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Northeast State GHG Emission Reduction Potential from Adoption of the California Motor Vehicle GHG Standards Summary of NESCAUM Analysis October, 2005

This summary provides the results of an analysis conducted for the Northeast states by NESCAUM and its contractor, Meszler Engineering Services. The purpose of the analysis is to estimate the greenhouse gas (GHG) emissions reductions that will be achieved in the Northeast through adoption of the California motor vehicle GHG standards. GHGs include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and hydrofluorocarbon (HFC) leakage from air conditioning systems. A summary of the analysis results are presented in Section II and an overview of the method used to estimate the GHG reductions is presented in Section III.

I. Background

Northeast air quality regulators estimate that approximately 20 percent of total anthropogenic GHG emissions in our region come from passenger cars and light-duty trucks. In order to reduce GHG emissions, states in our region have developed GHG reduction strategies. New York and New Jersey have developed energy and GHG reduction plans. The New England governors have committed to reduce GHGs as part of the New England Governors/Eastern Canadian Premiers Climate Action Plan adopted in 2002. The initial goals of the plan are to stabilize GHG emissions at 1990 levels by 2010 and reduce GHG emissions 10 percent below 1990 levels by 2020. Given the transportation sector's contribution to the GHG inventory, achieving the region's climate goals will require effective means to address the motor vehicle component.

To assist the Northeast states in developing a viable strategy to reduce motor vehicle GHGs, NESCAUM's sister organization, NESCCAF,[1] conducted a comprehensive analysis to assess the feasibility and costs associated with introduction of technologies to reduce GHGs from passenger cars.[2] The NESCCAF study team used state-of-the-art computer simulation modeling software to evaluate 75 different technology packages on five vehicle types. The study team also conducted a comprehensive cost analysis on the technologies evaluated. The study found that cost effective technologies exist to reduce motor vehicle GHGs for a range of GHG reductions of up to 55 percent. The study was the main technical support document for the California motor vehicle GHG regulation. California LEV - with the GHG component - will require a 30% reduction in new vehicle fleet average light-duty GHGs by 2016. This analysis estimates the GHG reductions that will be realized in our region with adoption of the GHG regulation component of the California LEV program.

[1] NESCCAF stands for Northeast States Center for a Clean Air Future
[2] NESCCAF "Reducing Greenhouse Gas Emissions From Light-Duty Motor Vehicles," 2004.

II. GHG Emission Reduction Results

A. GHG Emissions Reductions Projections

Tables 1 and 2 summarize the GHG emissions reductions that will be achieved in the seven Northeast LEV states with adoption of the motor vehicle GHG standards. Table 1 provides reductions for the year 2020 and Table 2 provides reductions for the year 2030. The tables show that a total of 27 million tons of GHGs will be reduced in 2020 in our region if all seven LEV states adopt the motor vehicle GHG standards. In 2030, 39 million tons of GHGs will be reduced annually in our region as a result of the regulation. This is equal to a reduction of 18 percent in motor vehicle GHG emissions in 2020 and a 24 percent reduction in 2030 from the baseline projections. The analysis assumes the motor vehicle GHG standards will be in place for model year 2009.

Table 1: GHG Reductions in 2020 Resulting from Adoption of the CA Regulations

State	Baseline GHG (millions of tons)	With Regulation (millions of tons)	GHGs Reduced in 2020 (millions of tons)	Percent Reduction from Baseline
Connecticut	16.6	13.5	3.1	19%
Maine	8.1	6.7	1.4	17%
Massachusetts	27.7	22.6	5.1	18%
New Jersey	32.3	26.5	5.8	18%
New York	57.8	47.8	10.0	17%
Rhode Island	4.8	3.9	0.9	18%
Vermont	4.2	3.5	0.7	17%
Total	**151.5**	**124.5**	**27.0**	**18%**

Table 2: GHG Reductions in 2030 Resulting from Adoption of the CA Regulations

State	Baseline GHGs (millions of tons)	With Regulation (millions of tons)	GHGs Reduced in 2030 (millions of tons)	Percent Reduction from Baseline
Connecticut	18.2	13.8	4.4	24%
Maine	8.8	6.7	2.1	24%
Massachusetts	28.8	21.9	6.9	24%
New Jersey	35.6	27.0	8.5	24%
New York	60.9	46.4	14.5	24%
Rhode Island	5.5	4.1	1.4	26%
Vermont	5.0	3.8	1.2	24%
Total	**162.8**	**123.7**	**39.0**	**24%**

This section provides a graphical representation of GHG emissions reductions that can be expected from adoption of the California motor vehicle GHG standards in different calendar years for each of the Northeast LEV states.

