Public Hearing to Consider Advanced Clean Cars II Regulations

Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response

Appendix F
Updated Costs and Benefits Analysis

Public Hearing Date: August 25, 2022
Agenda Item No.: 22-10-1

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I. Executive Summary

As a result of the modifications described in the Notice of Public Availability of Modified Text and Availability of Additional Documents and Information Proposed Advanced Clean Cars II Regulations, July 12, 2022, as amended by Errata and Comment Period Extension, July 13, 2022, (collectively, First 15-Day Notice), the cost of electric batteries used in zero-emission vehicles (ZEVs) sold during the 2026 – 2029 model years to comply with the Advanced Clean Cars II (ACC II) regulations are expected to decrease. These lower battery costs, in turn, will impact the future California fleet makeup as well as the estimated costs and benefits originally described in the Staff Report: Initial Statement of Reasons (ISOR), released on April 12, 2022. In addition to the battery cost changes and subsequent impacts, updates to assumptions used to estimate compliance costs for the adopted tighter emission running loss standard resulted in slightly lower overall costs for the Low-Emission Vehicle (LEV) regulation. All other cost input assumptions and methodologies remain the same as those in the ISOR. This Appendix describes the associated changes to the emissions benefits and economic impacts described in the ISOR resulting from those modifications. The aggregate impacts of these changes replace the costs and benefits presented in Table ES-05 of the ISOR. An overview of the updates and changes to the final analysis are provided below followed by a more detailed description in the sections that follow.

A. Updates to Battery Costs and Fleet Technology Mix

The modifications to 1962.4, subsections (d)(2)(A) and (B), reduced the durability requirement for battery-electric vehicles (BEVs) in the 2026 through 2029 model years. The reduced durability requirements allowed staff to modify assumptions regarding usable energy percentage for batteries used in those specific model years. For the final updated analysis, staff assumed usable battery energy percentage increases from 92.5% as described in the ISOR (p. 159) to 95%. These changes effectively lowered the battery costs by about 2.6% for BEVs from those costs presented in Appendix G of the ISOR.

The lower battery costs result in lower overall incremental costs of BEVs relative to plug-in hybrid electric vehicles (PHEVs) for the 2026-2029 model years. These reduced incremental BEV prices change the relative ranking of ZEV technologies in the analysis staff used to estimate costs. These changes result in a lower percentage of PHEVs estimated to be sold in the 2028 through 2033 model years than was assumed in the ISOR (and commensurately a higher percentage of BEVs sold in those same model years). The fleet mix for the anticipated compliance response therefore shifts slightly to a higher proportion of BEVs, which modifies the technology mixes presented in Appendix D of the ISOR.

B. Updated Emission Benefits

The ACC II regulations are expected to result in minor, additional well-to-wheel (WTW) oxides of nitrogen (NOx), fine particulate matter ($PM_{2.5}$), and greenhouse gas (GHG) emission reductions due to the replacement of some PHEVs with BEVs when BEVs with ranges of 400 miles or more on a single charge (BEV400 vehicles) become less costly for manufacturers to produce in the earlier years of the regulations. These emission benefits

replace the emission benefits presented in Section VII of the ISOR.

C. Updated Health Benefits

The increased emission reductions associated with the modifications in the adopted regulations provide minor increased health benefits. Among those benefits are small reductions in respiratory hospitalizations and avoided Emergency Room (ER) visits. These benefits replace the benefits presented in Section VI.B of the ISOR.

D. Updated Climate Benefits

The benefit of the GHG reductions can be estimated using the Social Cost of Carbon (SC-CO_2), which provides a dollar valuation of the damages caused by one ton of carbon pollution and represents the monetary benefit today of reducing carbon emissions in the future. As the ACC II regulations are anticipated to increase reductions of carbon dioxide (CO_2) emissions as compared to the reductions predicted in the ISOR, there is a corresponding increase in climate benefits. These benefits replace the benefits presented in Section VI.C of the ISOR.

E. Updated Economic Costs and Benefits

A variety of additional economic impacts differ slightly from those described in the ISOR due to the modifications from the initial proposal that were adopted in the final ACC II regulations. These economic impacts include:

- **Updated Vehicle Average Incremental Costs and Total Industry Compliance Costs -** The battery price reductions result in lower average incremental costs for vehicles and total industry compliance costs during the timeframe of the regulations. The costs presented in this Appendix replace the costs presented in Section X of the ISOR.
- **Updated Total Cost of Ownership** - The battery price reductions reduced the total cost of ownership from -$81.8 billion to -$92.9 billion in 2040, which represents additional cost savings of $11.1 billion. The costs presented in this Appendix replace the costs presented in Section X of the ISOR.
- **Updated Employment Impacts -** Modified employment impacts are presented in this Appendix and replace those values presented in Section X of the ISOR. The overall employment impacts were minimal and nearly equivalent (0.01% change in total employment in 2040) to those described in ISOR.
- **Updated Impacts to New Business Creation or Existing Business Elimination -** Overall, the change in output did not change significantly as a result of the modifications in the final ACC II regulations. The total change in output was -0.2% in 2040 compared to -0.4% in the ISOR. The values presented in this Appendix replace those presented in Section X of the ISOR.
- **Updated Impacts to Businesses Currently Doing Business within California -** Based on the estimated business impacts, sectors where expansion is expected to occur are primarily in the major sectors of Transportation and Public Utilities, Finance, Insurance and Real Estate, and Services. Compared to the ISOR, overall output slightly increased in these sectors ranging from 1 to 3% higher than the original values. The values presented in this Appendix replace those presented in

Section X of the ISOR.

- **Updated Impacts to Investments in the State of California -** Changes in investment as a result of the modifications in the final regulations are minimal and, as in the original ISOR, do not exceed 1% of baseline investment across the regulatory horizon. The values presented in this Appendix replace those presented in Section X of the ISOR.
- **Updated Impacts to Overall Benefit-Cost Ratio -** The ACC II regulations continue to deliver a cumulative net benefit to California and has a benefit-cost ratio of 1.43, an increase from the 1.38 presented in the ISOR. The values presented in this Appendix replace those presented in Section X of the ISOR.
- **Updated Fiscal Impacts -** The overall cumulative fiscal impacts to state and local governments changed slightly. Fiscal impacts of -$1.3 billion and -$12.5 billion for State and local governments respectively, are more negative than the -$0.9 billion and -$12.2 billion impacts estimated in the ISOR. Local government fleets would realize overall costs savings, like other vehicle owners. Sales and utility tax revenues may increase while gasoline sales tax revenues are expected to decrease. The cumulative net effect is expected to be a decrease in revenue. The values presented in this Appendix replace those presented in Section X of the ISOR.

