additional flexibilities including banking and trading of credits across model years, and trading of credits between manufacturers.<sup>6</sup> Additionally, under the LEV III rules, manufacturers have the option of demonstrating compliance with the GHG standards across California and all the Section 177 states instead of complying on a state-by-state basis.<sup>7</sup>

When the current Tier 3 GHG standards were adopted in 2012, EPA made a regulatory commitment to conduct a midterm review of the standards and determine whether the standards for MY 2022-2025 remained appropriate. In July 2016, EPA, the National Highway Safety Administration ("NHTSA"), and the California Air Resources Board ("CARB") issued a Draft Technical Assessment Report for public comment, which analyzed the technical feasibility and costs associated with complying with the MY 2022-2025 GHG standards.<sup>8</sup> In November 2016, based on the draft TAR, updated analyses, and information provided during the public comment period, EPA issued a Proposed Determination that the MY 2022-2025 GHG standards remained appropriate.<sup>9</sup> The Proposed Determination included an extensive analysis of the costs and benefits associated with retaining the existing MY 2022-2025 standards. On January 12, 2017, EPA issued a Final Determination that these GHG standards remained appropriate.<sup>10</sup>

On March 22, 2017, EPA issued a Notice of Intent to Reconsider its January 12, 2017 Final Determination. After taking public comment, EPA issued a Notice of Withdrawal of the January 12, 2017 Final Determination.<sup>11</sup> In support of its decision, EPA determined that the current standards were based on outdated information, and that more recent information suggests that the current standards may be too stringent.<sup>12</sup> Following the withdrawal of the Final Determination of appropriateness, NHTSA and EPA proposed the Safer Affordable Fuel Efficient Vehicles Rule ("SAFE") on August 24, 2018.<sup>13</sup> In SAFE, NHTSA and EPA identify a number of potential options and propose a preferred option, which would relax the GHG standards and related corporate average fuel economy ("CAFE") standards for model years 2021-2025. Under the

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<sup>5</sup> *Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation* (January 2017) at 14-15 (hereinafter "Final Determination").

<sup>6</sup> *Id.* at 14.

<sup>7</sup> 13 CCR § 1961.3(a)(5)(D).

<sup>8</sup> *Draft Technical Assessment Report: Mid-Term Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025* (July, 2016) (hereinafter "Draft TAR").

<sup>9</sup> *Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation*, 81 Fed. Reg. 87927 (November 2016) (hereinafter "Proposed Determination"); Draft TAR.

<sup>10</sup> Final Determination.

<sup>11</sup> 83 Fed. Reg. 16077 (April 2, 2018).

<sup>12</sup> *Id.* at 16077.

<sup>13</sup> 83 Fed. Reg. 42,986.

SAFE preferred option, MY 2021 and later vehicles would be subject to the existing standards for MY 2020 vehicles.<sup>14</sup> In support of SAFE, NHTSA and EPA issued a Preliminary Regulatory Impact Analysis (“SAFE Rule RIA”), which, similar to the Draft TAR and Technical analysis developed in conjunction with the Preliminary Determination, analyzed the costs and benefits associated with rolling back the existing standards to MY 2020 levels.

In CLEAR, we are proposing that the Commission adopt the LEV III standards for MY 2022 vehicles and beyond.<sup>15</sup> In conducting this Economic Impact Analysis pursuant to § 25-7-110.5(4)(C)(i), we are assessing the costs and benefits of CLEAR relative to the preferred option identified in the SAFE rule, which would roll back the existing Tier 3 GHG standards for model year 2021 and beyond light duty vehicles to the existing 2020 standards.<sup>16</sup>

## **OVERVIEW OF DATA RELIED ON IN FINAL EIA**

The costs and benefits of complying with the current GHG standards for MY 2022-2025 and beyond have already been exhaustively analyzed in the various technical analyses conducted prior to the January 2017 Final Determination, and in the subsequent Preliminary Regulatory Impact Analysis supporting the SAFE Rule.<sup>17</sup> This Final EIA relies extensively on these prior analyses in determining the vehicle technology costs of complying with the LEV III GHG standards for MY 2022 and beyond, which mirror the current Tier 3 standards, and in assessing the fuel savings that will be achieved by complying with these standards.

The data from these analyses have been customized using Colorado specific data regarding light duty vehicle sales, and the mix between passenger cars and light duty trucks in the Colorado. The costs and benefits derived from both the technical analyses underlying the January 2017 Final Determination, and the SAFE Rule RIA are separately included to give the Commission the most complete set of information available for use in determining whether CLEAR makes good policy sense for Colorado.

In addition to presenting Colorado specific costs and benefits using 1) the 2017 Final Determination related analyses and 2) the SAFE RIA, the Division has included a separate Colorado specific analysis of expected fuel savings from the adoption of CLEAR relative to the SAFE Rule preferred option. This analysis uses Colorado specific information including the price of fuel and VMT numbers typically used in Colorado mobile source modeling efforts. This

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<sup>14</sup> *Safer Affordable Fuel Efficient (SAFE) Vehicle Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, 83 Fed. Reg. 42,986 (Aug. 24, 2018) (hereinafter “SAFE Rule”).

<sup>15</sup> If adopted, CLEAR will become effective in late December 2018. Because section 177 of the Clean Air Act provides that Colorado must adopt the new standards at least two years prior to their commencement, they will not be applicable for MY 2021, which begins on January 2, 2020, but will be applicable to MY 2022, which begins January 2, 2021.

<sup>16</sup> In addition to the provisions on the adoption of the LEV III new vehicle emission standards CLEAR includes a proposal to adopt California’s aftermarket catalyst provisions. Under these requirements, aftermarket catalysts sold in Colorado, which are currently certified to federal standards, would need to be certified to California standards.

<sup>17</sup> These analyses are hereby incorporated into this Final EIA by reference: CARB Staff, *Staff Report: Initial Statement of Reasons, Public Hearing to Consider Proposed Amendments to the Low-Emission Vehicle III Greenhouse Gas Emission Regulation* (Aug. 7, 2018); California Air Resources Board, *Advanced Clean Cars Midterm Review, Resolution 17-3* (Mar. 24, 2017); Final Determination, *supra* FN 5; Draft TAR, *supra* FN 8; Proposed Determination, *supra* FN 9; SAFE Rule, *supra* FN 14.

analysis also includes information and assumptions taken from the 2017 Final Determination analyses and the SAFE RIA.