Figure 1: GHG Reductions Achieved in New York

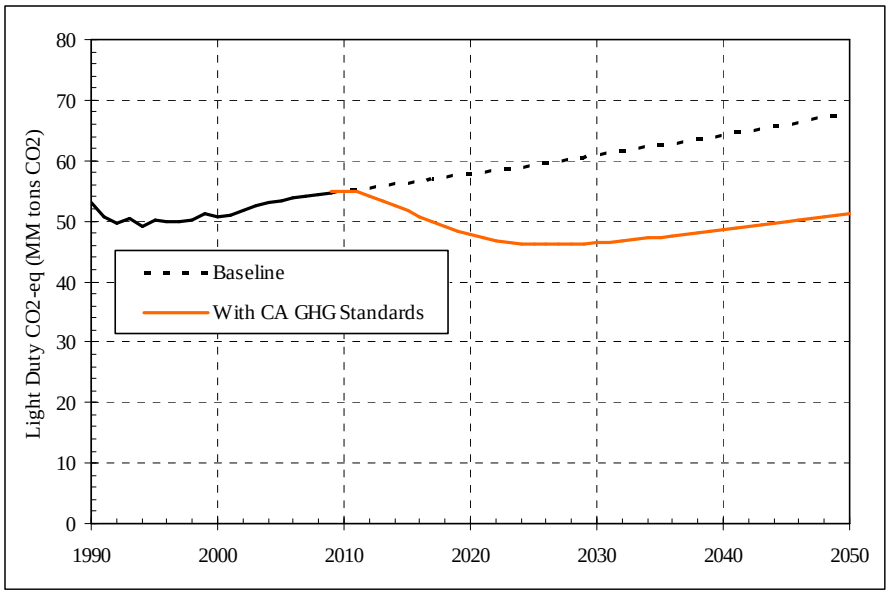


Figure 2: GHG Reductions Achieved in Massachusetts

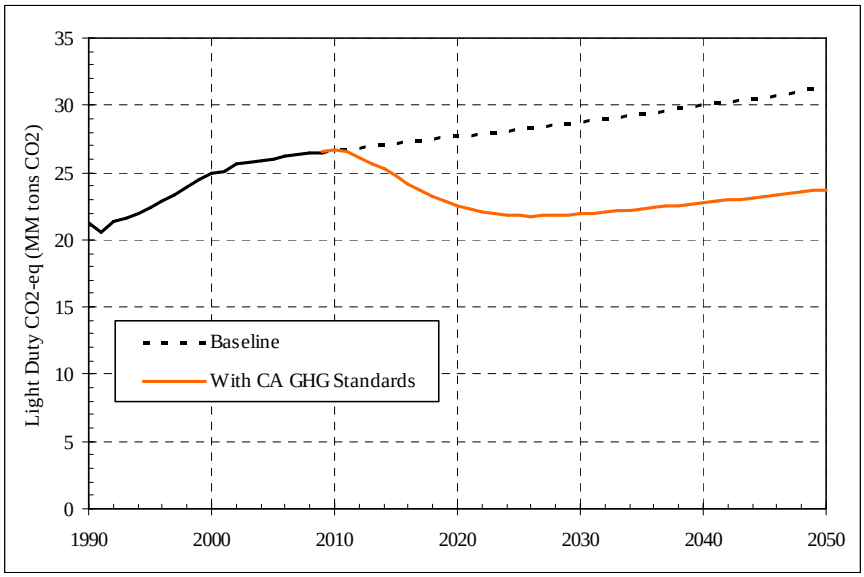


