

To: Chairman and Members, Environmental Regulation Commission

From: Florida Consumer Action Network and Consumer Federation of America

Date: October 29, 2008

Subject: Rule Adoption – Proposed New adoption of California Motor Vehicle Emission Standards (Rule 62-285.400, F.A.C.)

The Florida Consumer Action Network¹ and the Consumer Federation of America² respectfully submit these comment for the record regarding the proposed new Rule 62-285.400 “Adoption of California Motor Vehicle Emission Standards.” We urge the Environmental Regulation Commission to approve the rule immediately so it can be considered by the legislature in the 2009 session pursuant to HB 7135. We base that recommendation on the extensive analysis of the Clean Cars program described in the attached study prepared by CFA.

The CFA analysis leads us to conclude that the program is in the consumer interest. Compliance with the “Clean Cars Program” will result in reduced use of gasoline and lower consumer gasoline expenditures. Consumers who purchase vehicles that are compliant with the program spend less on gasoline on a monthly basis than the increase in their monthly auto loan payment. The out of pocket savings that will be enjoyed by consumers exceeds the increase in the cost to manufacture compliant vehicles by a wide margin. At the end of a five-year loan, including the enhanced resale value that fuel-efficient vehicles enjoy in the current auto market, consumers will enjoy net benefits of \$1,000 to \$2,000 on vehicles that are compliant with the standard. This direct, consumer pocketbook test alone justifies the program.

However, Florida consumers will also benefit indirectly from the program because reduced gasoline consumption reduces the vulnerability of the economy to price shocks, enhances national security and improves the environment.³ While these benefit are indirect, embedded in the prices consumers pay for goods and services, they are real and they are enjoyed by real people. The value of these externalities has been rising dramatically.

Consumption of gasoline is a major cause of pollution, emissions of global warming greenhouse gases, and a large household expenditure. Policies to require the reduction in emissions of pollutants and greenhouse gases will promote the reduction in the use of gasoline. Thus, an unintended, but inevitable consequence of adopting policies to reduce greenhouse gas emissions will be to reduce household expenditures on gasoline.

Many of the societal costs of burning fossil fuels result in societal expenditures that are paid for in taxes. Many analyses have found that excessive oil dependence increases the military expenditure to protect American interests in oil producing regions. The drag on the economy

¹ FCAN is Florida’s largest consumer group with members from Key West to Tallahassee. FCAN works on issues including energy, insurance, and environment.

² CFA is a national non-profit group that seeks to advance the consumer interest through research, education, and advocacy. Founded in 1968, the federation has more than 300 organizational members.. FCAN is a member of CFA.

³ The concept of external costs and benefits is widely recognized in the social sciences For example, introductory texts, such as John B. Taylor, Economics (Boston: Houghton Mifflin, 1998), second edition, pp. 412-425, include the topic.

created by the drain of local resources out of the national and state economy and the vulnerability to economic disruptions as a result of huge imports of crude oil is felt across many sectors. Many of the health effects of auto emissions are felt locally. The global effects will be felt locally.

The societal benefits from reduced gasoline consumption flow indirectly to consumers. Some of these benefits, like strengthening the state economy by keeping resources within the state, will flow directly to the state. Moreover, while it is hard to tie some of these societal benefits directly to Florida, such as a strengthened national economy or reduced costs of defending our oil supply – they, too, will flow to Florida. Indeed, given that per capita gasoline consumption in Florida is above the national average, these indirect benefits will flow disproportionately to Florida. Moreover, when one considers the primary impacts of climate change, hotter temperatures, more severe weather and rising ocean levels, it is clear that Florida is uniquely vulnerable to the harmful effects of climate change.

The recently released government assessment of the effects of climate change makes it clear that global warming is a nightmare for Florida

Even under the most optimistic CO₂ emissions scenarios, important changes in sea level, regional and super-regional temperatures, and precipitation patterns will have profound effects. Management of water resources will become more challenging. Increased incidence of disturbances such as forest fires, insect outbreaks, severe storms, and drought will command public attention and place increasing demand on management resources.⁴

We believe that prior analyses of the consumer benefits, of the Clean Cars Program, which have generally found the program to be justified, are too low because they have undervalued the direct benefits of the program and have failed to take externalities into the cost benefit calculation. The attached report updates those earlier studies. The analysis was prepared in late 2007 to update the original CARB analysis of the Clean Cars Program. Changes in the auto and energy markets since then reinforce the basic conclusion that adoption of the program is in the consumer and public interest.

With respect to the consumer pocketbook analysis, there are three factors that reinforce the conclusion.

First, the price of gasoline chosen, \$3.00 per gallon is quite reasonable given what the gasoline market has been through in the past year. Projecting a price of \$3 per gallon over the next decade is conservative. Moreover, volatility in gasoline prices imposes a severe burden on households. The best insurance against the pain of volatility is to use less and spend less on gasoline.

Second, the shift in consumer preferences in the marketplace, which had been emerging over recent years became pronounced in the last year, reinforces the beneficial effects of the clean cars program. This shift has increased the value of used vehicles that are more fuel-efficient. The resale value of the vehicle after five years plays a key role in the bottom line of the consumer pocketbook

⁴ Peter Backlund, Anthony Janetos and David Schimel, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States* (U.S. Climate Change Science Program and Subcommittee on Global Change Research), p. vii.

analysis. The CARB assumed that vehicles that were compliant with the standard would be worth \$250 to \$350 more. Today that figure is probably over \$1,000 higher. For conventional fuel vehicles, the increase in resale value exceeds the total cost of the additional technologies that need to be included in the vehicle to comply with the standard. Across the nine generic vehicles studies, a \$1,000 increase in resale value doubles the consumer savings of the basic analysis (life of the role then replacement).

