

Supplemental Table S1: Total Annual Costs and Benefits for the U.S. in 2025, and for California post-2025 (billions of 2011\$, 7% discount rate). Numbers taken from Tables ES-6 and ES-10 in the Draft Ozone RIA and Tables ES-5 and ES-9 in the Final Ozone RIA.

	U.S. non-California Cost/Benefits in 2025		California Costs/Benefits post-2025	
	Alternative Standards		Alternative Standards	
	0.070 ppm	0.065 ppm	0.070 ppm	0.065 ppm
Draft Ozone RIA (2014)				
Total Costs	\$3.9	\$15	\$0.80	\$1.6
Total Health Benefits	\$6.4 to \$13	\$19 to \$38	\$1.1 to \$2	\$2.2 to \$4.1
Net Benefits	\$2.5 to \$9.1	\$4 to \$23	\$0.3 to \$1.2	\$0.6 to \$2.5
Final Ozone RIA (2015)				
Total Costs	\$1.4	\$16	\$0.80	\$1.5
Total Health Benefits	\$2.9 to \$5.9	\$15 to \$30	\$1.2 to \$2.1	\$2.3 to \$4.2
Net Benefits	\$1.5 to \$4.5	-\$1.0 to \$14	\$0.4 to \$1.3	\$0.8 to \$2.7

Supplemental Table S2: EPA Estimation and Alternative 1 Re-estimation of Ozone Benefits and PM_{2.5} Co-benefits for 2025 (non-California estimates, millions of 2011\$); (EPA numbers from EPA Draft Ozone RIA Table 5-20 for ozone and Table 5-22 for PM_{2.5}).

Study	EPA Estimates		Alternative 1 Estimates	
	0.070 ppm	0.065 ppm	0.070 ppm	0.065 ppm
		Ozone Benefits (Short-Term Mortality)		
Smith et al. (2009)	\$2,000 (\$180 to \$5,800)	\$6,400 (\$560 to \$18,000)	\$1,200 (\$110 to \$3,500)	\$3,800 (\$340 to \$11,000)
Zanobetti & Schwartz (2008)	\$3,400 (\$300 to \$9,600)	\$11,000 (\$950 to \$30,000)	\$1,700 (\$150 to \$4800)	\$5,500 (\$480 to \$15,000)
		PM_{2.5} Benefits (Long-Term Mortality, 7% Discount rate)		
Krewski et al. (2009)	\$4,300	\$12,000	\$2,600	\$7,200
LePeule et al. (2012)	\$9,700	\$28,000	\$4,800	\$14,000

Supplemental Table S3. Alternative Benefits Calculations Assuming Uncertainty in Health Studies.

Health Effect & Study	Probability of Assumption Being True				Overall Probability	Benefit Estimate with Uncertainty (in Millions)
	True Association?	Causal?	Linear No-Threshold?	True in the Future		
	Ozone Benefits – Short-term Mortality					
Smith et al. (2009)	0.5	0.5	0.5	0.5	0.0625	\$400
Zanobetti & Schwartz (2008)	0.5	0.5	0.5	0.5	0.0625	\$690
	PM _{2.5} Benefits – Long-term Mortality					
Krewski et al. (2009) ^a	0.5	0.5	0.5	0.5	0.0625	\$750
LePeule et al. (2012) ^a	0.5	0.5	0.5	0.5	0.0625	\$1,750
Total Monetized Benefits						\$1,150 to \$2,500

^aLong-term mortality calculated using a 7% discount rate.

Supplemental Table S4: Millions of tons of NO_x Emission Reductions from EPA’s Draft RIA, Harrison, et. al. (2015), Fisher, et. al (2015), Krupnick et. al. (2015), and Lange et. al. (2018) (compliance year in parentheses).

	EPA Draft RIA (2025)	Harrison, et. al. (2022)	Fisher et. al. (2025)	Krupnick et. al. (2025)	Lange et. al. (2025)
Base Case Emissions	6.29	6.60	6.29	6.29	6.29
Updated 2015 Base Case			(0.06)		
Reductions to CPP proposal	(0.31)			(0.31)	
Reductions to CPP final			(0.18)		(0.18)
Reductions to 75 ppb	(0.24)	(0.30)	(0.24)	(0.24)	(0.24)
Baseline Emissions	5.75	6.30	5.81	5.75	5.87
Known controls, minus EGU SCR	(0.92)	(0.80)	(0.92)	(0.92)	(0.92)
EGU SCR	(0.20)		(0.24)		(0.20)
EGU closures		(0.80)	(0.12)		
NO _x Trading Program*				(0.42)	
Unknown controls	(0.75)	(1.00)	(0.66)	(0.53)	(0.88)
Compliance Emissions	3.87	3.70	3.87	3.88	3.87
Total Reductions from Baseline	1.88	2.60	1.94	1.87	2.00

* Does not exclude SCRs and other control methods

Supplemental Table S5: Unidentified NO_x Control Costs by Alternative Standard using Alternative Methods (Based on Table 4A-10 from EPA Final Ozone RIA 2015 ^a).

Level of Standard	Simulation Approach						Lange et. al. using EPA (2015) RIA		
	Tons of Unidentified NO _x reductions ^{b,c}	Regression Approach	Sector Percentages from Applied Controls	Sector Percentages from Remaining Emissions	Random Draws from all Identified Controls	Random Draws from Regression Line Beyond Identified Controls	Random Draws from Entire Regression Line	Minimum Cost of Initial Unidentified Methods is \$15,000/ton	Minimum Cost of Initial Unidentified Methods is \$19,000/ton
70 ppb	97,000	\$960 (9,800)	\$250 (2,500)	\$310 (3,100)	\$290 (3,000)	\$1,400 (14,000)	\$940 (9,600)	\$1,770 (\$1,843)	\$2,148 (\$2,237)
65 ppb	960,000	\$14,000 (14,000)	\$2,700 (2,800)	\$3,000 (3,100)	\$2,900 (3,000)	\$14,000 (14,000)	\$9,300 (9,600)	\$33,763 (\$35,170)	\$36,623 (\$38,149)

^aAll EPA values are rounded to two significant figures.