To calculate the environmental benefit from adopting CLEAR, the Division compared the current emission standards to the standards that would apply under the SAFE Rule to calculate the cumulative CO<sub>2</sub> reduction benefit. This analysis used a Colorado specific truck/car fleet mix, assumptions about the real world effectiveness of the standards employed by EPA and NHTSA, VMT numbers used in Colorado mobile source modeling efforts, and assumptions used by NHTSA and EPA regarding the impact of maintaining existing standards on VMT.

Finally, the Division did a cost benefit analysis of the aftermarket catalyst proposal using data regarding the relative costs and effectiveness of California certified aftermarket catalysts to their federally certified counterparts, and estimates on the annual sales of aftermarket catalysts in Colorado.

### **ECONOMIC IMPACT ANALYSIS PURSUANT TO 25-7-110.5 (4)(c)(I), C.R.S.**

*(A) The cumulative cost, including but not limited to the total capital, operation, and maintenance costs of any proposed controls for affected business entity or industry to comply with the provisions of the proposal:*

In order to meet the GHG standards under the LEV III program (and by extension the requirements of CLEAR) manufacturers will need to utilize additional advanced technologies. Employing these advanced technologies will increase the costs of manufacturing vehicles relative to what would be required under the SAFE Rule preferred option. While the LEV III program, and the current federal Tier III program establish GHG standards by model year they do not prescribe the technologies that must be used in order to meet these standards. Rather they provide the manufacturers with flexibility on which technologies to employ to meet the standards. This allows manufactures to identify the most cost effective options that can be employed for different vehicles to meet the standards. Additionally, as discussed above, the LEV III program (and the current Tier 3 rules) provide various other compliance flexibilities, including separate standards for trucks and cars, sliding compliance standards based on the size of the vehicles that a manufacturer sells, banking of credits, and trading of credits between manufacturers.

While these various flexibilities allow manufacturers to maximize the cost effectiveness of their compliance strategies, they create significant complexities in determining the costs to comply with the applicable standards. To address these complexities both EPA and NHTSA have employed sophisticated models. EPA utilizes their own in-house developed vehicle technology/cost model, the OMEGA model (Optimization Model for Reducing Emissions of Greenhouse Gases from Automobiles). The model is optimized to calculate vehicle compliance costs based on the types of technologies used to achieve GHG compliance, and the utilization of those technologies in a projected modeled fleet. The OMEGA model was utilized in the original 2012 rulemaking as well as in the various analyses supporting the 2017 Final Determination. NHTSA uses the Compliance and Effects Model (“Café Model”) developed by the Department

of Transportation Volpe National Transportation Systems Center.<sup>18</sup> The CAFÉ model assesses how manufacturers will comply with a given standard by adding technology to future vehicle fleets and estimating the impact of that technology on fuel consumption, greenhouse gas emissions and economic costs and benefits to vehicle owners and society.<sup>19</sup> NHTSA used the CAFÉ model in support of the proposed SAFE Rule.<sup>20</sup>

EPA and NHTSA used these respective models to determine the vehicle technology costs associated with complying with the GHG standards that the Division is proposing the Commission adopt in CLEAR. These costs were determined for various model years, and were broken out as costs for cars, costs for light-duty trucks, and average costs per vehicle based on the national average car/truck fleet mix. As reflected below, the Division utilized these costs to generate average vehicle costs by model year of complying with CLEAR relative to the SAFE Rule preferred option, using a Colorado specific car/truck fleet mix (25%/75%). The Division then used these per vehicle costs and applied them to estimated Colorado new vehicle sales for MY 2022-2031. In determining new vehicle sales the Division used 2017 sales data from the Colorado Automobile Dealers Association<sup>21</sup>, and grew the fleet by 3% per year. These new vehicle sales estimations are reflected in Table 1.

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<sup>18</sup> NHTSA, Compliance and Effects Modeling System: The Volpe Model, <https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system>.

<sup>19</sup> *Id.*

<sup>20</sup> SAFE Rule RIA at 7.

<sup>21</sup> Colorado Automobile Dealers Association 2018 Colorado Economic Impact Report.

**TABLE 1**

<b>Projected Colorado New Vehicle Sales for Cars and Trucks (2022-2031)</b>			
<b>Year</b>	<b>Cars (number of vehicles)</b>	<b>Trucks (number of vehicles)</b>	<b>Fleet (number of vehicles)</b>
2022	61190	183570	244760
2023	63026	189077	252103
2024	64916	194749	259666
2025	66864	200592	267456
2026	68870	206610	275479
2027	70936	212808	283744
2028	73064	219192	292256
2029	75256	225768	301024
2030	77514	232541	310054
2031	79839	239517	319356
<b>TOTAL</b>	<b>818559</b>	<b>2455678</b>	<b>3274238</b>

**CLEAR Vehicle Technology Costs Based on 2017 Determination Analyses**

To determine the per-vehicle and cumulative vehicle technology costs to comply with CLEAR the Division started with the per vehicle costs for cars and trucks listed in Table IV.4. of the Proposed Determination document.<sup>22</sup> As reflected in that table the incremental costs of complying with the MY 2025 standards relative to the MY 2021 standards is \$749 for cars and \$1,018 for trucks. While these costs form a starting point for assessing the costs of CLEAR, they have a couple of limitations. First, they do not include the incremental cost of going from the MY 2020 standards, which would be the final standards under the SAFE Rule preferred option, to MY 2021 standards. Second, they do not include the yearly incremental costs from MY 2022, MY 2023 and MY 2024. To calculate the incremental cost of going from MY 2020 standards to MY 2021 standards the Division took the total incremental costs of meeting the MY 2021 standards, relative to the MY 2016 standard, listed<sup>22</sup> and divided by five based on the assumption that there would be a linear increase in costs during the five years from MY 2017 through MY 2021. Based on this calculation the incremental cost of going from MY 2020 to MY 2021 will be \$78 for cars and \$106 for trucks. The Division then summed these costs with

