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September 2000

Mail-Out #MSC 00-19

MEMORANDUM

TO: LIGHT- AND MEDIUM-DUTY VEHICLE MANUFACTURERS
ZERO-EMISSION VEHICLE SUPPLIERS AND
MANUFACTURERS OTHER INTERESTED PARTIES

FROM: Robert H. Cross, Chief
Mobile Source Control Division

DATE: September 6, 2000

SUBJECT: Errata Notice for 2000 Zero-Emission Vehicle Program Biennial
Review Staff Report

Please note the following corrections and information updates to the staff report entitled "2000 Zero Emission Vehicle Program Biennial Review" released on August 7, 2000.

Page 82, paragraph 1. Add Southern California Edison and Warner Brothers to the list of fleets affected by lack of EV availability. (These are the two fleets whose representatives testified at the workshop, as discussed in the first paragraph on page 82).

Page 111, Table 8-2. Delete footnote "a" (total incremental cost is not shown in this table).

Pages 117 through 126, Tables 8-6 through 8-12. The staff report contains a minor error in the calculation of the lifecycle cost per mile for gasoline fueled vehicles (HEVs and PZEVs). The staff report calculations use the miles traveled in year 1 to calculate the cost of the fuel used in year 2, and so on. Because the miles traveled decrease each year, the effect of this error is to very slightly overstate the lifecycle cost per mile for gasoline fueled vehicles, by \$0.0015 per mile. The correct totals are shown in bold in the revised tables below.

The graphs that show relative vehicle cost have not been revised because the changes are too small to be visible.

**Table 8-6
2003 Vehicles
Base Case Cost Estimates**

			Initial	Vehicle	Total	Lifecycle
	Battery	Charger	Pack	Incremental	Incremental	Cost per
Vehicle Type	Type	Cost	Cost	Cost	Cost	Mile
2 Passenger						
MOA 2 Passenger	NiMH	\$1,500	\$13,059	\$9,500	\$24,059	\$0.288
MOA 2 Passenger	PbA	\$1,500	\$3,839	\$9,500	\$14,839	\$0.219
City EV	NiMH	\$1,500	\$3,558	\$5,000	\$10,058	\$0.167
City EV	PbA	\$1,500	\$1,065	\$5,000	\$7,565	\$0.150
HEV 2 Passenger	NiMH	\$0	\$782	\$2,500	\$3,282	\$0.099
PZEV 2 Passenger	NA	\$0	\$0	\$500	\$500	\$0.074
4 Passenger						
MOA 4 Passenger	NiMH	\$1,500	\$12,317	\$8,000	\$21,817	\$0.270
MOA 4 Passenger	PbA	\$1,500	\$3,538	\$8,000	\$13,038	\$0.208
HEV 4 Passenger	NiMH	\$0	\$782	\$2,500	\$3,282	\$0.106
PZEV 4 Passenger	NA	\$0	\$0	\$500	\$500	\$0.082
Pickup/fleet						
MOA Pickup/Fleet	NiMH	\$1,500	\$12,512	\$8,000	\$22,012	\$0.275
MOA Pickup/Fleet	PbA	\$1,500	\$3,839	\$8,000	\$13,339	\$0.216
HEV Pickup/Fleet	NiMH	\$0	\$782	\$2,500	\$3,282	\$0.113
PZEV Pickup/Fleet	NA	\$0	\$0	\$500	\$500	\$0.098