II. Updates to Battery Costs and Fleet Technology Mix

A. Updates to Battery Costs

Manufacturers use a variety of methods to make batteries durable and maintain the driving range of their BEVs over a long period of time. One of those methods is to hold some battery energy in reserve such that the battery does not cycle to its highest or lowest energy states. To account for the reduced battery durability requirements of the regulation compared to the ISOR, staff increased the usable battery energy (UBE) percentage of the BEV batteries in the ZEV Cost Workbook[1] to 95% from 92.5% for model years 2026 through 2029. This was an increase from the 92.5% UBE assumed in the ISOR, which has the effect of reducing the total battery energy (TBE) and thus, cost. For model years 2030 to 2035, the UBE percentage remained at the 92.5% that was used in the ISOR. This results in a 2.6% reduction in BEV battery costs for model years 2026 to 2029 and no change in battery costs to 2030 and subsequent model years. All other assumptions regarding battery cost estimates remained unchanged from the ISOR.

Table II-1, Table II-2, Table II-3 and Table II-4 show the updated total battery costs for BEV300, BEV400, PHEV50 and fuel cell electric vehicles (FCEVs), respectively, for model years 2026 through 2035. (For comparison, Small SUV costs were shown in Table 10 of the ISOR, Appendix G.)

[1] California Air Resources Board. 2022. ZEV Cost Modeling Workbook July 2022. CARB 2022qqq, First 15-Day Notice.

Table II-1: BEV300 Total Battery Costs (2021$[2])

Vehicle Class	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032	MY 2033	MY 2034	MY 2035
SmallCar	6248	5782	5350	4951	4784	4522	4274	4040	3819	3610
MedCar	6450	5968	5523	5110	4938	4667	4412	4170	3942	3726
SmallSUV	6727	6225	5761	5331	5151	4869	4602	4350	4112	3887
MedSUV	8138	7530	6968	6448	6230	5889	5567	5262	4974	4702
Pickup	10387	9612	8894	8230	7952	7517	7105	6716	6349	6001

Table II-2 - BEV400 Total Battery Costs (2021$[2])

Vehicle Class	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032	MY 2033	MY 2034	MY 2035
SmallCar	9257	8566	7927	7335	7087	6699	6332	5986	5658	5348
MedCar	9565	8851	8190	7579	7323	6922	6543	6185	5846	5526
SmallSUV	9953	9210	8522	7886	7620	7203	6808	6435	6083	5750
MedSUV	12011	11115	10285	9517	9196	8693	8217	7767	7342	6940
Pickup	15338	14193	13134	12153	11743	11100	10493	9918	9375	8862

Table II-3 - PHEV50 Total Battery Costs (2021$[2])

Vehicle Class	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032	MY 2033	MY 2034	MY 2035
SmallCar	1966	1819	1683	1557	1465	1385	1309	1238	1170	1106
MedCar	2086	1931	1787	1653	1555	1470	1390	1314	1242	1174
SmallSUV	2499	2312	2140	1980	1863	1761	1664	1573	1487	1406
MedSUV	2713	2510	2323	2149	2022	1912	1807	1708	1614	1526
Pickup	3363	3112	2879	2664	2507	2370	2240	2117	2001	1892

Table II-4 - FCEV300 Total Battery Costs (2021$[2])

Vehicle Class	MY 2026	MY 2027	MY 2028	MY 2029	MY 2030	MY 2031	MY 2032	MY 2033	MY 2034	MY 2035
SmallCar	580	578	576	573	571	563	556	548	540	533
MedCar	696	681	665	650	634	626	617	609	601	592
SmallSUV	761	745	729	713	698	676	654	633	613	592
MedSUV	761	745	729	713	698	688	679	670	661	651
Pickup	954	938	921	904	888	864	840	816	793	770

[2] These costs are based on an early 2021 report and thus reported in year 2021 dollars. However, consistent with CARB's standard practice of only adjusting for inflation on an annual basis, these values are treated as being in year 2020 dollars for purposes of the economic impact analysis as data necessary to adjust these values did not become available until after the estimates for the Standardized Regulatory Impacts Assessment (SRIA) had been developed.

B. Fleet Technology Mix Update

As a result of the updated battery costs, the lower incremental cost associated with BEVs relative to PHEVs resulted in a likely compliance path of auto manufacturers choosing more BEVs to comply with ZEV sales requirements in the 2028-2033 model years. Staff used the same methods described in the ISOR to update the ZEV sales fraction projections to reflect the changes in battery costs for the ACC II regulations. Table II-5 compares the change in ZEV sales percentages under the Original Proposal and adopted ACC II regulations.[3,4]

Although BEV300s are typically less expensive than BEV400s, the increase in BEVs fall into the BEV400 category due to an imposed 50% cap on BEV300 sales in each vehicle type segment. This cap is based on an assumption that not all consumers will purchase a vehicle that provides less than 350 miles driving range – a range that conventional vehicles typically provide. By 2029, most of the segments have reached this cap. Imposing this cap effectively requires auto manufacturers to sell longer range vehicles, which with the updated battery costs are BEV400s instead of PHEVs.

Table II-5: Comparison of ZEV and PHEV Technology Sales Fractions under the Original Proposal and Adopted Regulation

	BEV300		BEV400		PHEV		FCEV	
MY	**Original**	**Final**	**Original**	**Final**	**Original**	**Final**	**Original**	**Final**
2026	31.4%	31.4%	0.0%	0.0%	3.3%	3.3%	0.3%	0.3%
2027	39.4%	39.4%	0.0%	0.0%	3.3%	3.3%	0.3%	0.3%
2028	45.3%	46.8%	0.0%	0.0%	5.4%	3.9%	0.3%	0.3%
2029	46.8%	46.8%	0.1%	8.0%	11.8%	3.9%	0.3%	0.3%
2030	48.0%	48.0%	5.7%	13.7%	11.8%	3.9%	2.5%	2.5%
2031	48.0%	48.0%	13.4%	21.3%	11.8%	3.9%	2.8%	2.8%
2032	48.0%	48.0%	19.4%	27.3%	11.8%	3.9%	2.8%	2.8%
2033	48.0%	48.0%	25.4%	33.3%	11.8%	3.9%	2.8%	2.8%
2034	48.0%	48.0%	38.5%	38.5%	4.7%	4.7%	2.8%	2.8%
2035	48.0%	48.0%	40.0%	40.0%	9.2%	9.2%	2.8%	2.8%

[3] California Air Resources Board. 2022. FSOR OEM Cost Calculator Main Scenario. CARB 2022oo, First 15-Day Notice.