<sup>22</sup> Proposed Determination at 38. As reflected in the Final Determination, the EPA Administrator determined that no information was presented in public comments on the Proposed Determination that materially changed the analysis presented in the Proposed Determination therefore the Administrator relied on the Proposed Determination analysis in the Final Determination. Final Determination at 3.

the incremental costs from MY 2021 through MY 2025 to get a total incremental cost for going from MY 2020 standards to MY 2025 standards. Assuming a linear increase, the Division calculated costs for MY 2022, MY 2023 and MY 2024. Table 2 lists the final vehicle technology costs for cars, trucks and a Colorado average vehicle using the 25%/75% car/truck mix.<sup>23</sup>

**TABLE 2**

<b>CLEAR Vehicle Technology Costs Based on 2017 Determination Analysis (Per-Vehicle Costs)</b>			
<b>Year</b>	<b>Cars (dollars)</b>	<b>Trucks (dollars)</b>	<b>Colorado Average Vehicle (dollars)</b>
2022	283	384	359
2023	487	662	619
2024	692	941	879
2025	897	1219	1138
2026	897	1219	1138
2027	897	1219	1138
2028	897	1219	1138
2029	897	1219	1138
2030	897	1219	1138
2031	897	1219	1138

<sup>23</sup> These costs were expressed in 2018 dollars using Colorado CPI data.

To calculate the cumulative vehicle technology costs of adopting CLEAR the Division multiplied the per vehicle costs in Table 2 by the expected number of new vehicle sales listed in Table 1. These cumulative costs by model year and during the 10-year period from MY 2022-2031 are reflected in Table 3.

**TABLE 3**

<b>CLEAR Vehicle Technology Costs Based on 2017 Determination Analysis (Cumulative Compliance Costs)</b>			
<b>Year</b>	<b>Cars (millions of dollars)</b>	<b>Trucks (millions of dollars)</b>	<b>Fleet (millions of dollars)</b>
2022	17.3	70.5	87.9
2023	30.7	125.2	156.1
2024	44.9	183.3	228.2
2025	60.0	244.5	304.4
2026	61.8	251.9	313.5
2027	63.6	259.4	322.9
2028	65.5	267.2	332.6
2029	67.5	275.2	342.6
2030	69.5	283.5	352.8
2031	71.6	292.0	363.4
<b>TOTAL</b>	<b>552.5</b>	<b>2252.6</b>	<b>2804.3</b>



## CLEAR Vehicle Technology Costs Based on SAFE Rule RIA Analysis

To determine the per-vehicle technology costs to comply with CLEAR by model year, the Division used the costs for cars listed in Table 9-53, and for trucks listed in Table 9-55 of the SAFE Rule RIA.<sup>24</sup> These costs, along with a Colorado specific average vehicle cost are identified in Table 4.<sup>25</sup>

**TABLE 4**

<b>CLEAR Vehicle Technology Costs Based on SAFE Rule RIA Analysis (Per-Vehicle Costs)</b>			
<b>Year</b>	<b>Cars (dollars)</b>	<b>Trucks (dollars)</b>	<b>Colorado Average Vehicle (dollars)</b>
2022	1266	1755	1633
2023	1574	1936	1846
2024	1734	2021	1950
2025	1862	2085	2030
2026	2117	2362	2301
2027	2202	2447	2386
2028	2255	2596	2511
2029	2255	2660	2559
2030	2255	2660	2559
2031	2255	2660	2559

<sup>24</sup> SAFE Rule RIA at 1151, 1153.

<sup>25</sup> While the Division did not have to perform additional analyses to calculate separate costs for MY 2021 to MY 2025 vehicles, it did apply Colorado CPI data to express the costs in 2018 dollars consistent with the costs listed above in Table 2.

Multiplying the results from Table 4 by the expected vehicle sales from Table 1 reveals the following cumulative costs:

**TABLE 5**

<b>CLEAR Vehicle Technology Costs Based on SAFE Rule RIA Analysis (Cumulative Compliance Costs)</b>			
<b>Year</b>	<b>Cars (millions of dollars)</b>	<b>Trucks (millions of dollars)</b>	<b>Fleet (millions of dollars)</b>
2022	77.5	322.2	399.7
2023	99.2	366.1	465.3
2024	112.6	393.6	506.4
2025	124.5	418.3	542.9
2026	145.8	488.0	633.9
2027	156.2	520.7	677.1
2028	164.8	569.0	733.8
2029	169.7	600.5	770.2
2030	174.8	618.5	793.3
2031	180.1	637.0	817.1
<b>TOTAL</b>	<b>1405.2</b>	<b>4933.8</b>	<b>6339.5</b>

**Other Cumulative Costs for Affected Entities to Comply**

The Colorado Automobile Dealers Association and their expert have indicated that auto dealers may incur additional transportation costs and delays in trading vehicles with out-of-state dealers because dealers in surrounding states will not be required to sell LEV III compliant vehicles.<sup>26</sup> The Division acknowledges that this is a possibility, but does not have any information on how many trades Colorado dealers engage in with dealers in surrounding states, whether the out of state dealers that engage in these trades would stock LEV III compliant vehicles in order to serve the Colorado market, whether current out of state trades could be replaced with in-state trades, or the increased cost associated with obtaining a vehicle from a LEV III state dealer, the manufacturer or an in-state dealer. Accordingly, the Division cannot reasonably quantify this

<sup>26</sup> It is not clear how manufacturers will react to having two separate GHG emission standards under the Tier 3 and LEV rules. One possible outcome is that manufacturers will produce two sets of vehicles, one for sale in LEV states and one for sale in the rest of the country. It is also possible, however, that manufacturers will produce one set of vehicles that meets both the LEV standards that will be sold in all 50 states.

potential cost.

Aftermarket catalytic converter sales number approximately 33,000 per year in Colorado according to market sources. Based on the Division’s firsthand experience, the retail cost differential between a currently-available federal- and California certified aftermarket converter is approximately \$100. Based on this the estimated total annual cumulative cost of the aftermarket catalytic converter provision is approximately \$330,000.