**Table 8-7
2003 Vehicles
Alternative Scenario Cost Estimates
(Increased Battery Life)**

Vehicle Type	Incremental Lifecycle Cost Per Mile			
	Base Case	Increased Battery Life	Difference	Percent
2 Passenger				
MOA 2 Passenger, NiMH	\$0.288	\$0.246	-\$0.042	-14.6%
MOA 2 Passenger, PbA	\$0.219	\$0.188	-\$0.031	-14.0%
City EV, NiMH	\$0.167	\$0.149	-\$0.018	-10.7%
City EV, PbA	\$0.150	\$0.133	-\$0.016	-11.0%
HEV 2 Passenger	\$0.099	\$0.099	\$0.000	0.0%
PZEV 2 Passenger	\$0.074	\$0.074	\$0.000	0.0%
4 Passenger				
MOA 4 Passenger, NiMH	\$0.270	\$0.231	-\$0.040	-14.7%
MOA 4 Passenger, PbA	\$0.208	\$0.179	-\$0.029	-13.8%
Hybrid 4 Passenger	\$0.106	\$0.106	\$0.000	0.0%
PZEV 4 Passenger	\$0.082	\$0.082	\$0.000	0.0%
Pickup/fleet				
MOA Pickup/Fleet, NiMH	\$0.275	\$0.235	-\$0.040	-14.7%
MOA Pickup/Fleet, PbA	\$0.216	\$0.186	-\$0.031	-14.2%
Hybrid Pickup/Fleet	\$0.113	\$0.113	\$0.000	0.0%
PZEV Pickup/Fleet	\$0.098	\$0.098	\$0.000	0.0%

**Table 8-8
2003 Vehicles
Alternative Scenario Cost Estimates
(Increased Gasoline Price)**

Vehicle Type	Incremental Lifecycle Cost Per Mile			
	Base Case	Increased Gas Price	Difference	Percent
2 Passenger				
MOA 2 Passenger, NiMH	\$0.288	\$0.288	\$0.000	0.0%
MOA 2 Passenger, PbA	\$0.219	\$0.219	\$0.000	0.0%
City EV, NiMH	\$0.167	\$0.167	\$0.000	0.0%
City EV, PbA	\$0.150	\$0.150	\$0.000	0.0%
HEV 2 Passenger	\$0.099	\$0.104	\$0.005	5.4%
PZEV 2 Passenger	\$0.074	\$0.084	\$0.009	12.6%
4 Passenger				
MOA 4 Passenger, NiMH	\$0.270	\$0.270	\$0.000	0.0%
MOA 4 Passenger, PbA	\$0.208	\$0.208	\$0.000	0.0%
Hybrid 4 Passenger	\$0.106	\$0.115	\$0.008	7.8%
PZEV 4 Passenger	\$0.082	\$0.095	\$0.012	15.2%
Pickup/fleet				
MOA Pickup/Fleet, NiMH	\$0.275	\$0.275	\$0.000	0.0%
MOA Pickup/Fleet, PbA	\$0.216	\$0.216	\$0.000	0.0%
Hybrid Pickup/Fleet	\$0.113	\$0.123	\$0.011	9.5%
PZEV Pickup/Fleet	\$0.098	\$0.117	\$0.019	19.1%

**Table 8-9
2003 Vehicles
Alternative Scenario Cost Estimates
(Increased Electricity Price)**

Vehicle Type	Incremental Lifecycle Cost Per Mile			
	Base Case	Increased Elect. Price	Difference	Percent
2 Passenger				
MOA 2 Passenger, NiMH	\$0.288	\$0.295	\$0.007	2.5%
MOA 2 Passenger, PbA	\$0.219	\$0.224	\$0.005	2.2%
City EV, NiMH	\$0.167	\$0.172	\$0.005	2.9%
City EV, PbA	\$0.150	\$0.155	\$0.005	3.4%
HEV 2 Passenger	\$0.099	\$0.099	\$0.000	0.0%
PZEV 2 Passenger	\$0.074	\$0.074	\$0.000	0.0%
4 Passenger				
MOA 4 Passenger, NiMH	\$0.270	\$0.280	\$0.010	3.5%
MOA 4 Passenger, PbA	\$0.208	\$0.216	\$0.008	4.1%
Hybrid 4 Passenger	\$0.106	\$0.106	\$0.000	0.0%
PZEV 4 Passenger	\$0.082	\$0.082	\$0.000	0.0%
Pickup/fleet				
MOA Pickup/Fleet, NiMH	\$0.275	\$0.285	\$0.010	3.6%
MOA Pickup/Fleet, PbA	\$0.216	\$0.226	\$0.010	4.5%
Hybrid Pickup/Fleet	\$0.113	\$0.113	\$0.000	0.0%
PZEV Pickup/Fleet	\$0.098	\$0.098	\$0.000	0.0%