Third, a shift to smaller vehicle with fewer cylinders will make it easier for automakers to comply with the emission standards in the Clean Care program. It will lower the cost of compliance.

The social cost benefit analysis has also likely shifted in favor of adopting the program for two reasons, although these changes are more difficult to quantify. First, concern about the speed and impact of global warming has increase in the past year. Second, the strategic and national security impact of oil dependence has been underscored by events in Eastern Europe. Thus, the externalities adder we chose, \$2 per gallon, is conservative.

In short, we conclude that the California Clean Cars Program should be adopted in Florida because it would result in substantial economic benefits to consumers in Florida in addition to the environmental benefits that it provides.

Sincerely,

Mark Cooper
Director of Research, CFA

Bill Newton
Executive Director, FCAN

A CONSUMER ANALYSIS OF THE ADOPTION OF THE CALIFORNIA CLEAN CARS PROGRAM IN OTHER STATES: FLORIDA

**Submitted to the Environmental Regulation Commission
in consideration of
Adoption of California Motor Vehicle Emission Standards
Rule 62-285.400, F. A.C.**

**Mark Cooper,
Director of Research**

October 2008

INTRODUCTION

The Clean Air Act of 1970s embodies the principle of cooperative federalism in a unique manner. California, which had suffered from particularly severe air pollution problems, was allowed to adopt standards that exceeded the national vehicle emission standards. In 1977, with more cities facing pollution problems, Congress allowed other states to also adopt stricter standards by adopting the California standard. Fifteen states have gone to court in support of the California Program.⁵

One of the key considerations in deciding to adopt the program is the impact it would have on consumers. The Consumer Federation of America⁶ has prepared a consumer analysis of the impact of adopting the California Clean Cars program in other states. This analysis answers the key question: **How will the California Clean Cars program affect the consumer?**

PURPOSE

Prior analyses have shown that the Clean Car Program is in the consumer interest.⁷ We agree with those findings. In fact, we believe that prior studies underestimate the benefit that consumers will get from the program for three reasons:

First, by and large, the studies were done over two years ago. The value of reduced greenhouse gas emissions and the reduction in gasoline consumption that occurs as a result of efforts to lower emissions has increased dramatically since the studies were done.

Second, the studies emphasized direct benefits – the value of reduced gasoline consumption on the price of gasoline. However, there are other indirect benefits that are

⁵ <http://www.calcleancars.org/news.html>

⁶ The Consumer Federation of America (CFA) is a non-profit association of approximately 300 consumer groups in 45 states including Florida. It was established in 1968 to advance the consumer interest through research, advocacy and education.

⁷ California Environmental Protections Agency, Air Resources Board, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles*, August 6, 2004 (hereafter CARB); Spencer Quong, *The UCS Vanguard: A Vehicle to Reduce Global Warming Emissions Using Today's Technologies and Fuels* (Union of Concerned Scientists, March 2007) (hereafter, UCS).

ultimately enjoyed by consumers whose importance has grown as the external costs of gasoline consumption have increased. These costs include increased vulnerability to supply disruptions, national security problems associated with greater reliance on imports from and greater wealth transferred to nations that are hostile to our interests, health care costs associated with pollution, and the impact of global warming.⁸ We believe these should also be considered. Therefore, we applied two tests to the program, a consumer pocketbook test and a societal cost benefit test.

Finally, we also find that the existence of numerous studies, done by different researchers at different times for different purposes, may create a mistaken impression that there is imprecision in the cost benefit analysis. This impression is mistaken because a significant part of the difference in estimates reflects the fact that different analyses modeled different technologies with different assumptions about prices, benefit measures, discount rates, etc. When one standardizes the analysis around a common set of assumptions and parameters and recognizes that different vehicles are being examined, the analyses prove to be more consistent than appears at first glance.

Thus, the purpose of this report is to present the Florida Environmental Regulation Commission (ERC) with an analysis of adopting the Clean Cars program based on an up-to-date, systematic assessment of the direct and indirect benefits for the consumer, measured in terms of the pocketbook impacts and societal costs and benefits.

APPROACH

Economic Fundamentals

At the core of each of the prior analyses is a simple concept that we accept. Technologies are included in vehicles to reduce greenhouse gas emissions. These technologies have a cost, which is estimated by the analyst. The analyst builds a vehicle by estimating the cost of technologies that reduce emissions in compliance with the program. These technologies also have the effect of lowering the operating cost of the vehicle.

For the purpose of this analysis, we examine nine generic “vehicles” that have been recognized as compliant with the Clean Car Standard by the California Air Resources Board (CARB) and the Union of Concerned Scientists (UCS).⁹ CARB estimated the lifecycle cost of over three dozen technologies in five vehicle categories (small car, large car, minivan, small truck and large truck).¹⁰ They then considered “logical combinations of these technologies”¹¹ and found that “nearly all technology combinations modeled provided reductions in lifetime operating costs greater than the retail price of the technology.”¹² They combined these automotive technologies into conventional fuel vehicles that are compliant with the Clean Car

⁸ See Mark Cooper, *50 by 2030* (Washington, D.C.: Consumer Federation of America, May 2006, available at: http://www.consumerfed.org/pdfs/50_by_2030.pdf, and Mark Cooper *No Time to Waste* (Washington, D.C.: Consumer Federation of America, October 2007), available at http://www.consumerfed.org/pdfs/No_Time_To_Waste.pdf, for a discussion of the treatment of externalities.