[4] California Air Resources Board. 2022. ISOR OEM Cost Calculator Main Scenario. CARB 2022nn, First 15-Day Notice.

III. Update Emissions Benefits

Due to the fact BEVs contain no internal combustion components (unlike PHEVs), the higher BEV sales resulted in fewer tailpipe and upstream criteria and greenhouse gas emissions. This section summarizes the expected emissions impacts in California due to the ACC II regulations, and includes an overview of the emission inventory methods, a description of the baseline used to estimate emission benefits of the regulations, and the resulting changes in NOx, $PM_{2.5}$, and GHG emissions. The details of the emission inventory development are discussed in Attachment D of the ISOR.

A. Emission Inventory Methods

All actions due to the ACC II regulations are compared against a business as usual (BAU) baseline and the Original Proposal. The BAU baseline is based on California's emissions inventory and includes the effects of existing state and federal regulations. For evaluation of the relative emission impacts of ACC II, staff used the same BAU as used in the ISOR.

Staff produced emission inventories for ACC II using the same methods used in the ISOR. Tank-to-wheel (TTW) vehicle emissions were estimated using the EMFAC2021 model and well-to-tank (WTT) emissions were calculated using estimated fuel demand and emission rates derived from the California VISION model. NOx, $PM_{2.5}$, and GHG emission reductions are based on the tailpipe emission differences between internal combustion engine vehicles (conventional vehicles) and ZEVs as well as differences in emissions associated with upstream fuel production.

B. Emission Inventory Results

The ACC II regulations are expected to result in minor, additional well-to-wheel (WTW, or the sum of WTT and TTW emissions) NOx, $PM_{2.5}$, and GHG emission reductions due to the replacement of some PHEVs with BEVs as BEV400 vehicles become less costly for manufacturers to produce, resulting in the sales mix fractions previously shown in Table II-5. Table III-1 summarizes the expected criteria and greenhouse gas emission benefits from 2026 through 2040 for the ACC II regulations. This table updates the values presented in Section VII of the ISOR.

Table III-1: Total Emission Benefits of the ACC II Regulations

	Emission Benefits		
CY	NOx (tons/day)	$PM_{2.5}$ (tons/day)	CO2e (MMT/yr)
2026	0.6	0.0	0.9
2027	1.5	0.1	2.6
2028	2.7	0.1	4.8
2029	4.1	0.2	7.6
2030	5.7	0.3	10.9
2031	7.7	0.4	14.8
2032	9.8	0.6	19.2

	Emission Benefits		
CY	NOx (tons/day)	$PM_{2.5}$ (tons/day)	CO2e (MMT/yr)
2033	12.1	0.7	23.9
2034	14.6	0.9	29.1
2035	17.3	1.1	34.5
2036	20.0	1.3	39.8
2037	22.6	1.5	44.9
2038	25.3	1.7	49.6
2039	27.8	1.9	54.1
2040	30.4	2.0	58.4

Table III-2 compares WTW NOx emissions of the ACC II regulations relative to the BAU baseline and Original Proposal. Under the regulations,[5] emissions decline at a slightly greater rate due to the higher prevalence of BEVs than under the Original Proposal described previously.

Table III-2: NOx Emissions under the Original Proposal and Adopted Regulation

	Projected NOx Emissions (tons/day)		
CY	BAU	Original Proposal	Adopted Regulation
2026	163.0	162.4	162.4
2027	151.2	149.7	149.7
2028	140.7	138.1	138.1
2029	131.6	127.6	127.5
2030	123.4	117.8	117.7
2031	116.2	108.8	108.6
2032	109.9	100.4	100.1
2033	104.3	92.5	92.2
2034	99.4	85.0	84.8
2035	94.9	77.9	77.6
2036	91.0	71.3	71.0
2037	87.5	65.1	64.8
2038	84.3	59.3	59.1
2039	81.5	53.8	53.6
2040	78.9	48.8	48.6

Table III-3 compares WTW $PM_{2.5}$ emissions of the ACC II regulations[5] relative to the BAU baseline and the Original Proposal. Similar to NOx, emissions of $PM_{2.5}$ decline at a slightly greater rate under the proposed modifications as BEV400 vehicles displace the emissions of some PHEV vehicles under the Original Proposal. The magnitude of these

[5] California Air Resources Board. 2022. FSOR Proposal Criteria Emissions. CARB 2022rr, First 15-Day Notice.

changes to expected emissions, however, is small and cannot be discerned in the table below due to rounding of the emissions values.

Table III-3: $PM_{2.5}$ Emissions under the Original Proposal and Adopted Regulation

	Projected $PM_{2.5}$ Emissions (tons/day)		
CY	**BAU**	**Original Proposal**	**Adopted Regulation**
2026	13.2	13.1	13.1
2027	13.0	12.9	12.9
2028	12.8	12.6	12.6
2029	12.5	12.3	12.3
2030	12.3	12.0	12.0
2031	12.2	11.7	11.7
2032	12.0	11.4	11.4
2033	11.8	11.1	11.1
2034	11.7	10.8	10.7
2035	11.5	10.4	10.4
2036	11.3	10.1	10.1
2037	11.2	9.7	9.7
2038	11.1	9.4	9.4
2039	11.0	9.1	9.1
2040	10.9	8.8	8.8

Table III-4 shows the WTW GHG emissions of the ACC II regulations[6] relative to the Original Proposal. Note that in the ISOR, GHG emissions were quantified as CO_2 emissions rather than carbon dioxide-equivalent (CO_2-e) emissions. To maintain consistency with other California Air Resources Board (CARB) programs and to better account for total GHG emissions, staff calculated CO_2-e for the ACC II regulations, rather than CO_2 emissions. Accordingly, staff also calculated CO_2-equivalent emissions for the BAU scenario to provide a valid comparison for estimating emission benefits. CO_2-e emissions represent the total combined emissions of CO_2 plus nitrous oxide (N_2O) and methane (CH_4), which are multiplied by their relative global warming potentials (i.e., 298 and 24, respectively). The EMFAC model does not calculate CO_2-e emissions directly, but it is capable of calculating N_2O and CH_4 emissions. The EMFAC model scenarios associated with this final analysis, however, did not contain N_2O and CH_4 output. As a result, staff estimated CO_2-e emissions based on the historical relationships between CO_2 and CO_2-e emissions derived from the online EMFAC database[7] for various vehicle type and fuel type combinations. The conversion to CO_2-e emissions only marginally affects the emission inventories and does not alter the overall conclusion of the GHG benefits of the ACC II regulations.