**Table 8-10
Volume Production Vehicles
Base Case Cost Estimates**

			Initial	Vehicle	Total	Lifecycle
	Battery	Charger	Pack	Incremental	Incremental	Cost per
Vehicle Type	Type	Cost	Cost	Cost	Cost	Mile
(Standard Vehicles)						
2 Passenger						
City EV	NiMH	\$750	\$2,666	\$0	\$3,416	\$0.071
City EV	PbA	\$750	\$731	\$0	\$1,481	\$0.060
HEV 2 Passenger	NiMH	\$0	\$586	\$500	\$1,086	\$0.078
PZEV 2 Passenger	NA	\$0	\$0	\$500	\$500	\$0.072
4 Passenger						
MOA 4 Passenger	NiMH	\$750	\$9,230	\$0	\$9,980	\$0.126
HEV 4 Passenger	NiMH	\$0	\$586	\$500	\$1,086	\$0.084
PZEV 4 Passenger	NA	\$0	\$0	\$500	\$500	\$0.078
Pickup/Fleet						
HEV Pickup/Fleet	NiMH	\$0	\$586	\$500	\$1,086	\$0.090
PZEV Pickup/Fleet	NA	\$0	\$0	\$500	\$500	\$0.089
(High Efficiency Vehicles)						
2 Passenger						
60 mile 2 Passenger	NiMH	\$750	\$2,989	\$1,500	\$5,239	\$0.081
60 mile 2 Passenger	PbA	\$750	\$1,449	\$1,500	\$3,699	\$0.080
100 mile 2 Passenger	NiMH	\$750	\$5,098	\$1,500	\$7,348	\$0.098
100 mile 2 Passenger	PbA	\$750	\$2,553	\$1,500	\$4,803	\$0.096
150 mile 2 Passenger	NiMH	\$750	\$8,438	\$1,500	\$10,688	\$0.125
4 Passenger						
60 mile 4 Passenger	NiMH	\$750	\$4,336	\$0	\$5,086	\$0.082
60 mile 4 Passenger	PbA	\$750	\$2,098	\$0	\$2,848	\$0.079
100 mile 4 Passenger	NiMH	\$750	\$7,384	\$0	\$8,134	\$0.107
100 mile 4 Passenger	NiMH	\$750	\$6,593	\$0	\$7,343	\$0.099

Table 8-11
Volume Production Vehicles
Alternative Scenario Cost Estimates
(Increased Gasoline Price)

Vehicle Type	Incremental Lifecycle Cost Per Mile			
	Base Case	Increased Gas Price	Difference	Percent
(Standard Vehicles)				
2 Passenger				
City EV, NiMH	\$0.071	\$0.071	\$0.000	0.0%
City EV, PbA	\$0.060	\$0.060	\$0.000	0.0%
HEV 2 Passenger	\$0.078	\$0.083	\$0.005	6.0%
PZEV 2 Passenger	\$0.072	\$0.080	\$0.008	11.6%
4 Passenger				
MOA 4 Passenger, NiMH	\$0.126	\$0.126	\$0.000	0.0%
HEV 4 Passenger	\$0.084	\$0.091	\$0.007	8.1%
PZEV 4 Passenger	\$0.078	\$0.088	\$0.011	13.8%
Pickup/Fleet				
HEV Pickup/Fleet	\$0.090	\$0.100	\$0.009	10.4%
PZEV Pickup/Fleet	\$0.089	\$0.104	\$0.015	16.9%
(High Efficiency Vehicles)				
2 Passenger				
60 mile 2 Passenger, NiMH	\$0.081	\$0.081	\$0.000	0.0%
60 mile 2 Passenger, PbA	\$0.080	\$0.080	\$0.000	0.0%
100 mile 2 Passenger, NiMH	\$0.098	\$0.098	\$0.000	0.0%
100 mile 2 Passenger, PbA	\$0.096	\$0.096	\$0.000	0.0%
150 mile 2 Passenger, NiMH	\$0.125	\$0.125	\$0.000	0.0%
4 Passenger				
60 mile 4 Passenger, NiMH	\$0.082	\$0.082	\$0.000	0.0%
60 mile 4 Passenger, PbA	\$0.079	\$0.079	\$0.000	0.0%
100 mile 4 Passenger, NiMH	\$0.107	\$0.107	\$0.000	0.0%
100 mile 4 Passenger, NiMH	\$0.099	\$0.099	\$0.000	0.0%