⁹ CARB

¹⁰ *Id.*, p. 83.

¹¹ *Id.*, p. 101.

¹² *Id.*, p. 102.

program. CARB also considered alternative fuel vehicles and found that “two alternative fueled vehicle technologies are also projected to provided positive life cycle cost benefits when compared to convention vehicles.”¹³

The CARB analysis uses four “vehicles” that reflect these bundles of technologies. There are two conventional vehicles: “passenger cars and light duty trucks with test weights under 3751 lbs. loaded vehicle weight (PC/LDT1)”¹⁴ and light duty trucks with test weights between 3751 lbs. loaded vehicle weight and 8,000 lbs. gross vehicle weight (GVW) (LDT2).¹⁵ There are two alternative fuel vehicles. “These include LPG and HEV with an all-electric range of 20 miles.”¹⁶ The alternative fuel vehicles that were found not to be cost effective at the assumed values for 2003 might be cost effective at today’s higher values, but for this proceeding, we take the cautious path and examine only those that passed the test in the original CARB analysis.

UCS took the CARB analysis one step further in an approach that “combines climate-friendly automotive technologies with the use of biofuels in one vehicle.”¹⁷ The UCS analysis gives us estimates for one vehicle in each of the five vehicle types identified by the CARB. Thus, there are nine generic vehicles – two conventional fuel vehicles, two alternative fuel vehicles, and five that mix alternative fuels and automotive technologies.

As a result of the utilization of technologies to reduce greenhouse gas emissions, vehicles will consume less gasoline, which results in a reduction in the operating cost of the vehicle. This estimate is based on a number of assumptions, such as how many miles per year is the vehicle driven? What is the difference in fuel consumption?

Multiplying the reduction in gasoline use by the price of gasoline, one arrives at the value of the operating cost savings.

A financial analysis is laid over these basic elements. The analyst chooses an economic criterion (e.g. cash flow, payback, and benefit-cost ratio), a period (e.g. life of the loan, full lifecycle of the vehicle) and an interest rate or discount rate to assess the investment.

Societal Cost-Benefit

The societal cost benefit test uses the same economic fundamentals but it values the reduction in fuel consumption higher. It includes the value of external costs that are avoided. The concept of external costs and benefits is widely recognized in the social sciences.¹⁸ These costs and benefit are indirect. However, if we take the concept of externalities seriously, which we should, we must recognize that real people feel the indirect effects, pay the costs and reap the benefits.

¹³ Id., p. 102.

¹⁴ Id., p 104.

¹⁵ Id., p. 104.

¹⁶ Id. p. 102.

¹⁷ UCS, p. 1.

¹⁸ For example, introductory texts, such as John B. Taylor, *Economics* (Boston: Houghton Mifflin, 1998), second edition, pp. 412-425, include the topic.

Consumption of gasoline is a major cause of pollution, emissions of global warming greenhouse gases, and a large household expenditure. Policies to require the reduction in emissions of pollutants and greenhouse gases will promote the reduction in the use of gasoline. Thus, an unintended, but inevitable consequence of adopting policies to reduce greenhouse gas emissions will be to reduce household expenditures on gasoline.

Many of the societal costs of burning fossil fuels result in societal expenditures that are paid for in taxes. Many analysts believe that excessive oil dependence increases the military expenditure to protect American interests in oil producing regions. The drag on the economy created by the drain of local resources out of the state and national economy and the vulnerability to economic disruptions as a result of huge imports of crude oil is felt across many sectors. Many of the health effects of auto emissions are felt locally. The global effects will be felt locally.

Thus, we believe it is a mistake not to quantify and personalize these external costs and benefits. The key is to use a method that reasonably reflects these external values in a way that suggests the impact consumers will feel. Our approach is to increase the estimated value of gasoline used in the analysis.

Conducting two separate analyses can result in a quandary, when the results point in opposite directions. If the results of the consumer pocketbook analysis is negative, but the results of the societal cost benefit test is positive, the relative size of the effects and the difference between direct and indirect effect can make for a complex decision and a tough call. Fortunately, that is not the case with the policy decision before the Commission. We find that the adoption of policies to reduce greenhouse gas emissions will have a positive net benefit under both the consumer pocketbook test and the societal cost-benefit test.

This approach was applied to the nine vehicles that comply with the Clean Cars program that were analyzed by the California Air Resources Board and the Union of Concerned Scientists. The approach is to use the operating cost savings to also value the societal benefits by placing an adder on the price of gasoline. This approach keeps the analysis simple, but it underestimates the societal benefits slightly because there are reductions in greenhouse gases that are achieved with measures that do not affect operating costs.¹⁹

The details of the analyses are described in the Appendix to these comments. Exhibit A-1 in the Appendix describes fundamental parameters of the analysis. Exhibit A-2 in the Appendix presents details on the estimation of the consumer pocketbook and societal cost benefit analyses.