[6] California Air Resources Board. 2022. FSOR Proposal GHG Emissions. CARB 2022ss, First 15-Day Notice.
[7] California Air Resources Board. 2022. EMFAC Fleet Database. https://arb.ca.gov/emfac/fleet-db.

Table III-4: CO_2 and CO_2-equivalent Benefits under the Original Proposal and Adopted Regulation (well-to-wheel)

	Projected CO_2 Emissions (MMT/yr)			Projected CO_2-e Emissions (MMT/yr)		
CY	BAU	Original Proposal	Original Benefits	BAU	Adopted Regulation	Final Benefits
2026	138.2	137.3	0.9	140.6	139.6	0.9
2027	135.0	132.4	2.6	137.3	134.7	2.6
2028	131.9	127.2	4.7	134.2	129.4	4.8
2029	129.1	121.9	7.2	131.4	123.8	7.6
2030	126.5	116.2	10.3	128.7	117.9	10.9
2031	124.0	110.0	14.0	126.2	111.4	14.8
2032	121.7	103.6	18.2	123.9	104.8	19.2
2033	119.7	96.9	22.7	121.8	97.9	23.9
2034	117.7	89.8	27.9	119.8	90.8	29.1
2035	116.0	82.6	33.4	118.0	83.5	34.5
2036	114.4	75.7	38.7	116.4	76.6	39.8
2037	113.0	69.3	43.8	115.0	70.2	44.9
2038	111.8	63.2	48.6	113.8	64.1	49.6
2039	110.8	57.6	53.1	112.7	58.5	54.1
2040	109.9	52.4	57.4	111.7	53.3	58.4

IV. Updated Health Benefits

The increased emission reductions associated with the modifications in the adopted ACC II regulations provide increased health benefits.[8] The health benefits associated with these modifications are summarized in Table IV-1 and Table IV-2 below based on the same methodology for monetizing health impacts as described in the ISOR. Statewide valuations of health benefits were calculated by multiplying the value per incident by the statewide total number of incidents for 2026-2040. The total statewide health benefits derived from criteria emissions reductions is estimated to be $12.94 billion, with $12.91 billion resulting from reduced premature cardiopulmonary mortality and $0.03 billion resulting from reduced hospitalizations and emergency room (ER) visits. The spatial distribution of these benefits across the state follows the distribution of the health impacts by air basin.

[8] California Air Resources Board. 2022. Health Benefits Proposal July. CARB 2022iii, First 15-Day Notice.

Table IV-1: Avoided Mortality and Morbidity Incidents for the Five Major Air Basins and Statewide from 2026 to 2040

Air Basin	Avoided Cardiopulmonary Deaths	Avoided Hospitalizations for Cardiovascular Illness	Avoided Hospitalizations for Respiratory Illness	Avoided ER visits for Asthma
San Diego County	60 (47 - 73)	8 (0 - 17)	10 (2 - 18)	24 (15 - 33)
San Francisco Bay	184 (144 - 226)	29 (0 - 57)	35 (8 - 61)	101 (64 - 138)
San Joaquin Valley	40 (32 - 49)	5 (0 - 10)	6 (1 - 10)	15 (9 - 20)
South Central Coast	16 (12 - 19)	2 (0 - 5)	3 (1 - 5)	7 (4 - 9)
South Coast	974 (761 - 1190)	164 (0 - 322)	196 (46 - 346)	496 (314 - 678)
Rest of the State	13 (10 - 16)	2 (0 - 3)	2 (0 - 4)	5 (3 - 7)
Statewide	**1287 (1006 - 1574)**	**211 (0 - 413)**	**252 (59 - 444)**	**647 (409 - 886)**

Table IV-2: Statewide Valuation of Avoided Health Outcomes (millions 2020$)

Year	Avoided Premature Mortality	Avoided Cardiovascular Hospitalizations	Avoided Acute Respiratory Hospitalizations	Avoided ER Visits	Total Health Benefit
2023	0	0	0	0	$0.0
2024	0	0	0	0	$0.0
2025	0	0	0	0	$0.0
2026	3	0	1	2	$33.0
2027	9	1	2	5	$87.2
2028	16	2	3	8	$157.4
2029	24	4	4	13	$242.5
2030	35	5	6	18	$347.4
2031	47	7	9	24	$469.7
2032	60	10	11	31	$606.8
2033	76	12	14	38	$759.0
2034	92	15	18	47	$925.7
2035	110	18	22	56	$1,104.3
2036	128	21	25	64	$1,285.6
2037	146	24	29	73	$1,464.6
2038	164	27	32	82	$1,644.0
2039	181	30	36	90	$1,819.1
2040	198	33	39	98	$1,990.4
Total	**1287**	**211**	**252**	**647**	**$12,936.7**

V. Updated Climate Benefits

The ACC II regulations account for GHG benefits in terms of CO_2-e. The benefit of these GHG reductions can be estimated using the SC-CO_2, which provides a dollar valuation of the damages caused by one ton of carbon dioxide pollution and represents the monetary benefit today of reducing carbon emissions in the future. As the ACC II regulations are anticipated to increase CO_2 emission reductions compared to the Original Proposal, there is a corresponding increase in climate benefits. The methodology to calculate the social cost of carbon is the same as described in the ISOR in Section VI.C.

If all GHG reductions under the ACC II regulation are assumed to be in CO_2-equivalents, the avoided SC-CO_2 from 2026 to 2040 is the sum of the annual WTW GHG emissions reductions multiplied by the SC-CO_2 in each year. The cumulative WTW GHG emissions reductions along with the estimated climate benefits from the ACC II regulations are shown in Table V-1.[9] These benefits range from about $9.8 billion to $41.3 billion through 2040 (compared to $9.4 billion to $40.1 billion in the Original Proposal), depending on the chosen discount rate.

***Table V-1:* Avoided Social Cost of Carbon for the ACC II Regulations**

Year	GHG Emission Reductions (MMT)	Avoided SC-CO_2 (Million 2020$) 5% Discount Rate	Avoided SC-CO_2 (Million 2020$) 3% Discount Rate	Avoided SC-CO_2 (Million 2020$) 2.5% Discount Rate
2026	0.9	$17	$56	$81
2027	2.6	$51	$164	$239
2028	4.8	$94	$309	$447
2029	7.6	$150	$489	$718
2030	10.9	$229	$715	$1,044
2031	14.8	$311	$990	$1,437
2032	19.2	$428	$1,310	$1,890
2033	23.9	$533	$1,662	$2,384
2034	29.1	$687	$2,062	$2,940
2035	34.5	$815	$2,490	$3,531
2036	39.8	$992	$2,925	$4,126
2037	44.9	$1,119	$3,358	$4,773
2038	49.6	$1,302	$3,775	$5,337
2039	54.1	$1,420	$4,189	$5,892
2040	58.4	$1,609	$4,598	$6,437
Total	**395.1**	**$9,758**	**$29,092**	**$41,277**

[9] California Air Resources Board. 2022. Social Cost of Carbon Calculation. CARB 2022ppp, First 15-Day Notice.