**Table 8-12
Volume Production Vehicles
Alternative Scenario Cost Estimates
(Increased Electricity Price)**

Vehicle Type	Incremental Lifecycle Cost Per Mile			
	Base Case	Increased Elect. Price	Difference	Percent
(Standard Vehicles)				
2 Passenger				
City EV, NiMH	\$0.071	\$0.074	\$0.003	4.6%
City EV, PbA	\$0.060	\$0.063	\$0.003	5.2%
HEV 2 Passenger	\$0.078	\$0.078	\$0.000	0.0%
PZEV 2 Passenger	\$0.072	\$0.072	\$0.000	0.0%
4 Passenger				
MOA 4 Passenger, NiMH	\$0.126	\$0.133	\$0.007	5.9%
HEV 4 Passenger	\$0.084	\$0.084	\$0.000	0.0%
PZEV 4 Passenger	\$0.078	\$0.078	\$0.000	0.0%
Pickup/Fleet				
HEV Pickup/Fleet	\$0.090	\$0.090	\$0.000	0.0%
PZEV Pickup/Fleet	\$0.089	\$0.089	\$0.000	0.0%
(High Efficiency Vehicles)				
2 Passenger				
60 mile 2 Passenger, NiMH	\$0.081	\$0.085	\$0.004	5.0%
60 mile 2 Passenger, PbA	\$0.080	\$0.083	\$0.003	3.7%
100 mile 2 Passenger, NiMH	\$0.098	\$0.102	\$0.004	4.0%
100 mile 2 Passenger, PbA	\$0.096	\$0.100	\$0.004	4.1%
150 mile 2 Passenger, NiMH	\$0.125	\$0.129	\$0.004	3.1%
4 Passenger				
60 mile 4 Passenger, NiMH	\$0.082	\$0.087	\$0.005	5.9%
60 mile 4 Passenger, PbA	\$0.079	\$0.084	\$0.005	5.7%
100 mile 4 Passenger, NiMH	\$0.107	\$0.112	\$0.005	4.8%
100 mile 4 Passenger, NiMH	\$0.099	\$0.104	\$0.005	4.6%

Pages 137-139, Tables 9-2, 9-3 and Graph 9-2. The results shown in the staff report for per vehicle indirect emissions of NOx have been revised. The updated results for indirect marginal NOx emissions are lower by a factor of 10 for all vehicle types, as shown in bold in the revised Tables 9-2 and 9-3 below. A revised version of Graph 9-2 also is provided.

**Table 9-2
Estimated Indirect Emissions Per Vehicle
South Coast Air Basin in 2010**

Vehicle Type	Fuel Cycle (g/mi)		
	NMOG	NOx	Toxics1
BEV	0.0020	0.0003	0.0010
PZEV SULEV	0.0310	0.0016	0.0060
PZEV HEV non-grid	0.0210	0.0011	0.0040
SULEV	0.0310	0.0016	0.0060
SULEV with LEV II DR	0.0310	0.0016	0.0060
MY 2002 vehicle	0.0310	0.0016	0.0060

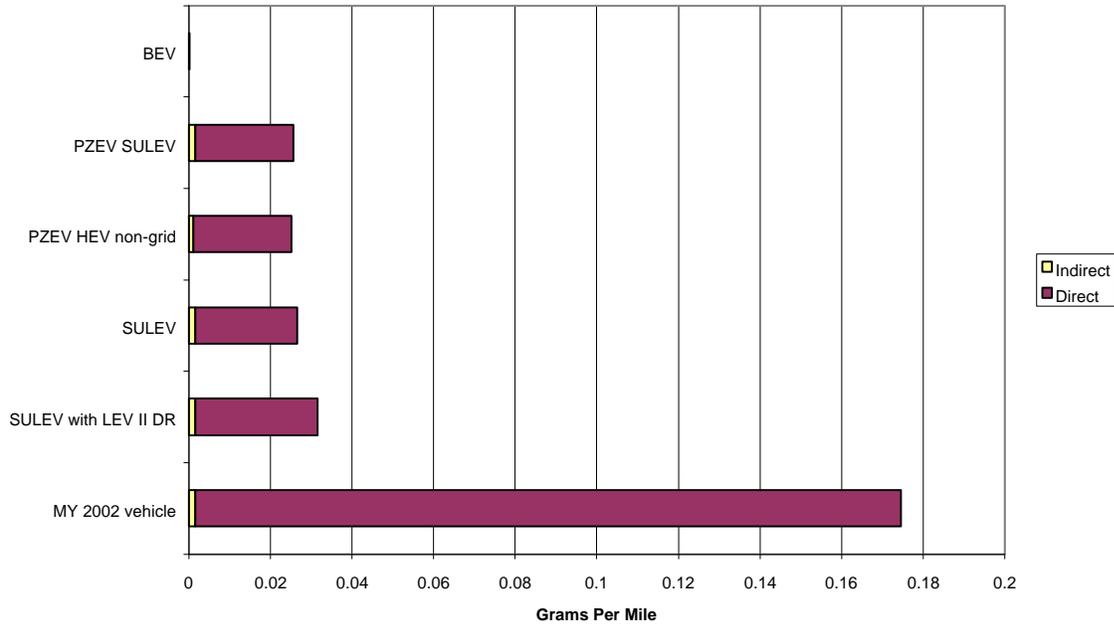
1. Toxic weighting: Formaldehyde 1.0; Acetaldehyde 0.5; Benzene 4.8; 1,3 Butadiene 28.0.