RESULTS

Consumer Pocketbook

In the original analyses, gasoline prices were set in the range of \$1.74-\$2.55 per gallon, but six of the eight vehicles had positive cash flow for the consumer. That is, the monthly

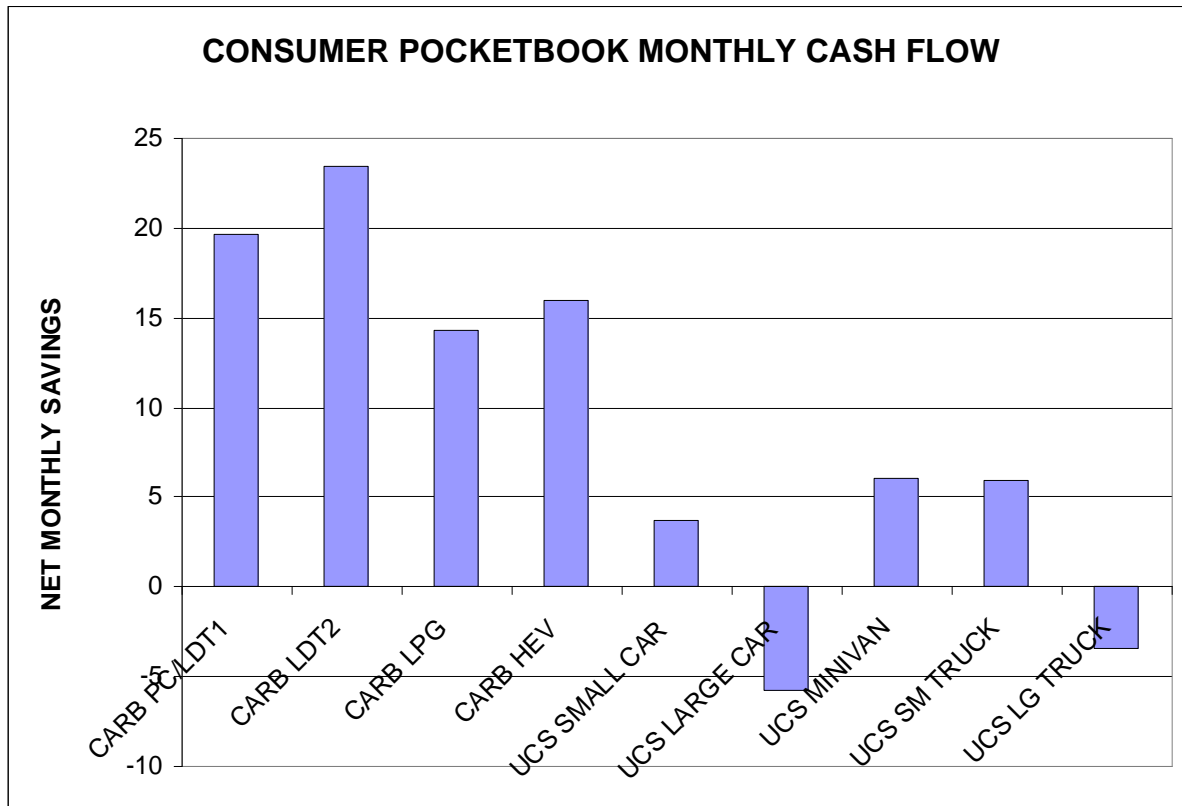
¹⁹ CARB, p. 80, shows that refrigerant leakage reduction equals 1.45 percent of the total.

savings in operating costs exceed the increase in the loan payment for the lower emission vehicle. When gasoline prices of \$3 per gallon are used, all of the vehicles resulted in positive cash flow.

In this analysis, the consumer pocketbook analysis is conducted by taking the increased cost of the vehicle that results from the inclusion of greenhouse gas reducing technologies and adding it to the amount of the auto loan. The loan payment is calculated assuming a five year loan, which is the typical loan period today with a 7 percent auto loan rate.

We find that the savings in operating costs is larger than the increase in the monthly auto loan payment for all of the CARB vehicles and three of the five UCS vehicles (see Exhibit 1). The ethanol component of the UCS vehicles cuts into the operating cost savings because UCS assumed a substantial lower mileage and a narrow price difference. The compliant, conventional fuel vehicles modeled by CARB have positive monthly cash flow of about \$20 per month, which is particularly important, as these are likely to be the primary approach to compliance. Moreover, it is important to note that the one category of vehicles not modeled by CARB, minivans, has a positive cash flow in the UCS analysis.