VI. Updated Economic Costs and Benefits

A. Compliance Cost Updates

The reduced incremental costs associated with BEVs resulted in a reduction of total industry costs for the ACC II regulations relative to the Original Proposal.

Table VI-1compares the average industry incremental costs between the Original Proposal and final regulations of the entire ACC II package.[3,4] These costs include compliance with the ZEV Regulation, ZEV assurance measures and LEV regulations.

Table VI-1: Comparison of Average Incremental Costs under the Original and Final Proposals (2020 Dollars)

MY	Original Average Incremental Cost	Final Average Incremental Cost
2026	$477	$440
2027	$619	$563
2028	$712	$661
2029	$831	$819
2030	$1,054	$1,092
2031	$1,181	$1,181
2032	$1,198	$1,161
2033	$1,199	$1,129
2034	$1,075	$1,075
2035	$1,119	$1,119

Costs associated with the ZEV assurance measures did not change because the total number of ZEVs (BEVs + PHEVs) sold did not change between the Original Proposal and the final ACC II regulations. Costs associated with the ZEV regulations changed as a result of the changes in the ZEV sales mix and battery costs described previously.

There are no changes to the costs associated with the medium-duty LEV regulations. The costs for the light-duty LEV regulations change slightly for several reasons. First, the reduction in PHEVs -- which are subject to LEV regulations -- results in a smaller portion of the fleet required to comply with the US06 nonmethane organic gas plus oxides of nitrogen (NMOG+NOx) stand-alone standards and new cold-start standards, lowering the total cost of compliance for those provisions. Additionally, updates to assumptions based on more recent data used to estimate compliance costs for the adopted tighter emission running loss standard reduced the cost from $0.28 per vehicle to $0.26 per vehicle.[10] Namely, certification data from the 2021 model year (rather than 2019 used in the ISOR) showed that 8% of vehicle groups that share the same evaporative control systems may need to incur the one-time redesign cost, which translates to 16 evaporative vehicle groups. Using the same labor hours and labor rates as in the ISOR, the total cost of compliance with the running loss requirement is estimated to be:

(16 evap families) X (80 hr) X ($66.58/hr) = $85,216 total cost

[10] California Air Resources Board. 2022. MY2021 Evaporative Running Loss Emission Certification Data. CARB 2022j, First 15-Day Notice.

which is then apportioned across the five-year design cycle life of the vehicle. All other light-duty LEV-related costs, assumptions, and methods remain the same used in the ISOR. The total combined annual costs for the light-duty vehicle LEV amendments are summarized in Table VI-2.[11,12]

Table VI-2 Cost of Compliance with the Light-Duty Vehicle LEV Regulations by Model Year (2020 dollars)

Model Year	US06 NMOG+NOx	Cold-Start	Running Loss	Final Total Cost	Original Total Cost
2026	$ -	$543,293	$ -	$543,293	$543,293
2027	$ -	$423,449	$ -	$423,449	$423,449
2028	$4,100,204	$495,355	$17,043	$4,612,602	$4,831,371
2029	$3,410,470	$263,657	$17,043	$3,691,170	$4,404,288
2030	$2,671,602	$197,077	$17,043	$2,885,722	$3,552,124
2031	$2,033,563	$157,129	$17,043	$2,207,735	$2,862,167
2032	$1,563,084	$133,160	$17,043	$1,713,287	$2,355,918
2033	$1,110,719	$101,202	$ -	$1,211,920	$1,837,563
2034	$734,963	$79,896	$ -	$814,859	$809,533
2035	$617,835	$85,222	$ -	$703,057	$703,057

A comparison of the total industry compliance costs including all components of the ACC II package under the Original Proposal and final ACC II regulations are summarized in Table VI-3.[3,4] As expected, the regulation has slightly lower cumulative costs for industry as a whole between 2026 and 2040 largely due to the reduction in battery costs.

[11] California Air Resources Board. 2022. LEV Cost Estimates. CARB 2022bb, First 15-Day Notice.

[12] California Air Resources Board. 2022. LEV FSOR Cost Estimates. CARB 2022cc, First 15-Day Notice.

Table VI-3: Cumulative Industry Compliance Costs

Calendar Year	Original Cumulative Total Cost (millions 2020$)	Final Cumulative Total Cost (millions 2020$)
2026	$937	$864
2027	$1,220	$1,110
2028	$1,407	$1,307
2029	$1,649	$1,627
2030	$2,099	$2,174
2031	$2,358	$2,358
2032	$2,399	$2,327
2033	$2,408	$2,268
2034	$2,165	$2,165
2035	$2,259	$2,259
2036	$2,269	$2,269
2037	$2,280	$2,280
2038	$2,292	$2,292
2039	$2,303	$2,303
2040	$2,315	$2,315
Average Annual	$2,024	$1,995
Total	$30,359	$29,918

B. Total Costs of Ownership

Table VI-4 below shows the final results of the statewide average total costs of ownership (TCO) results[13] during the period of increasing requirements for the ACC II regulations, 2026 to 2035, and extends it five years further to 2040 where the requirements remain the same as 2035. Specifically, the calculations here account for the revised cumulative sales of ZEVs and PHEVs as a result of the ACC II regulations during each year 2026 to 2040, and any annual mileage and costs incurred during those years. However, input assumptions on energy prices, annual vehicle miles traveled, tax rates, etc. remain the same as those used in the ISOR. Additionally, this updated analysis does not include capital and operating costs beyond 2040 for vehicles still in operation after the regulation period. Compared to the Original Proposal, the total net cost from 2026 to 2040 decreased from -$81.8 billion to -92.9 billion (2020 dollars), which represents additional owner savings of about $11.1 billion (2020 dollars).

[13] California Air Resources Board. 2022. ACC II TCO 15-Day Version Proposal. CARB 2022sss, First 15-Day Notice.