(B) Any direct costs to be incurred by the general public to comply with the provisions of the proposal:

Consistent with the analyses for the 2017 Final Determination and the SAFE Rule RIA the Division assumes that the per-vehicle technology costs listed in Section A above will be passed along to new vehicle purchasers. As a result of the increased vehicle technology costs vehicle purchasers will likely incur additional direct costs in the form of increased sales tax at the time of the purchase, and ongoing increases in the price of vehicle insurance and vehicle maintenance costs over the life of the vehicle. In addition to these costs, vehicle owners will realize ongoing fuel savings over the life of the vehicle as a result of CLEAR. EPA and NHTSA analyzed these costs in the analyses supporting the 2017 Final Determination and in the SAFE Rule RIA.

**CLEAR Consumer Costs Based on 2017 Determination Analyses**

EPA reports the per-vehicle consumer costs and fuel savings benefits of maintaining the MY 2022-2025 GHG standards on pages 41-43 of the Proposed Determination document. Table IV.10 of the Proposed Determination document lists costs and fuel savings benefits for a cash purchased MY 2025 vehicle on a yearly basis during the first 8 years of vehicle ownership. The information from Table IV.10 is displayed in Table 6.

**TABLE 6**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO 2016 Reference Fuel Price Case, Cash Purchase (3% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1st	\$863 <sup>27</sup>	\$47	\$16	\$926	\$6	-\$238	\$693
2nd	\$0	\$0	\$15	\$15	\$6	-\$232	\$483
3rd	\$0	\$0	\$14	\$14	\$5	-\$223	\$279
4th	\$0	\$0	\$13	\$13	\$5	-\$213	\$85
5th	\$0	\$0	\$12	\$12	\$5	\$-202	-\$100
6th	\$0	\$0	\$11	\$11	\$5	-\$189	-\$274
7th	\$0	\$0	\$10	\$10	\$4	-\$178	-\$437
8th	\$0	\$0	\$9	\$9	\$4	-\$166	-\$589

<sup>27</sup> The notes to Table IV.10 state the following: 1) “Insurance costs include depreciation effects and all cost metrics shown include vehicle survival rate factors.” and 2) “The \$863 delta cost per vehicle was calculated from the average per-vehicle cost of \$875 discounted at 3 percent to the mid-year point of the first year of ownership.”

Table IV.11 of the Proposed Determination document lists the same information for a MY 2025 vehicle purchased using a 5 year loan.<sup>28</sup> The information from Table IV.11 is displayed in Table 7.

**TABLE 7**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO 2016 Reference Fuel Price Case, 5-year (60 Month) Loan Purchase (3% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1 <sup>st</sup>	\$863 <sup>29</sup>	\$47	\$16	\$217	\$6	-\$238	-\$16
2 <sup>nd</sup>	\$0	\$0	\$15	\$209	\$6	-\$232	-\$32
3 <sup>rd</sup>	\$0	\$0	\$14	\$201	\$5	-\$223	-\$49
4 <sup>th</sup>	\$0	\$0	\$13	\$193	\$5	-\$213	-\$64
5 <sup>th</sup>	\$0	\$0	\$12	\$184	\$5	-\$202	-\$78
6 <sup>th</sup>	\$0	\$0	\$11	\$11	\$5	-\$189	-\$251
7 <sup>th</sup>	\$0	\$0	\$10	\$10	\$4	-\$178	-\$414
8 <sup>th</sup>	\$0	\$0	\$9	\$9	\$4	-\$166	-\$567

Table 8 shows the same information as Table 6 using a 7% discount rate. Table 9 shows the cost and savings information using a 7% discount rate and a 72 month loan purchase.<sup>30</sup> The figures in Tables 8 and 9 are taken from Table C.66 and Table C.71 in the appendix to the Proposed Determination document.

**TABLE 8**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO Reference Fuel Price Case, Cash Purchase (7% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1 <sup>st</sup>	\$846	\$46	\$16	\$908	\$6	-\$234	\$680
2 <sup>nd</sup>	\$0	\$0	\$15	\$15	\$5	-\$219	\$481
3 <sup>rd</sup>	\$0	\$0	\$13	\$13	\$5	-\$203	\$296
4 <sup>th</sup>	\$0	\$0	\$12	\$12	\$5	-\$186	\$126
5 <sup>th</sup>	\$0	\$0	\$10	\$10	\$4	-\$170	-\$30
6 <sup>th</sup>	\$0	\$0	\$9	\$9	\$4	-\$153	-\$170
7 <sup>th</sup>	\$0	\$0	\$8	\$8	\$3	-\$139	-\$298
8 <sup>th</sup>	\$0	\$0	\$7	\$7	\$3	-\$125	-\$412

<sup>28</sup> In the loan purchase scenarios EPA used a 4.25% loan rate. Proposed Determination at 42.

<sup>29</sup> The notes to Table IV.11 contain the same information.

<sup>30</sup> Table C.70 shows costs and savings for a 60-month loan and 7% discount rate, but there are obvious errors in the table so the data for a 72-month loan is included here instead.

**TABLE 9**

Payback Period for the Sales Weighted Average MY2025 Vehicle Relative to the Reference Case Standards, AEO Reference Fuel Price Case, 5-Year (72 Month) Loan Purchase (7% discounting, 2015\$)

Year of Ownership	Delta Cost per vehicle	Delta Taxes per Vehicle	Delta Insurance Per Vehicle	Delta Purchase Costs per Vehicle	Delta Maintenance Costs per Vehicle	Delta Fuel Costs per Vehicle	Cumulative Delta Operating Costs per Vehicle
1st	\$846	\$46	\$16	\$183	\$6	-\$234	-\$45
2 <sup>nd</sup>	\$0	\$0	\$15	\$170	\$5	-\$219	-\$88
3 <sup>rd</sup>	\$0	\$0	\$13	\$158	\$5	-\$203	-\$128
4 <sup>th</sup>	\$0	\$0	\$12	\$145	\$5	-\$186	-\$165
5 <sup>th</sup>	\$0	\$0	\$10	\$133	\$4	\$-170	-\$198
6 <sup>th</sup>	\$0	\$0	\$9	\$122	\$4	-\$153	-\$226
7 <sup>th</sup>	\$0	\$0	\$8	\$8	\$3	-\$139	-\$354
8 <sup>th</sup>	\$0	\$0	\$7	\$7	\$3	-\$125	-\$468

Because EPA used the information in Tables 5-8 above to show the payback period for the vehicle owner associated with retaining the MY2022-MY2025 GHG standards, they do not show the full lifetime per vehicle savings. EPA included life time fuel savings and net savings information for different fuel price scenarios in Table IV.12 of the Proposed Determination document. This information is reflected in Table 10 below.