^bTotal tons of NO_x reductions required includes 51,000 tons for Post-2025 California and 46,000 tons for the rest of the United States in 2025. Because these simulations are designed to be proof of concept, we combined the emissions reductions needed and controls applied in these analyses.

^cTotal tons of NO_x reductions required includes 100,000 tons for Post-2025 California and 860,000 tons for the rest of the United States in 2025. Because these simulations are designed to be proof of concept, we combined the emissions reductions needed and controls applied in these analyses.

Supplemental Table 6: Monetized Costs of Tons of NO_x Emissions using EPA Final Ozone RIA 2015, (in billions 2011\$).

	Revised 65 ppb Standard Levels			Revised 70 ppb Standard Levels		
	EPA RIA	Lange et al. using EPA (2015) RIA		EPA RIA	Lange et al. using EPA (2015) RIA	
		Minimum Cost of Initial Unidentified Methods is \$15,000/ton	Minimum Cost of Initial Unidentified Methods is \$19,000/ton		Minimum Cost of Initial Unidentified Methods is \$15,000/ton	Minimum Cost of Initial Unidentified Methods is \$19,000/ton
Identified Costs	\$2.6	\$2.6	\$2.6	\$0.7	\$0.7	\$0.7
Unidentified Costs	\$12.6	\$28.4	\$31.1	\$0.7	\$0.8	\$0.9
Total Cost of Emission Reduction	\$16	\$31	\$34	\$1.4	\$1.5	\$1.6

Note: All values are rounded to two significant figures. Unidentified control costs are based on an average cost-per-ton methodology described in chapter 4 of EPA Final Ozone RIA (2015).

For 65 ppb: Cost to mitigate 560,000 tons from identified sources and 860,000 tons from unidentified sources (non-CA).

For 70 ppb: Cost to mitigate 560,000 tons from identified sources and 46,000 tons from unidentified sources (non-CA).

Supplemental Table 7: Estimated Monetized Ozone and PM_{2.5} Benefits for Revised and Alternative Annual Ozone Standards of 0.065 ppm using EPA 2015 Final Ozone RIA Table 6-24 as the basis (in billions of dollars) ^a

Revised 65 ppb Standard Levels			
	EPA RIA (2015)	Lange et al. Alternative 1	Lange et al. Alternative 2
Ozone-only benefits ^b	\$5.3 to \$8.7	\$3.2 to \$4.4	\$0.3 to \$0.5
PM _{2.5} Cobenefits ^c	\$9.3 to \$21	\$4.6 to \$10	\$0.6 to \$1.3
Total Benefits	\$15 to \$30	\$7.8 to \$14	\$0.9 to \$1.9
Identified Control Strategies Only			
Ozone-only benefits ^b	\$2.2 to \$3.5	\$1.3 to \$1.8	\$0.1 to \$0.2
PM _{2.5} Cobenefits ^c	\$3.6 to \$8.1	\$1.8 to \$4.9	\$0.2 to \$0.5
Total Benefits	\$5.7 to \$12	\$3.1 to \$6.7	\$0.4 to \$0.7

^aRounded to two significant figures. The reduction in premature fatalities each year accounts for over 98% of total monetized benefits in this analysis. Mortality risk valuation for PM_{2.5} assumes discounting over the SAB-recommended 20-year segmented lag structure. These estimates reflect the economic value of avoided morbidities and premature deaths using risk coefficients from the studies noted

^bRange reflects Smith et al, 2009 and Zanobetti & Schwartz, 2008. Ozone-only benefits reflect short-term exposure impacts and as such are assumed to occur in the same year as ambient ozone reductions. Consequently, social discounting is not applied to the benefits for this category

^cRange reflects Krewski et al., 2009, and Lepeule et al., 2012. 7% discount rate.

Supplemental Table 8: Estimate of Monetized Ozone and PM_{2.5} Net Benefits for Proposed Annual Ozone Standard of 0.065 ppm 2025 Scenario, using EPA Final Ozone RIA (2015) as the basis (nationwide benefits of attaining each alternative standard everywhere in the U.S. except California and except as noted) – Full Attainment (billions of 2011\$) ^a

Total Benefits ^a		Costs		Net Benefits	
Source		Source	Minimum Cost of Initial Unidentified Method (per ton) Total Costs		
EPA (2015)	\$15 to \$30	EPA (2015) RIA	\$15,000	\$16	(\$1.0) to \$14
		Lange et al. using EPA (2015) RIA	\$15,000	\$31	(\$16) to (\$1.0)
		Lange et al. using EPA (2015) RIA	\$19,000	\$34	(\$19) to (\$3.7)
Alternative 1	\$7.8 to 14	EPA (2015) RIA	\$15,000	\$16	(\$8.2) to \$2.0
		Lange et al. using EPA (2015) RIA	\$15,000	\$31	(\$23) to (\$17)
		Lange et al. using EPA (2015) RIA	\$19,000	\$34	(\$26) to (\$20)
Alternative 2	\$0.9 to \$1.9	EPA (2015) RIA	\$15,000	\$16	(\$15) to (\$14)
		Lange et al. using EPA (2015) RIA	\$15,000	\$31	(\$30) to (\$29)
		Lange et al. using EPA (2015) RIA	\$19,000	\$34	(\$33) to (\$32)

^a7% discount rate.