**Table 9-3
Total Emissions Per Vehicle
(Grams per mile)**

Vehicle Type	NMOG	NOx	Toxics
BEV	0.0020	0.0003	0.0010
PZEV SULEV	0.0577	0.0256	0.0092
PZEV HEV non-grid	0.0477	0.0251	0.0072
SULEV	0.0703	0.0266	0.0098
SULEV with LEV II DR	0.0780	0.0316	0.0127
MY 2002 vehicle	0.1420	0.1746	0.0306

Graph 9-2

**Total NOx Emissions Per Vehicle
(Revised)**



Pages 141-142, Tables 9-6 and 9-7. Due to the changes in estimated per vehicle NOx upstream emissions noted above, the total fleet emissions have also been revised. The updated results are slightly lower for both total fleet emissions and for the emission reductions as compared to the baseline. The updated results are shown in bold in the revised Tables 9-6 and 9-7 and associated text below.

“...As shown in Table 9-6, due to upstream emissions, the total emissions from the baseline scenario are **25.45** tons per day in the South Coast Air Basin”.

**Table 9-6
Total Fleet Emissions
South Coast Air Basin in 2010
(Tons per day)***

Scenario	ROG Exhaust	ROG Evap	ROG Upstream	NOx	NOx Upstream	Total ROG+NOx
Baseline--No ZEVs	4.45	3.67	4.29	12.82	0.22	25.45
1. 10% ZEVs, no multipliers	4.33	3.30	3.89	11.82	0.20	23.54
2. 10% ZEVs, with multipliers	4.35	3.47	4.01	12.20	0.21	24.24
3. 4% ZEVs, 6% PZEVs, with multipliers	4.28	3.42	4.18	11.53	0.22	23.63

*Estimates include only those vehicles sold in model years 2003 to 2010; other vehicles excluded.

“Table 9-7 below presents the emission reduction for each scenario as compared to the baseline. As is shown in the table, scenarios 1, 2 and 3 result in emission reductions of **1.91, 1.21, and 1.82** tons per day respectively as compared to the baseline.”

Table 9-7
Reduction in Total Vehicle Emissions As Compared to Baseline
South Coast Air Basin in 2010
(Tons per day)*

Scenario	ROG Exhaust	ROG Evap	ROG Upstream	NOx	NOx Upstream	Total ROG+NOx
1. 10% ZEVs, no multipliers	0.12	0.37	0.40	1.00	0.02	1.91
2. 10% ZEVs, with multipliers	0.10	0.20	0.28	0.62	0.01	1.21
3. 4% ZEVs, 6% PZEVs, with multipliers	0.17	0.25	0.11	1.29	0.00	1.82

*Estimates include only those vehicles sold in model years 2003 to 2010; other vehicles excluded.

NOTE: The estimates of 2020 fleet emissions and emission reductions as shown in Tables 9-8 and 9-9 do not include indirect emissions. Therefore the results shown in these tables have not changed.

The staff apologizes for any inconvenience this may have caused. If you have any questions regarding these corrections, please contact Mr. Chuck Shulock, at (916) 322-6964, or cshulock@arb.ca.gov.