Figure 3: GHG Reductions Achieved in Connecticut

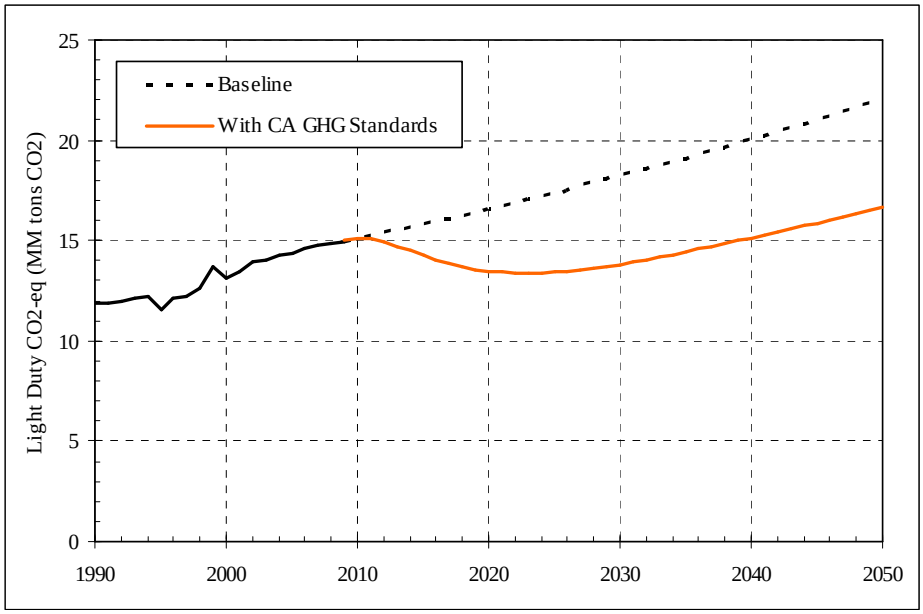


Figure 4: GHG Reductions Achieved in New Jersey

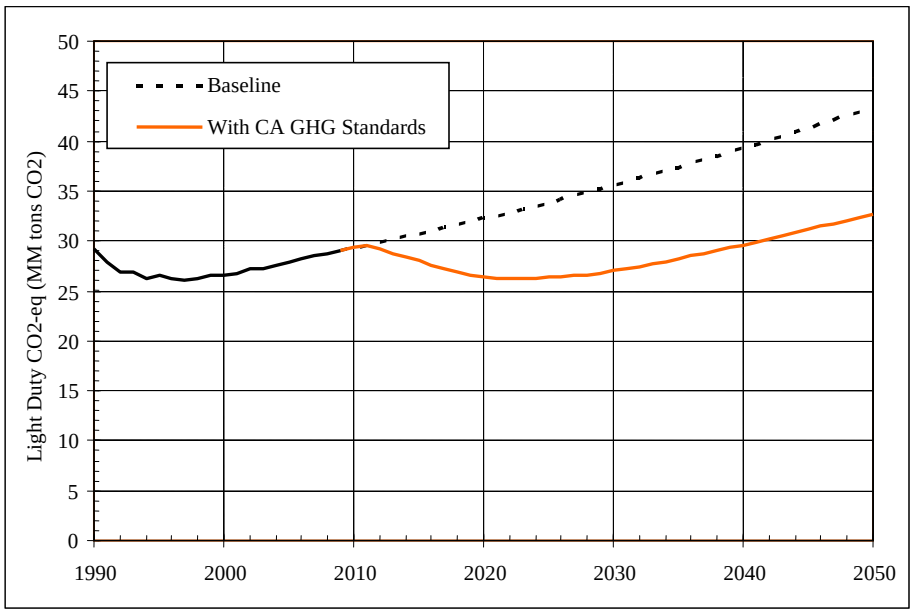