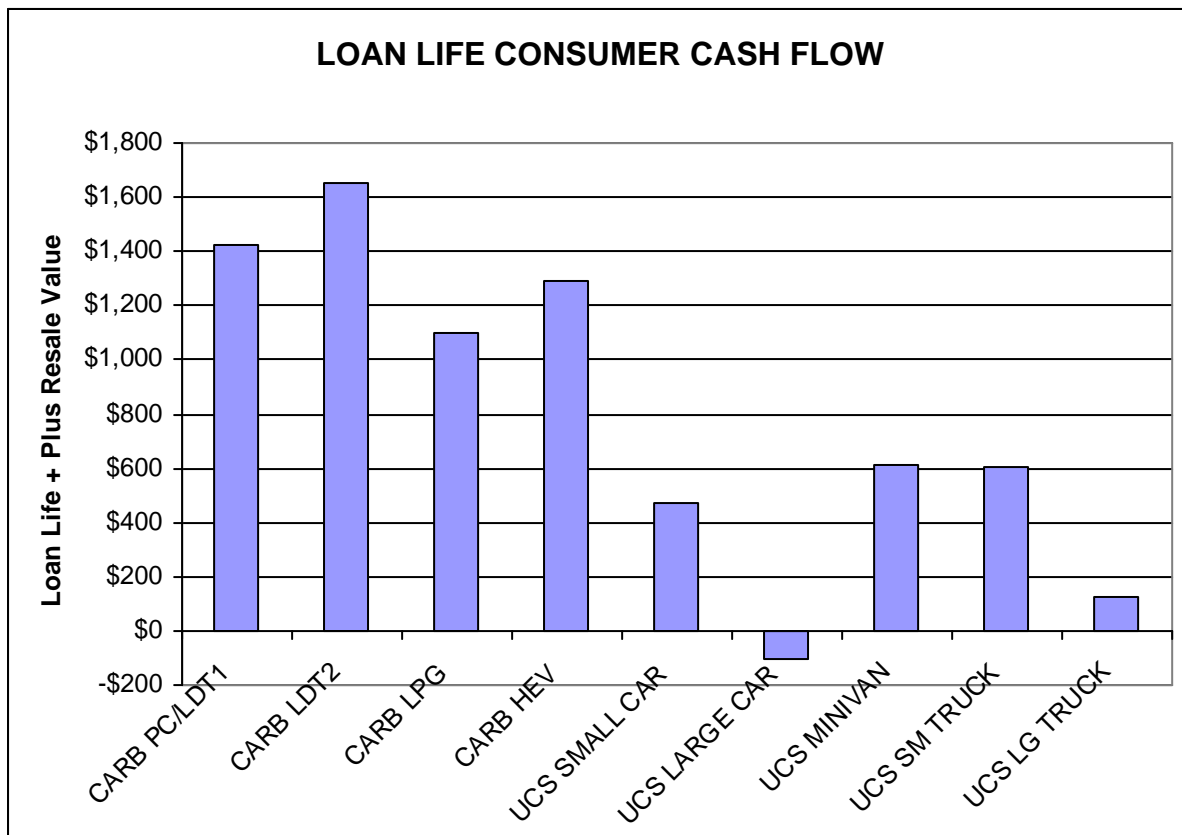
Exhibit 1:



Source: See Appendix A

The consumer monthly cash flow is the primary consumer pocketbook test we use, but the savings can be aggregated. Savings over the life of the loan would be between \$500 and \$1,000. CARB notes that the resale values of the compliant conventional fuel vehicles are likely to be higher by \$250 to \$350. As shown in Exhibit 2, at the end of the loan, which is a key moment from the consumer point of view, the net benefit for the CARB vehicles is over \$1,000. For the UCS vehicles they are smaller, with four of the five positive. The longer the consumer owns the vehicle, the greater the savings. In fact, savings over the entire life of the vehicle (lifecycle savings) would be two to three times as large, depending on how long one assumes the vehicles will stay in use. An indication of this can be found in the net lifecycle cost savings with fuel costs only, which is part of the societal analysis.

Exhibit 2:

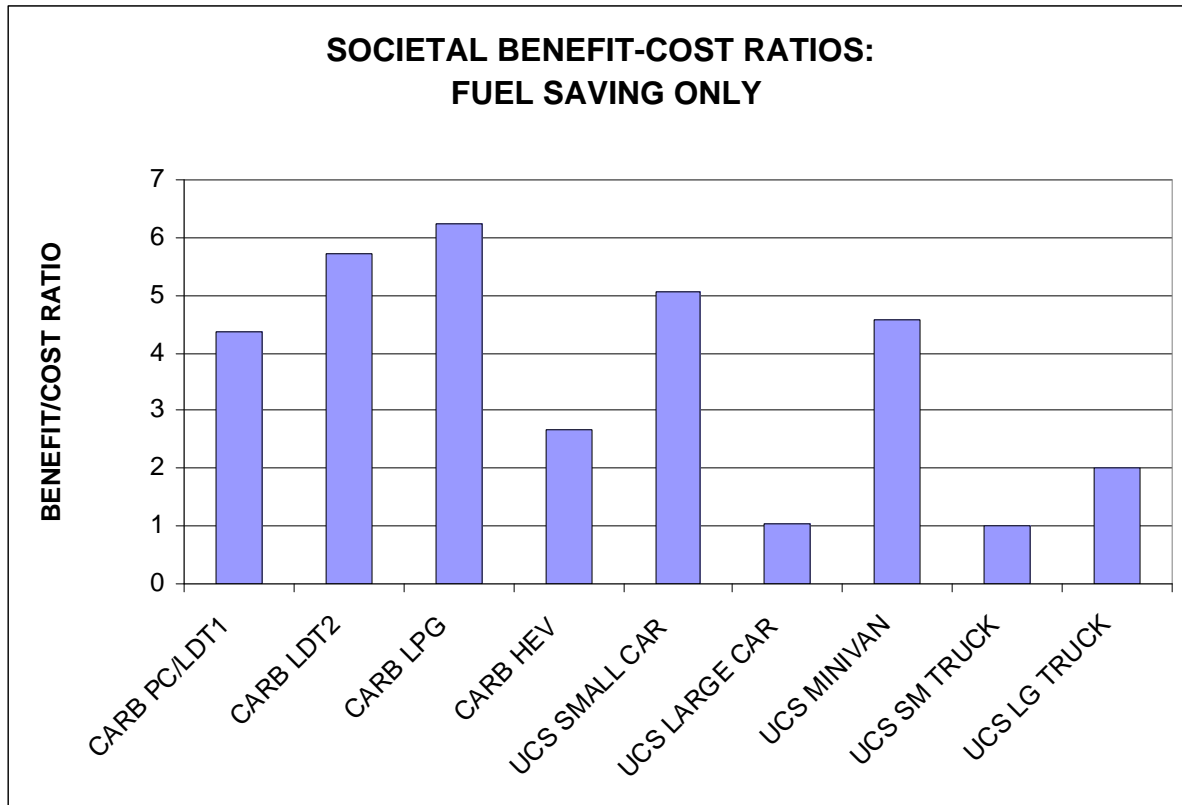


Societal Cost-Benefit

In the original analysis, seven of the eight vehicles had societal benefit cost ratios greater than one, i.e. benefits exceeded costs. In the updated analysis, all of the vehicles have societal

cost benefit ratios well above one, even when only fuel savings are included (see Exhibit 3). Since the earlier studies did not include external benefits, this analysis with fuel savings only is a simple update of the earlier analysis. This is the equivalent of the societal analysis in the earlier studies.