**TABLE 10**

Lifetime Fuel Savings and Net Savings for the Sales-Weighted Average MY2025 Vehicle Purchased with Cash under Each of the AEO 2016 Fuel Price Cases (2015\$)

Case	3 Percent Discount Rate		7 Percent Discount Rate	
	Lifetime Fuel Savings	Lifetime Net Savings	Lifetime Fuel Savings	Lifetime Net Savings
AEO High Fuel Prices	\$4,209	\$3,054	\$3,223	\$2,145
AEO Reference Fuel Prices	<b>\$2,804</b>	<b>\$1,648</b>	\$2,128	\$1,051
AEO Low Fuel Prices	\$1,899	\$723	\$1,439	\$345

While Tables 6-10 provide directional information on the consumer costs and savings associated with CLEAR, they do not include the additional vehicle technology costs or fuel savings associated with the incremental difference between the MY 2020 standards, which will be the final standards under the SAFE Rule preferred option, and the MY 2021 standards. Nor do these Tables account for the additional vehicle, taxes, insurance, and maintenance costs of an average Colorado vehicle using a 25%/75% car truck mix. At the same time, these tables also do not account for the additional fuel savings that will be achieved by an average Colorado vehicle.

### **CLEAR Consumer Costs Based on SAFE RIA Analyses**

In the SAFE Rule RIA NHTSA conducted an analysis of the consumer costs and fuel savings benefits of rolling back the existing MY2021-2025 GHG standards to MY2020 levels as proposed under the preferred option. This analysis examined the consumer costs and benefits for

cars and trucks by model year using a 3% and a 7% discount rate. A summary of impacts, which includes additional information regarding the nationwide impact of the rule on traffic fatalities and total technology costs and societal benefits, along with certain per-vehicle consumer costs and benefits for MY2030 is included in Table 1-78 of the SAFE RIA. The information from Table 1-78 is included in Table 11.

**TABLE 11**

Table 1-78 – Preferred Alternative, Summary of Impacts, CO<sub>2</sub>

Category	Light Truck	Passenger Car	Combined Fleet
Required MPG for MY 2026+	31.3	43.7	37.0
Achieved MPG for MY 2025+	33.2	45.1	38.9
Achieved MPG for MY 2020	31.2	42.4	36.4
Per Vehicle Price Increase	-\$2,450	-\$2,080	-\$2,260
MY 2030 Lifetime Fuel Savings (per vehicle), Discounted at 3%	-\$2,460	-\$1,560	-\$1,830
MY 2030 Lifetime Fuel Savings (per vehicle), Discounted at 7%	-\$2,000	-\$1,310	-\$1,510
Consumer Per Vehicle Savings, Discounted at 3%	-\$290	\$360	\$290
Consumer Per Vehicle Savings, Discounted at 7%	\$280	\$680	\$690
Payback Period Relative to MY 2016 (Years), Values Discounted at 3%	3	4	4
Payback Period Relative to MY 2016 (Years), Values Discounted at 7%	4	5	5
Total Lifetime Fuel Savings (bGallons)	-41	-38	-79
Total Lifetime CO <sub>2</sub> Reductions (million metric tons)	-451	-422	-872
Fatalities (Excluding Rebound Miles)	-4,650	-3,700	-8,350
Fatalities (Rebound Miles)	-3,490	-3,800	-7,300
Total Technology costs (\$b), Discounted at 3%	-\$137	-\$123	-\$260
Total Technology Costs (\$b), Discounted at 7%	-\$103	-\$92	-\$196
Total Net Societal Benefits (\$b), Discounted at 3%	\$113	\$88	\$201
Total Net Societal Benefits (\$b), Discounted at 7%	\$80	\$60	\$141

Consumer cost numbers per-vehicle, by model year are included in a series of Tables on pages 1156-1159 of the SAFE Rule RIA. This information is included in Tables 12-15 below.<sup>31</sup>

<sup>31</sup> Because adoption of the SAFE Rule preferred option will reduce costs, the consumer costs in these tables are negative numbers.

**TABLE 12**Table 9-59 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Passenger Car, 3% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Price Increase	-1190	-1480	-1630	-1750	-1990	-2070	-2120	-2120	-2080
Additional Ownership Costs	-290	-360	-390	-420	-480	-490	-500	-500	-490
Total Consumer Costs	-1480	-1840	-2020	-2170	-2470	-2570	-2620	-2620	-2560

**TABLE 13**Table 9-63 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Light Truck, 3% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Price Increase	-1650	-1820	-1900	-1960	-2220	-2300	-2440	-2500	-2450
Welfare Loss	-400	-440	-460	-480	-540	-560	-590	-610	-600
Total Consumer Costs	-2050	-2270	-2370	-2440	-2760	-2870	-3030	-3110	-3050

**TABLE 14**Table 9-61 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Passenger Car, 7% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Price Increase	-1190	-1480	-1630	-1750	-1990	-2070	-2120	-2120	-2080
Welfare Loss	-260	-320	-350	-380	-430	-450	-460	-450	-440
Total Consumer Costs	-1460	-1810	-1980	-2130	-2420	-2520	-2570	-2570	-2520

**TABLE 15**Table 9-65 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Light Truck, 7% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Price Increase	-1650	-1820	-1900	-1960	-2220	-2300	-2440	-2500	-2450
Additional Ownership Costs	-360	-400	-420	-430	-490	-510	-540	-550	-540
Total Consumer Costs	-2010	-2220	-2320	-2390	-2710	-2810	-2970	-3050	-3000

NHTSA separately includes the consumer benefits associated with adoption of the preferred option separately in a series of tables on pages 1250-1253 of the Safe Rule RIA. This information is reflected in Tables 16-19.<sup>32</sup>

**TABLE 16**Table 10-44 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Passenger Car, 3% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Fuel Savings	-790	-970	-1150	-1260	-1430	-1510	-1550	-1570	-1560
Mobility Benefit	-300	-350	-400	-440	-500	-520	-540	-550	-560
Refueling Benefit	-10	-20	-40	-50	-60	-70	-70	-80	-80
Total Consumer Benefits	-1100	-1340	-1590	-1740	-1980	-2090	-2160	-2200	-2200

**TABLE 17**Table 10-48 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Light Truck, 3% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Fuel Savings	-1510	-1690	-1870	-1980	-2220	-2260	-2400	-2460	-2460
Mobility Benefit	-460	-500	-550	-590	-660	-420	-730	-760	-780
Refueling Benefit	-100	-100	-100	-100	-110	-60	-110	-100	-100
Total Consumer Benefits	-2070	-2290	-2530	-2680	-2990	-3050	-3240	-3300	-3340

<sup>32</sup> Because adoption of the SAFE Rule preferred option will eliminate savings that would otherwise be achieved under the existing GHG standards, the consumer benefits in these tables are negative numbers.