Figure 5: GHG Reductions Achieved in Maine

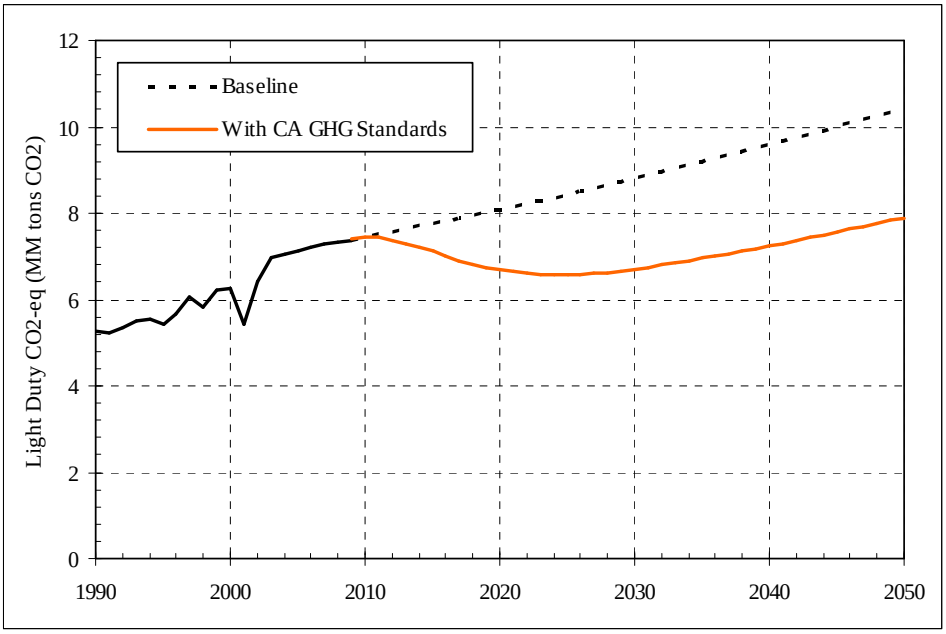


Figure 6: GHG Reductions Achieved in Vermont

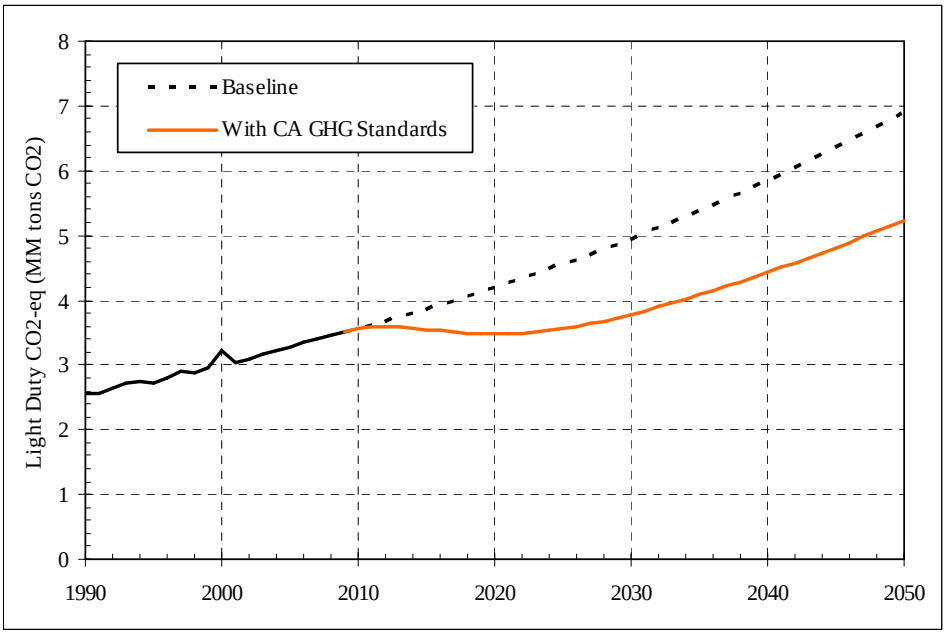
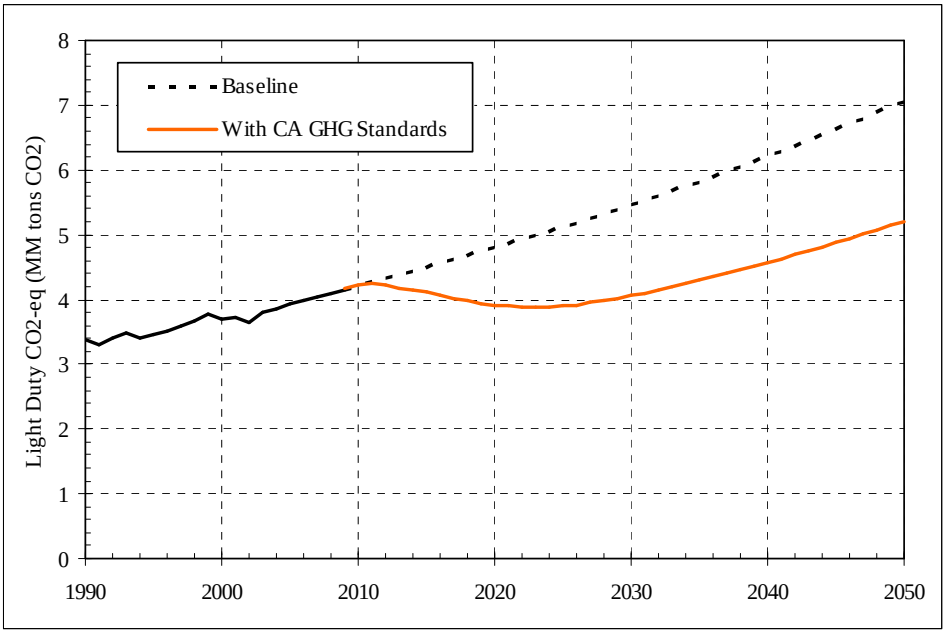