Exhibit 3:



Source: See Appendix A

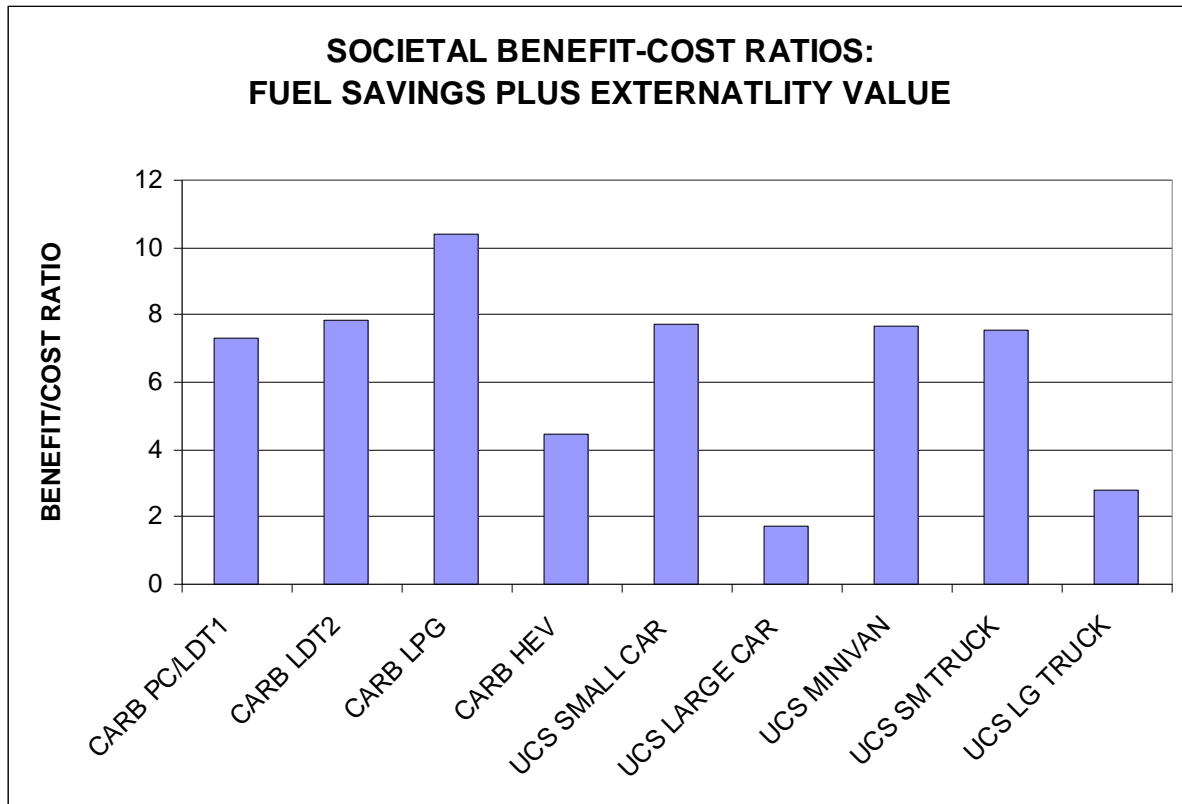
When the value of externalities is included, the societal benefit cost ratios become quite large. The CARB vehicles are in the range of 4 to 10. The UCS vehicles are in the range of 2 to 7 (see Exhibit 4). That is, a dollar of spending on reduces emissions yields 4 to 10 dollars of discounted value over the life of the vehicle.

We arrive at this conclusion in the following manner. The monthly operating cost savings is added up over the life of the vehicle and discounted at 7 percent. The discount rate represents the normal return that is available on investment in society.²⁰ The discounted life cycle savings resulting from reduced emission and energy use are then compared to the cost.

²⁰ This is the reason that we set the discount rate equal to the auto loan rate. It could be argued that a lower discount rate should be applied because average citizens tend to ear less than the auto loan rate on secure investments.

Our finding that the benefits far exceed the costs means that the benefits are in excess of the return that is normally available. Benefits that exceed costs by four to ten times are very attractive. Even this large net benefit is conservative because we assume that the costs are at present value and real. That is, we do not discount the costs, no matter how far in the future they occur, but it is entirely possible that the additional cost of the technologies used will decline over time as higher volumes are sold and the manufacturers gain familiarity with the technologies.