**TABLE 18**Table 10-46 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Passenger Car, 7% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Fuel Savings	-700	-840	-980	-1070	-1210	-1270	-1310	-1320	-1310
Mobility Benefit	-240	-280	-330	-360	-400	-420	-440	-450	-460
Refueling Benefit	-10	-20	-30	-40	-50	-60	-60	-60	-70
Total Consumer Benefits	-950	-1150	-1340	-1470	-1660	-1750	-1800	-1830	-1840

**TABLE 19**Table 10-50 – Per-Vehicle Net Present Value of Ownership Benefits under Preferred Alternative, Light Truck, 7% Discount Rate, CO<sub>2</sub>

	MY 2022	MY 2023	MY 2024	MY 2025	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030
Fuel Savings	-1250	-1380	-1530	-1620	-1810	-1840	-1950	-2000	-2000
Mobility Benefit	-370	-410	-450	-480	-530	-550	-590	-620	-630
Refueling Benefit	-80	-80	-90	-90	-90	-90	-90	-90	-80
Total Consumer Benefits	-1700	-1870	-2060	-2180	-2430	-2470	-2630	-2700	-2710

Under this analysis, the savings achieved through decreased costs associated with adopting the preferred option generally exceeds the benefits lost from the rule in most scenarios except in the case of costs and benefits for truck owners using the 3% discount analysis, where the lost savings from adopting the preferred option exceed the reduced costs in most model years.

### **CLEAR Consumer Costs Based on Colorado Specific Fuel Savings Analysis**

The Division conducted an independent calculation of the fuel savings per vehicle expected from adoption of CLEAR using Colorado specific data. In conducting this analysis, the Division first calculated the expected real world per mile fuel savings benefit for both cars and trucks for every model year between 2022 and 2031 based on the difference between the LEV III standards for MY2022-2031 and the final standard under the SAFE Rule preferred option (current Tier 3 MY2020 standard). To account for real world driving the difference for each model year was multiplied by 0.8.<sup>33</sup> The per mile fuel savings for cars and trucks were then converted into a Colorado specific weighted average per mile savings per vehicle using the 25%/75% car/truck mix.

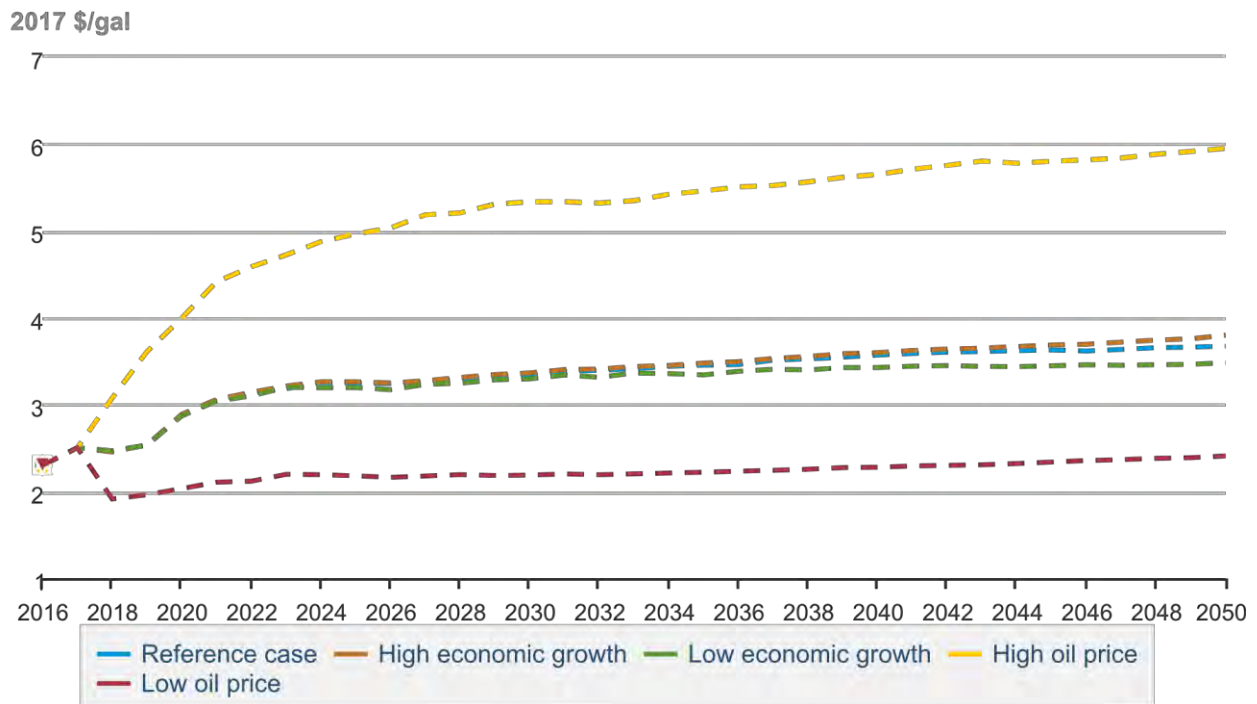
To calculate the gallons of fuel saved per Colorado weighted average vehicle for each year of vehicle life, the Division used standard annual values of VMT by vehicle age used in Colorado mobile source emissions modeling, and assumed that the vehicles will operate for 150,000 miles.


<sup>33</sup> This is consistent with the methodology employed by NHTSA in the SAFE Rule RIA. See SAFE Rule RIA at 11.