Table VI-4: Statewide Total Costs of Ownership (millions 2020$)

Year	Vehicle Price and Plug	Sales Tax	Gasoline	Electricity	Hydrogen	Maintenance and Repair	Insurance	Registration	V2G	Total Cost	Total Savings	Net Cost
2026	$228	$19	-$547	$325	$0	-$143	$41	$32	$0	$645	-$690	-$46
2027	$536	$46	-$1,441	$851	$0	-$368	$94	$80	-$1	$1,607	-$1,811	-$204
2028	$912	$78	-$2,676	$1,602	$0	-$674	$157	$146	-$6	$2,895	-$3,355	-$460
2029	$1,381	$117	-$4,219	$2,572	$0	-$1,066	$236	$229	-$13	$4,535	-$5,298	-$763
2030	$1,991	$169	-$6,193	$3,734	$154	-$1,537	$343	$334	-$25	$6,727	-$7,755	-$1,028
2031	$2,432	$207	-$8,516	$5,113	$306	-$2,093	$460	$457	-$103	$8,975	-$10,713	-$1,738
2032	$2,797	$238	-$11,108	$6,673	$436	-$2,714	$575	$591	-$209	$11,309	-$14,031	-$2,722
2033	$3,089	$263	-$13,895	$8,412	$542	-$3,398	$687	$738	-$421	$13,730	-$17,715	-$3,984
2034	$3,274	$278	-$16,908	$10,330	$645	-$4,140	$794	$896	-$779	$16,217	-$21,827	-$5,610
2035	$3,346	$284	-$20,130	$12,423	$741	-$4,912	$906	$1,067	-$1,335	$18,768	-$26,377	-$7,608
2036	$3,363	$286	-$23,136	$14,437	$853	-$5,688	$1,018	$1,239	-$2,144	$21,197	-$30,968	-$9,771
2037	$3,378	$287	-$26,036	$16,273	$961	-$6,467	$1,131	$1,412	-$2,952	$23,443	-$35,455	-$12,012
2038	$3,399	$289	-$28,448	$17,797	$1,065	-$7,106	$1,204	$1,555	-$3,761	$25,309	-$39,315	-$14,006
2039	$3,438	$292	-$30,530	$19,118	$1,165	-$7,524	$1,224	$1,649	-$4,568	$26,887	-$42,622	-$15,735
2040	$3,451	$293	-$32,297	$20,238	$1,262	-$7,640	$1,182	$1,678	-$5,371	$28,105	-$45,309	-$17,204
Total	**$37,016**	**$3,146**	**-$226,078**	**$139,899**	**$8,131**	**-$55,471**	**$10,051**	**$12,105**	**-$21,690**	**$210,348**	**-$303,239**	**-$92,891**

C. The Creation or Elimination of Jobs within the State of California

The changes to the compliance costs and total costs of ownership also result in changes to the estimate of statewide employment impacts. Similar to the Original Proposal, these impacts from the ACC II regulations were calculated using the Regional Economic Models, Inc. (REMI) model.[14] The ACC II regulations are estimated to result in an initial decrease in employment growth that is less than 0.3% of baseline employment and begins to diminish towards the end of the regulatory horizon. Table VI-5 shows the impacts of the regulations on employment in major sectors in California. In 2040, the regulations are estimated to result in job gains of 24,995, primarily in services, manufacturing and constructions sectors and 65,811 jobs foregone, predominantly in the retail, wholesale, and government sectors. As noted in the ISOR, decreases in government employment are largely associated with declines in gas tax revenues funding certain government services; as these services are important, it is likely (but beyond the scope of this analysis) that alternate funding approaches, such as roadway pricing, may replace many of these revenues and so mitigate or eliminate some of these decreases. Thus these estimates are conservative. The net job impact of the ACC II regulations in 2040 is estimated as 40,816 jobs foregone. These trends are similar to those discussed in the ISOR (39,804 jobs foregone in 2040) and the difference in the percentage change from the baseline is only 0.01 percentage points.

Table VI-5: Total Employment Impacts

Year	2026	2028	2030	2032	2034	2036	2038	2040
% of California baseline change	-0.02%	-0.08%	-0.16%	-0.22%	-0.24%	-0.21%	-0.19%	-0.16%
Change in total jobs	-3,893	-19,159	-40,535	-55,274	-60,424	-55,136	-48,584	-40,816
Jobs gained	145	0	0	0	1,501	5,520	14,366	24,995
Jobs foregone	-4,039	-19,159	-40,535	-55,274	-61,926	-60,656	-62,950	-65,811
Natural resources	-27	-116	-232	-348	-445	-526	-586	-624
Construction	-419	-2,151	-4,146	-4,468	-2,655	465	2,713	3,517
Manufacturing	65	-201	-391	-290	139	931	1,663	2,272
Retail and wholesale	-1,773	-7,640	-16,062	-24,877	-32,916	-39,244	-43,234	-43,948
Transportation and public utilities	-142	-612	-1,191	-1,354	-1,079	-549	-231	136
Finance, insurance, and real estate	-143	-551	-1,050	-389	1,362	4,124	6,572	8,013
Services	-1,534	-6,159	-12,877	-14,976	-12,106	-4,125	3,419	11,057
Government	81	-1,728	-4,586	-8,573	-12,725	-16,213	-18,899	-21,239

D. The Creation of New Business or the Elimination of Existing Businesses within California

The ACC II regulations do not directly create or eliminate any businesses and there is no

[14] California Air Resources Board. 2022. ACC 2 REMI Results Proposal 15-day July. CARB 2022hhh, First 15-Day Notice.

threshold that identifies the creation or elimination of businesses. However, the ACC II regulations may have an indirect impact on business creation or elimination. Similar to the Original Proposal, these impacts from the regulations were calculated using the REMI model.[14] Although the REMI model cannot directly estimate the creation or elimination of businesses, changes in jobs and output for the California economy can be used to understand some potential impacts.

The REMI model estimates that overall jobs and output impacts of the ACC II regulations are small relative to the total California economy. Compared to the Original Proposal, the overall change in business output from the regulation only changed marginally from -$12.7 billion to -$12.9 billion (in 2020 dollars). However, as shown in Table VI-6, impacts to specific industries are larger. As with the Original Proposal, the ACC II regulations causes increased demand for electricity in the electric power sector, resulting in large increases in sales, but its services are provided primarily by existing utilities. New utilities are not expected to be created to meet this increased demand. The decreasing trend in demand for gasoline has the potential to result in the elimination of businesses in this industry and downstream industries, such as gasoline stations and vehicle repair businesses, if sustained over time, unless they adapt and provide charging and repair services for ZEVs that enable them to continue offering other services to drivers, such as convenience foods, that tend to be their profit centers. As ZEVs become a greater portion of the fleet, the vehicle repair and maintenance service industry are estimated to see negative impacts, including dealerships that have service departments, due to the lower maintenance requirements for ZEVs compared with conventional vehicles. This trend would suggest that the number of businesses providing these services may decrease along with the reduced demand.