Exhibit 4:



Source: See Appendix A

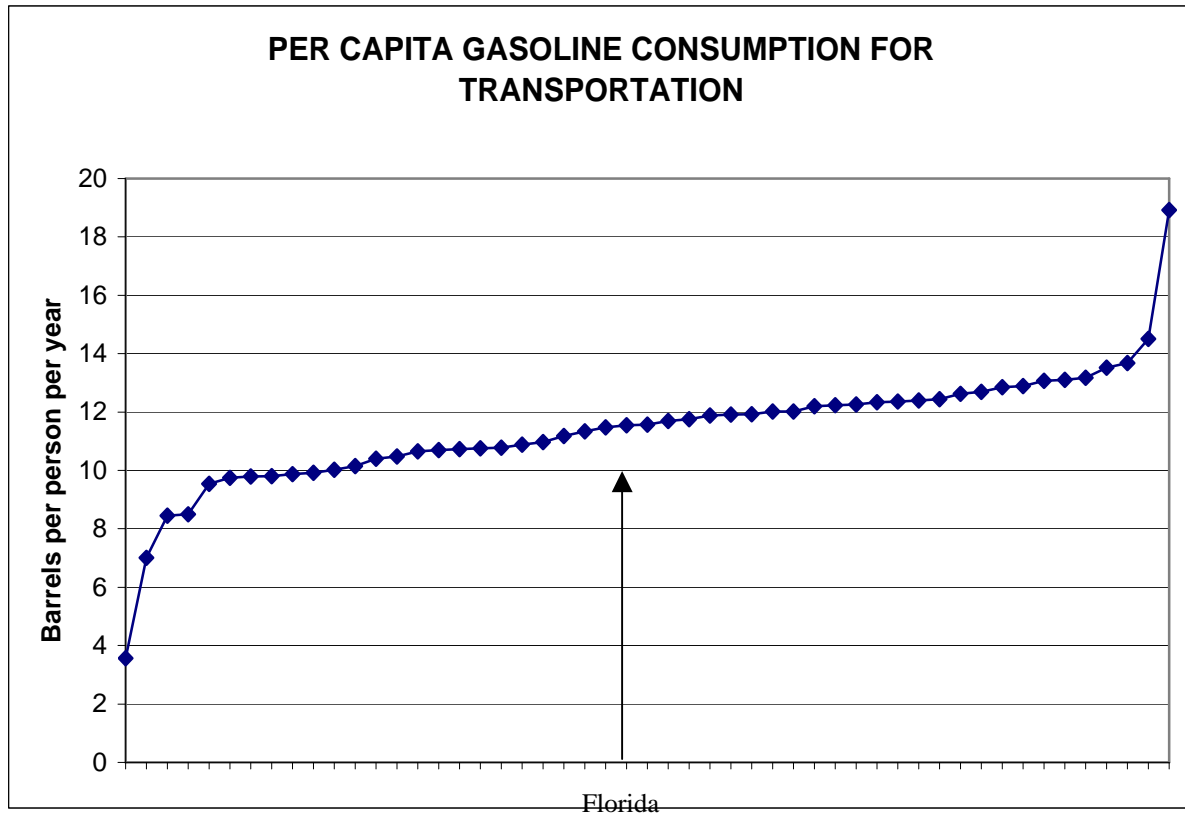
CONCLUSION

This analysis shows beyond a shadow of a doubt that adopting the clean cars program to reduce emissions of greenhouse gases from vehicles is in the consumer interest. Cash flow for all of the vehicles that would be in compliance is positive from the first month. Societal benefits exceed costs by a wide margin.

The consumer pocketbook test is a direct benefit to consumers in Florida. The societal benefits flowing from reduced gasoline consumption flow indirectly to consumers. Some of these benefits, like strengthening the state economy by keeping resources within the state, will

flow directly to the state. Moreover, while it is hard to tie other benefits like a strengthened national economy or reduced cost of defending the nation's oil supply directly to Florida, there is no doubt that some will flow to Florida. Indeed, as shown in Exhibit 4, given that per capita gasoline consumption in Florida is above the national average, these indirect benefits will flow disproportionately to Florida.

Exhibit 4:



Source: Energy Information Administration, *State Energy Data* available at http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_mg.html; Bureau of the Census, *Statistical Abstract of the United States*

In short, we conclude that the California Clean Cars Program should be adopted in Florida because it would result in substantial economic benefits to consumers in Florida in addition to the environmental benefits that it provides.

APPENDIX A

This Appendix describes in more detail the economic analysis presented above. Exhibit A-1 lists the elements of the analysis as briefly described in the text. The four estimates from the California Air Resources Board (CARB) are the bundles of technologies that the CARB found in compliance with the Program. The first two vehicles are based on conventional technology. The second two involve alternative fuels. The five vehicles modeled by UCS involve combinations of hybrid and conventional technologies. Thus the nine vehicles cover a wide range of technologies and costs.

All of the analyses are based on the assumption of 15,000 miles driven per year and assume a current mileage of 24.8 miles per gallon. The implicit monthly consumption of gasoline is 50.4 gallons of gasoline. The fuel savings equivalent varies across the technologies from 3.5 gallons to over 60 gallons.

The economic assumptions also varied across the studies. CARB presented a consumer pocketbook analysis for the two conventional fuel vehicle bundles. That is, it calculated the cash flow assuming an auto loan of five-year duration at an interest rate of 5 percent. They also identified the additional resale value that the vehicles would have if they were sold in the fifth year. The analysis focused on the cash flow impact felt by the consumer. This is the approach taken in our pocketbook analysis.

The remaining six vehicles were evaluated with more of a societal approach. They applied a discount rate to the flow of benefits to calculate a payback period, a lifecycle cost saving and a benefit cost ratio. They also include a rebound effect, which is a societal element.