The Division then multiplied this VMT by vehicle age by the per mile fuel savings numbers discussed above. Finally, the Division calculated dollar savings per vehicle using the calculated fuel savings and a \$3.012 price per gallon of gas. This price represents the average price per gallon in Colorado for the week ending October 1, 2018. Use of this price per gallon number is conservative given the Energy Information Administration’s prediction that that price per gallon of gasoline will increase from 2018 through 2050 under all scenarios, and will be over \$3.01 from 2022 onward for all scenarios except the low oil price scenario, as reflected in Chart 1.<sup>34</sup>

**CHART 1**

**Real Petroleum Prices: Transportation: Motor Gasoline**



 Source: U.S. Energy Information Administration

<sup>34</sup> U.S. Energy Information Administration AEO Energy Outlook 2018.

Table 20 shows the non-discounted dollar fuel savings per vehicle by model year and vehicle age, as well as a total lifetime savings per vehicle by model year assuming \$3.01 per gallon gas.

**TABLE 20**

	Vehicle Age											
Model Year	1	2	3	4	5	6	7	8	9	10	11	Total
2022	187	183	179	174	168	163	159	153	146	142	64	1,718
2023	257	252	246	240	232	225	220	211	202	196	89	2,370
2024	324	317	310	302	292	283	276	266	254	247	112	2,983
2025	391	382	374	364	352	342	333	320	306	298	135	3,597
2026	391	382	374	364	352	342	333	320	306	298	135	3,597
2027	391	382	374	364	352	342	333	320	306	298	135	3,597
2028	391	382	374	364	352	342	333	320	306	298	135	3,597
2029	391	382	374	364	352	342	333	320	306	298	135	3,597
2030	391	382	374	364	352	342	333	320	306	298	135	3,597
2031	391	382	374	364	352	342	333	320	306	298	135	3,597

Based on these numbers the Division calculated discounted savings based on a 3% and 7% discount rate. These discounted number are reflected in Tables 21 and 22 below.

**TABLE 21**

	Vehicle Age											
Model Year	1	2	3	4	5	6	7	8	9	10	11	Total
2022	184	175	166	157	147	139	131	123	114	108	47	1,490
2023	254	241	229	216	203	191	181	169	157	148	65	2,055
2024	319	303	288	272	256	241	228	213	198	187	82	2,586
2025	385	366	347	328	308	290	275	257	238	225	99	3,118
2026	385	366	347	328	308	290	275	257	238	225	99	3,118
2027	385	366	347	328	308	290	275	257	238	225	99	3,118
2028	385	366	347	328	308	290	275	257	238	225	99	3,118
2029	385	366	347	328	308	290	275	257	238	225	99	3,118
2030	385	366	347	328	308	290	275	257	238	225	99	3,118
2031	385	366	347	328	308	290	275	257	238	225	99	3,118

**TABLE 22**

Model Year	Vehicle Age											Total
	1	2	3	4	5	6	7	8	9	10	11	
2022	180	165	151	137	124	112	103	92	82	75	32	1,253
2023	249	228	208	189	171	155	141	127	114	103	44	1,729
2024	313	287	262	238	215	195	178	160	143	130	55	2,176
2025	378	346	316	287	260	235	215	193	172	157	66	2,624
2026	378	346	316	287	260	235	215	193	172	157	66	2,624
2027	378	346	316	287	260	235	215	193	172	157	66	2,624
2028	378	346	316	287	260	235	215	193	172	157	66	2,624
2029	378	346	316	287	260	235	215	193	172	157	66	2,624
2030	378	346	316	287	260	235	215	193	172	157	66	2,624
2031	378	346	316	287	260	235	215	193	172	157	66	2,624

To calculate cumulative savings the Division multiplied the per-vehicle savings numbers in Tables 20, 21 and 22 by the projected Colorado new vehicle sales from Table 1. Based on these calculations the total fuel savings from MY2022-MY2031 from the adoption of CLEAR will be \$ 9,164,147,992 using non-discounted fuel savings and \$ 7,944,523,137 and \$ 6,684,755,540 respectively using a 3% and 7% discount.

Using the fuel savings numbers from Tables 21 and 22, the vehicle technology costs in Table 2 and Table 4, and other consumer costs using the data from the 2017 Final Determination and the SAFE Rule RIA<sup>35</sup> the Division calculated per-vehicle net costs to consumers using both a 3% and 7% discount rate. Tables 25 contains the per-vehicle net costs using the 2017 Final Determination consumer cost numbers for the 2 fuel savings discounting scenarios for MY2025 vehicles,<sup>36</sup> and Table 26 contains the per-vehicle net costs for the highest cost year using the SAFE RIA consumer costs (MY 2029).<sup>37</sup>

<sup>35</sup> These other consumer cost numbers are reflected in Tables 6 and 8 (2017 Final Determination costs using 3% and 7% discount rates for MY2025) and Tables 12-15 (SAFE Rule RIA costs for cars and trucks by model year using 3% and 7% discount scenarios).

<sup>36</sup> As discussed above the consumer cost numbers from the 2016 Proposed Determination document do not include the incremental costs of going from the 2020 to 2021 standards. Additionally, the costs in Tables 7 and 9 are not in 2018 dollars, do not reflect the Colorado specific car/truck mix, and only go out for 8 years rather than the 11-year life that the Division assumed in its fuel savings calculations. To address this, the Division used the MY 2025 vehicle technology costs from Table 2, which corrected for these deficiencies. To correct the non-vehicle consumer costs, the Division first added three additional years of costs for insurance and maintenance based on the year 8 costs listed in EPA's tables, and then scaled the total taxes, insurance and maintenance costs up using the ratio of the EPA determined vehicle costs in Tables 6 and 8 to the MY 2025 Colorado average vehicle cost from Table 2.

<sup>37</sup> For the costs the Division used the Colorado average vehicle cost for MY 2029 from Table 4, and the additional ownership costs/welfare loss from Tables 12-15 above adjusted to 2018 dollars and Colorado average vehicle using the 25%/75% car/truck mix.