Figure 7: GHG Reductions Achieved in Rhode Island



B. Cost Savings to Consumers in the Northeast

A cost/benefit analysis was conducted by Meszler Engineering Services and the results are presented in Table 3. The analysis estimates the payback period for a low GHG emitting vehicle and the cost savings to consumers - on an annual basis - from purchasing a lower GHG emitting vehicle. ARB estimates that "mid-term" GHG standards (fully phased in, in 2016) will add an additional $1,064 to the cost of a passenger car and $1,069 to the cost of a truck or SUV. The cost for near term technologies (fully phased in, in 2012) was also estimated by ARB. The cost-benefit analysis presented here evaluates the additional cost a consumer will pay each month on his/her car loan due to that incremental cost and weighs that against monthly operating cost savings. The cost benefit is provided as the average annual cost savings during the five year loan period. There are also cost savings after the five year loan period, but these are not presented in the table. Also provided in Table 3 are the number of years consumers will need to own the lower emitting vehicle before the additional incremental cost of purchase is paid back - called "years until payback" in the table. Last a cost per ton of CO_2 reduced is also provided in Table 3.

The following assumptions were made in the analysis:

- MOBILE default VMT used for each vehicle age;
- Gasoline cost of $2.20 per gallon;
- Vehicle incremental costs of $1,064 cars and $1,029 for trucks;
- Sales tax of 8% assumed;
- Car loan interest rate of 5%;
- Discount rate of 10%;
- Assumes a five year car loan.

Table 3: Cost Savings to Consumers From Owning Lower GHG Emitting Vehicles

	Mid-Term (beginning in 2016) PC/LDT1	Mid-Term (beginning in 2016) LDT2
SUMMARY OF RESULTS		
Net Annual Savings (during 5 year loan period)	$155	$176
Years Until Payback	2.5	2.2
Dollars per Ton CO2	-127	-148

III. Method Overview

A three-step method was used to estimate the benefits associated with adoption of the California GHG program. First, the California GHG standards for model years 2009 through 2016 were disaggregated into their CO_2, CH_4, N_2O, and HFC components using information presented in the California Air Resources Board's Initial Statement of Reasons for Proposed Rulemaking for the GHG standards and associated addenda. This provided the expected GHG emission rates for new vehicles in the two vehicle classes: 1) passenger car and light duty trucks 1 & 2; and 2) light duty trucks 2-4 affected by the GHG rule. Second, the baseline CO_2, CH_4, N_2O, and HFC emission inventory in those same vehicle classes were estimated for each NESCAUM state. In the third step, the estimated baseline emission inventories were adjusted to account for the expected influx of lower GHG vehicles (with emission rates as estimated in step one). A relative comparison of the fleet average emission inventories produced in steps two and three yields the expected state-specific benefits of the California GHG program in each calendar year.

Default analysis data are derived from several sources. Vehicle age distributions, mileage accumulation rates, efficiencies, VMT fractions, and populations are from MOBILE6.2. VMT growth rates are based on a regression of historic gasoline sales, corrected for any associated changes in vehicle efficiency. Baseline travel and fuel use data are derived from 1990-2003 gasoline consumption statistics presented in the U.S. Federal Highway Administration's, *Highway Statistics*. GHG emission standards, CH_4, and N_2O emission rates, air conditioning efficiency impacts, air conditioning leakage rates, and compliance costs are from the California Air Resources Board's Initial Statement of Reasons for Proposed Rulemaking for the GHG standards. The GHG standards have been adjusted to include the allowances available to small and intermediate volume manufacturers. State-specific air conditioning usage rates and associated ambient conditions are from NESCCAF, *Reducing Greenhouse Gas Emissions from Light-Duty Motor Vehicles*. VMT elasticity (with respect to the fuel cost of driving) is estimated from statistics developed by David Greene, *Vehicle Use and Fuel Economy: How Big is the 'Rebound' Effect?*, February 1991. In several cases, default data have been replaced by state-specific data.

All impact estimates are expressed in units of million short tons CO_2-equivalent, where CO_2-equivalent is "as CO_2," not carbon. All impact estimates assume adoption of California GHG program beginning in MY09. All emission estimates are for light duty vehicles and light duty trucks only. Emissions associated with heavy duty vehicles, motorcycles, or other source categories are not considered as these vehicles are unaffected by the California GHG program.

IV. Conclusion

The analysis demonstrates that substantial GHG reductions from motor vehicles will be achieved in the Northeast by adoption of the California motor vehicle GHG standards. In addition, the cost benefit analysis shows that these reductions can be achieved at a cost savings to consumers of approximately $155 a year for owners of passenger cars and $176 for owners of light duty trucks with gasoline at an average cost of $2.20 per gallon. Sustained higher gasoline prices will provide an even greater savings to consumers.