Table VI-6: Change in California Output Growth by Industry Relative to the Baseline

Industry	Metric	2026	2028	2030	2032	2034	2036	2038	2040
California Economy	Baseline Output (2020M$)	5,734,719	5,867,144	6,010,188	6,166,889	6,342,899	6,541,029	6,772,294	7,038,021
	% Change	-0.01%	-0.07%	-0.14%	-0.19%	-0.21%	-0.20%	-0.20%	-0.18%
	Change (2020M$)	-772	-3,967	-8,476	-11,857	-13,513	-13,378	-13,220	-12,913
Electric power generation, transmission and distribution (2211)	% Change	0.44%	2.14%	4.89%	8.41%	12.25%	15.51%	17.32%	17.87%
	Change (2020M$)	217	1,072	2,499	4,386	6,523	8,442	9,667	10,257
Construction (23)	% Change	-0.03%	-0.17%	-0.33%	-0.36%	-0.22%	0.03%	0.21%	0.27%
	Change (2020M$)	-77	-403	-789	-866	-531	71	523	701
Petroleum and coal products manufacturing (324)	% Change	-0.27%	-1.33%	-2.98%	-5.15%	-7.56%	-9.98%	-11.84%	-12.98%
	Change (2020M$)	-251	-1,250	-2,901	-5,160	-7,794	-10,595	-12,984	-14,715
Basic chemical manufacturing (3251)	% Change	-0.02%	-0.10%	0.14%	0.63%	0.94%	1.23%	1.54%	1.82%
	Change (2020M$)	-5	-26	36	170	260	353	455	557
Insurance carriers (5241)	% Change	0.02%	0.09%	0.20%	0.38%	0.61%	0.87%	1.09%	1.13%
	Change (2020M$)	14	55	124	246	398	582	742	788
Retail trade (44-45)	% Change	-0.08%	-0.36%	-0.76%	-1.21%	-1.62%	-1.95%	-2.15%	-2.18%
	Change (2020M$)	-214	-967	-2,137	-3,494	-4,882	-6,156	-7,176	-7,717
Automotive repair and maintenance (8111)	% Change	-0.33%	-1.51%	-3.39%	-5.82%	-8.63%	-11.53%	-14.06%	-14.75%
	Change (2020M$)	-83	-389	-884	-1,540	-2,320	-3,152	-3,913	-4,189
State & Local Government	% Change	0.00%	-0.07%	-0.19%	-0.35%	-0.51%	-0.65%	-0.75%	-0.84%
	Change (2020M$)	15	-330	-883	-1,666	-2,494	-3,208	-3,782	-4,305

E. The Expansion of Businesses Currently Doing Business within California

Based on the estimated business impacts, sectors where expansion is expected to occur are primarily in the major sectors of Transportation and Public Utilities, Finance, Insurance and Real Estate, and Services. Compared to the Original Proposal, overall output from the ACC II regulations slightly increased in these sectors ranging from 1 to 3% higher than the original values.[14]

Table VI-7: California Business Impacts

Year	2026	2028	2030	2032	2034	2036	2038	2040
% Change	-0.01%	-0.07%	-0.14%	-0.19%	-0.21%	-0.20%	-0.20%	-0.18%
Change in Output (2020M$)	**-771**	**-3,966**	**-8,475**	**-11,857**	**-13,513**	**-13,378**	**-13,220**	**-12,912**
Natural Resources	-23	-111	-256	-455	-688	-944	-1,177	-1,363
Construction	-77	-403	-789	-866	-530	71	523	701
Manufacturing	-259	-1,376	-3,003	-4,961	-7,142	-9,313	-11,127	-12,336
Retail and Wholesale	-308	-1,406	-3,098	-4,990	-6,853	-8,489	-9,761	-10,422
Transportation and Public Utilities	170	857	2,037	3,703	5,672	7,495	8,659	9,270
Finance, Insurance & Real Estate	-95	-378	-756	-605	91	1,318	2,465	3,227
Services	-195	-819	-1,727	-2,019	-1,569	-308	981	2,315
Government	15	-330	-883	-1,666	-2,494	-3,208	-3,782	-4,305

F. Increase or Decrease of Investment in the State

Private domestic investment consists of purchases of residential and nonresidential structures and of equipment and software by private businesses and nonprofit institutions. It is used as a proxy for impacts on investments in California because it provides an indicator of the future productive capacity of the economy. The relative changes to growth in private investment under the ACC II regulations are shown in Table VI-8.[14] The results initially show a decrease of private investment of about $607 million in 2030 relative to a business-as-usual scenario, which trends positive resulting in an increase of about $4.91 billion by 2040. As with the Original Proposal these changes in investment do not exceed 1% of baseline investment across the regulatory horizon.

Table VI-8: Change in Gross Domestic Private Investment Growth

	2026	2028	2030	2032	2034	2036	2038	2040
Private Investment (2020M$)	505,625	511,821	522,983	535,029	549,820	566,271	585,020	605,645
% Change	-0.02%	-0.08%	-0.12%	-0.04%	0.18%	0.47%	0.69%	0.81%
Change (2020M$)	-92	-388	-607	-191	997	2,660	4,041	4,908

G. Total Cost and Overall Cost-Effectiveness Ratio

Table VI-9 indicates that the ACC II regulations has a cumulative net benefit of $91.1 billion and a benefit-cost ratio of 1.43, meaning benefits are more than costs during the analysis period between 2026 and 2040. Relative to the adopted ACC II regulations, Alternative 1 (a scenario requiring 70% ZEV sales by 2035) updated for the revised battery costs has a net benefit of $66.3 billion and a benefit-cost ratio of 1.68. Alternative 2 (a scenario requiring 100% ZEV sales by 2032) has an updated net benefit of $89.3 billion and a benefit-cost ratio of 1.40. As described in the ISOR, Alternative 1 was rejected because it does not meet California's goals to maximize permanent emission reductions from almost all passenger cars and light trucks. Alternative 2 was rejected because it is not sufficiently supported by evidence of a feasible path to compliance by manufacturers. The updated analysis for the ACC II regulations and alternatives does not alter these determinations.

Table VI-9: Benefit-Cost Ratio and Net Benefits of the ACC II Regulations and Alternatives for 2026-2040 (Billion 2020$)

Scenario	Total Costs	Cost Savings (benefit)	Health Benefits	Tax and Fee Revenue	Total Benefit	Net Benefit	Benefit-Cost Ratio
ACC II	$210.35	$303.24	$12.94	-$14.76	$301.41	$91.06	1.43
Alternative 1	$96.81	$164.88	$7.72	-$9.50	$163.10	$66.29	1.68
Alternative 2	$223.72	$314.17	$13.59	-$14.76	$313.00	$89.27	1.40

H. Fiscal Impacts

The effects of the ACC II regulations on the local and State governments are summarized in Table VI-10 and Table VI-11 below.[14] For local governments, the total fiscal impact, defined as the change in revenue minus change in costs, is estimated to be a decrease of $148.3 million over the first three years of the regulations and a cumulative decrease of $12.54 billion over the regulatory horizon (compared to $12.2 billion under the Original Proposal). The fiscal impact (i.e., revenues minus costs) to State government is estimated to be an increase of $29.1 million over the first three years and a cumulative decrease of $1.30 billion over the regulatory horizon (compared to $0.9 billion under the Original Proposal).