**TABLE 25**

<b>CLEAR Per-Vehicle Net Cost Based on 2017 Determination Costs Model Year 2025</b>				
Discount Scenario	Vehicle Technology Cost	Taxes, Insurance and Maintenance	Fuel Savings	Net Cost
3%	\$1,138	\$298	\$3,118	<b>-\$1,682</b>
7%	\$1,138	\$270	\$2,624	<b>-\$1,216</b>

**TABLE 26**

<b>CLEAR Per-Vehicle Net Cost Based on SAFE RIA Costs Model Year 2029</b>				
Discount Scenario	Vehicle Technology Cost	Additional Ownership Costs/Welfare Loss	Fuel Savings	Net Cost
3%	\$2,559	\$620	\$3,118	<b>\$61</b>
7%	\$2,559	\$525	\$2,624	<b>\$525</b>

**Aftermarket Catalytic Converter Cost to Consumers**

The Division assumes that the additional cost of approximately \$100 for a California certified aftermarket catalytic converter will be borne by the vehicle owner. Because of the longer warranty it is possible that use of a California certified catalyst could result in a net savings if vehicle owners need to replace the aftermarket catalyst. The Division, however, does not have information needed to verify or quantify this savings.

(C) Air pollution reductions caused by the proposal:

The Division estimates adopting CLEAR would result in an increasing annual emissions benefit of carbon dioxide equivalent (CO<sub>2</sub>e) as the standards become more stringent from MY2022-2025, and an increasing number of new vehicles will be subject to the new standards based on a 3% annual growth assumption.<sup>38</sup>

To calculate the GHG emission reduction benefit the Division used the same standards comparison methodology as used in calculating annual fuel savings per vehicle, but instead of fuel savings the Division calculated GHG reductions per vehicle. Then the Division reduced the GHG reductions per vehicle using a 10% and 20% rebound effect to account for the possibility that in response to lower per vehicle fuel costs vehicle owners will drive more miles. Finally,

<sup>38</sup> See Table 1 above.

these calculated per vehicle GHG savings were multiplied by projected vehicle sales listed in Table 1 to calculate GHG reductions by model year, and a cumulative number of reductions for MY 2022-MY2031. Reductions using the 10% rebound effect are shown in Table 27 and the values using a 20% rebound effect are included in Table 28 below.

**TABLE 27**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – No Rebound Effect)</b>	
<b>Model Year</b>	<b>Millions of Tons</b>
2022	1.44
2023	2.05
2024	2.64
2025	3.28
2026	3.38
2027	3.48
2028	3.58
2029	3.69
2030	3.80
2031	3.91
<b>TOTAL</b>	<b>31.24</b>

**TABLE 28**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – 10% Rebound Effect)</b>	
<b>Model Year</b>	<b>Millions of Tons</b>
2022	1.42
2023	2.01
2024	2.58
2025	3.18
2026	3.27
2027	3.37
2028	3.47
2029	3.58
2030	3.69
2031	3.80
<b>TOTAL</b>	<b>30.38</b>

**TABLE 29**

<b>Cumulative Greenhouse Gas Benefit by Model Year (in tons – 20% Rebound Effect)</b>	
Model Year	Millions of Tons
2022	1.41
2023	1.97
2024	2.53
2025	3.10
2026	3.19
2027	3.29
2028	3.39
2029	3.49
2030	3.59
2031	3.70
<b>TOTAL</b>	<b>29.67</b>

The Division conservatively estimates that maintaining the current standards will not result in upstream emission reduction benefits associated with fuel production and refining in Colorado. The Division also conservatively estimates that reducing CO<sub>2</sub> will not reduce tailpipe NO<sub>x</sub>, VOC and CO emissions.

**Aftermarket Catalytic Converter Benefit**

Aftermarket catalytic converters manufactured and sold for use in California perform demonstrably better than their federal counterparts. Based on somewhat limited research performed by California, the Northeast States’ Ozone Transport Corridor, and the Division, California aftermarket catalytic converters provide 77% lower NO<sub>x</sub>, 60% lower HC, and 63% lower CO emissions than their federal aftermarket counterparts.<sup>39</sup> Additionally, California aftermarket catalytic converters tend to continue to perform longer and carry a longer 50,000 mile warranty requirement.

Based on Division staff analysis applying Colorado-specific conditions to an emissions benefit

<sup>39</sup> Brenzy, R. and Kubsh, J., Manufacturers of Emission Controls Association, *Emission Performance of California and Federal Aftermarket TWC Converters* (January 2013).



methodology provided by the Manufacturers of Emissions Control Association<sup>40</sup>, adoption of a California-certified aftermarket catalytic converter rule could result in an additional 1 ton per day of statewide ozone precursor emissions.

*(D) The cost per unit of air pollution reductions caused by the proposal:*

The Division calculated a range of costs per ton using the net per-vehicle cost figures for the 4 scenarios in Tables 25 and 26. These cost numbers were divided by 11.59 tons, which is the calculated lifetime GHG benefit by the lifetime GHG reduction numbers for both model years 2025 and 2029 using the 20% rebound scenario. These results are set forth in Table 30.

**TABLE 30**

<b>CLEAR Cost Per Ton of GHG Reduced</b>	
<b>Scenario</b>	<b>Cost Per Ton</b>
2017 Final Determination Costs 3% Discount	<b>-\$380/ton</b>
2017 Final Determination Costs 7% Discount	<b>-\$105/ton</b>
SAFE RIA Costs 3% Discount	<b>\$5/ton</b>
SAFE RIA Costs 7% Discount	<b>\$45/ton</b>

The aftermarket catalytic converter rule adoption will reduce ozone precursors at a cost of \$9,041 per ton.

*(E) The cost for the Division to implement the provisions of the proposal:*

If CLEAR is adopted, the Division will need one additional full time equivalent (FTE) to monitor and track credits/debits for each auto manufacturer. This estimate is based on conversations with other Section 177 states on their costs in implementing the program. This new FTE will also aid in program enforcement. The direct cost to the Division would be approximately \$126,250 for salary, benefits and indirect (overhead). This is an annual cost that will continue as long as the program is operating. The Division expects that the nominal costs will slowly increase from year to year but does not have sufficient information to quantify these increases. Given the rate of salary increases over the last decade the cost increase in 2018 dollars is likely to be negligible or potentially even negative.

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<sup>40</sup> Manufacturers of Emissions Control Association, *MECA Aftermarket Converter Test Program*, (PowerPoint Presentation, 2016).