Table VI-10: Local Government Fiscal Impacts (Millions 2020$)

Year	Vehicle Cost	Operational Cost	Operational Savings	Utility User Fee Revenue	Vehicle Sales Tax Revenue	Gasoline Sales Tax Revenue	Excise Tax Revenue	Total Cost	Total Benefit	Total Fiscal Impact*
2026	$2.6	$2.8	-$5.3	$11.5	$45.0	-$20.2	-$30.7	$56.4	$61.8	$5.4
2027	$5.6	$7.3	-$13.9	$30.0	$60.9	-$53.3	-$80.1	$146.3	$104.9	-$41.4
2028	$9.2	$13.5	-$25.8	$56.6	$74.2	-$99.0	-$147.1	$268.9	$156.5	-$112.3
2029	$13.7	$21.6	-$40.8	$90.8	$92.5	-$156.1	-$229.7	$421.1	$224.1	-$197.0
2030	$19.6	$32.6	-$59.7	$131.8	$120.5	-$229.1	-$331.3	$612.6	$312.1	-$300.6
2031	$24.1	$45.3	-$82.5	$180.5	$132.1	-$315.1	-$447.9	$832.4	$395.1	-$437.3
2032	$28.0	$59.2	-$108.1	$235.6	$132.8	-$411.0	-$575.3	$1,073.5	$476.4	-$597.1
2033	$31.4	$74.2	-$136.4	$296.9	$132.0	-$514.1	-$713.9	$1,333.6	$565.4	-$768.2
2034	$34.0	$90.6	-$168.1	$364.6	$129.0	-$625.6	-$863.2	$1,613.4	$661.8	-$951.6
2035	$35.9	$108.4	-$203.1	$438.5	$134.7	-$744.8	-$1,021.2	$1,910.3	$776.4	-$1,133.8
2036	$37.4	$125.6	-$238.5	$509.6	$135.3	-$856.0	-$1,173.7	$2,192.7	$883.4	-$1,309.3
2037	$38.8	$141.4	-$273.0	$574.4	$135.8	-$963.3	-$1,320.8	$2,464.4	$983.3	-$1,481.1
2038	$40.1	$154.5	-$302.8	$628.2	$136.2	-$1,052.6	-$1,443.1	$2,690.3	$1,067.2	-$1,623.1
2039	$41.1	$165.6	-$328.2	$674.9	$136.7	-$1,129.6	-$1,548.7	$2,885.1	$1,139.8	-$1,745.3
2040	$41.5	$174.7	-$348.9	$714.4	$137.2	-$1,195.0	-$1,638.4	$3,049.6	$1,200.5	-$1,849.0
Total	**$403.2**	**$1,217.4**	**-$2,335.3**	**$4,938.4**	**$1,735.0**	**-$8,364.9**	**-$11,565.0**	**$21,550.5**	**$9,008.7**	**-$12,541.8**

Table VI-11: Estimated Fiscal Impacts on State Government (Million 2020$)

Year	Vehicle Cost	Operational Cost	Operational Savings	CARB Staffing Cost	Registration and License Fee Revenue	Energy Resource Fee	Vehicle Sales Tax Revenue	State Portion of Excise Tax Revenue	Total Cost	Total Benefit	Total Fiscal Impact*
2024	$0	$0	$0	$0.2	$0	$0	$0	$0	$0.2	$0	-$0.2
2025	$0	$0	$0	$0.4	$0	$0	$0	$0	$0.4	$0	-$0.4
2026	$0.8	$0.8	-$1.6	$0.4	$31.5	$0.4	$38.9	-$40.5	$42.5	$72.4	$29.8
2027	$1.7	$2.2	-$4.2	$0.4	$80.2	$0.9	$52.6	-$105.5	$109.8	$138.0	$28.1
2028	$2.7	$4.0	-$7.7	$0.4	$145.9	$1.7	$64.1	-$194.0	$201.2	$219.4	$18.2
2029	$4.1	$6.5	-$12.2	$0.4	$229.4	$2.7	$79.9	-$302.7	$313.7	$324.2	$10.5
2030	$5.9	$9.7	-$17.8	$0.4	$334.4	$3.9	$104.1	-$436.7	$452.7	$460.3	$7.6
2031	$7.2	$13.5	-$24.6	$0.4	$456.8	$5.2	$114.1	-$590.4	$611.5	$600.8	-$10.8
2032	$8.4	$17.7	-$32.3	$0.4	$591.2	$6.6	$114.7	-$758.4	$784.8	$744.9	-$40.0
2033	$9.4	$22.2	-$40.7	$0.4	$737.7	$8.2	$114.0	-$941.0	$973.0	$900.7	-$72.3
2034	$10.1	$27.1	-$50.2	$0.4	$895.9	$9.9	$111.5	-$1,137.8	$1,175.4	$1,067.5	-$107.9
2035	$10.7	$32.3	-$60.6	$0.4	$1,067.3	$11.8	$116.4	-$1,346.1	$1,389.6	$1,256.2	-$133.4
2036	$11.2	$37.5	-$71.2	$0.4	$1,239.5	$13.6	$116.9	-$1,547.1	$1,596.2	$1,441.1	-$155.1
2037	$11.6	$42.2	-$81.5	$0.4	$1,412.5	$15.3	$117.3	-$1,741.0	$1,795.3	$1,626.5	-$168.7
2038	$12.0	$46.1	-$90.4	$0.4	$1,554.7	$16.7	$117.7	-$1,902.3	$1,960.8	$1,779.5	-$181.4
2039	$12.3	$49.4	-$98.0	$0.4	$1,649.0	$17.9	$118.1	-$2,041.5	$2,103.7	$1,883.1	-$220.6
2040	$12.4	$52.1	-$104.2	$0.4	$1,678.5	$19.0	$118.5	-$2,159.7	$2,224.7	$1,920.2	-$304.5
Total	**$120.4**	**$363.4**	**-$697.1**	**$7.2**	**$12,104.5**	**$133.8**	**$1,499.1**	**-$15,244.8**	**$15,735.8**	**$14,434.5**	**-$1,301.2**