The rebound effect occurs when the consumer finds more money in his or her pocket and chooses to spend some of that money on more driving, therefore consuming more gasoline. As a result, there is less reduction in greenhouse gases than a simple analysis suggested. This is a societal effect and not a consumer pocketbook effect for the following reason. When consumers find themselves with more money in their pockets at the end of the month, they are better off by exactly the amount of additional money. If they choose to spend it on gasoline, that does not diminish the welfare gain at the consumer level. It does diminish the societal gain in terms of reduced oil imports or reduced greenhouse gas emissions.

It should be noted that the CARB conducted a societal analysis on the individual technologies used to build the compliant conventional fuel vehicles, but then did a consumer pocketbook analysis on the bundle of technologies they chose to use to build a compliant vehicle. That is, they did a “net present value analysis of engine and drive train technologies” (p. 100) for conventional fuel vehicles.

Our strategy is twofold.

First we extract the basic assumptions from the published analyses and complete the full set of “pay-off” analyses, as indicated by the arrows in Exhibit A-1.

Second, we recalibrate the analyses to more contemporary values. We increase the price of gasoline to \$3 per gallon. We increase the cost of a five-year auto loan to 7 percent, which is available today. To reflect that increase, we increase the discount rate to 7 percent, so the consumer pocketbook and societal cost benefit analysis are using the same interest rate.

We also consider an externality value of \$2 per gallon. In the current environment, this is a cautious figure. Economically, the U.S. is exposed on a daily basis to oil price shocks and supply disruptions.²¹ Retired Air Force General Charles Wald estimates that if the true cost of military security were incorporated into the price of gasoline, we would be paying between \$6.50 and \$7 a gallon. The IPCC put the global warming cost of carbon dioxide emissions at the equivalent of \$1 per gallon. Our review of the literature shows that these social costs have a value of between \$1 and \$2 per gallon.²² Given recent developments, we believe the higher figure is more appropriate.

To calculate the externalities, we use the implicit gasoline savings from the consumer pocketbook analysis as the base. This is conservative for both the compliant conventional fuel vehicles and the alternative fuel vehicles. In both cases, there are emissions reductions not associated with gasoline consumption, which are not accounted for in this approach. Thus, there are environmental benefits the analysis does not credit to the vehicle. For the alternatives there are also likely to be additional oil savings to the extent that the alternative fuels consumed do not require the use of oil to produce. This will vary, depending on the alternative fuel used.

This analysis is conservative because of the economic assumptions. We assume a constant real cost of gasoline and a constant real cost of technology. Over the course of the program gasoline prices are likely to rise in real terms and technology costs are likely to decline as more units with the technology are sold.

Exhibit A-2 shows the results of the analysis. We show the multiple economic criteria for the societal cost benefit test as well as the societal analysis both with and without the externality value.

²¹ David L. Greene and Sanjana Ahmad, *Cost of U.S. Oil Dependence: 2005 Update, 2005* (2005).

²² See 50 by 2030, citing International Center for Technology Assessment, *The Real Price of Gasoline, 1997*, Gasoline Cost Externalities Associated with Global Climate Change, September 29, 2004; Gasoline Cost Externalities: Security and Protection Services, January 25, 2005; Lovins, Amory, et al., *Winning the Oil Endgame* (Rocky Mountain Institute, 2004); Greene, David L., and Sanjana Ahmad, *Costs of U.S. Oil Dependence: 2005 Update* (Oak Ridge National Laboratory: Tennessee, February 2005).

Exhibit A-1:

ELEMENTS OF VARIOUS COST BENEFIT CALCULATIONS											
BASIC FEATURES											
Author		CARB	CARB	CARB	CARB		UCS	UCS	UCS	UCS	UCS
Date		2004	2004	2004	2004		2007	2007	2007	2007	2007
BASIC ASSUMPTIONS											
Technology		PC/LDT1	LDT2	LPG	HEV		SMALL CAR	RGE CAR	MINVAN	M. TRUCK	LG TRUCK
All analyses include least cost conventional plus E85											
Cost		1064	1029	370	4500		180	543	299	298	670
Annual Miles		15000	15000	15000	15000		15000	15000	15000	15000	15000
Mileage Base		24.8	24.8	24.8	24.8		NA	NA	NA	NA	NA
Consumption Base		50.4	50.4	50.4	50.4		NA	NA	NA	NA	NA
Fuel Savings equivalent (Gasoline, gal.)		13.57	14.17	6.73	35.03		2.43	1.66	4	3.95	3.29
Gasoline Price		1.74	1.74	1.74	1.74		2.55	2.55	2.55	2.55	0.255
ORIGINAL CASE											
POCKETBOOK ANALYSIS											
Payment Method		Loan	Loan	Loan	Loan		→				
Interest Rate		5%	5%	5%	5%						
Loan Period		5 year	5 year	5 year	5 year						
Resale Value		245	329	na	na						
Economic criteria		Cash Flow	Cash Flow	Cash Flow	Cash Flow						
SOCIAL ANALYSIS											
Discount rate				5	5		5	5	5	5	5
Economic criteria				Payback	Payback		Payback	Payback	Payback	Payback	Payback
Rebound Effect				3.08%	3.08%		3.08%	3.08%	3.08%	3.08%	3.08%
MODIFICATIONS TO RECALIBRATE TO 2007											
POCKETBOOK ANALYSIS											
Gasoline Price		\$3	\$3	\$3	\$3		\$3	\$3	\$3	\$3	\$3
Auto Loan Rate		7%	7%	7%	7%		7%	7%	7%	7%	7%
SOCIAL ANALYSIS											
Gasoline Price		\$3	\$3	\$3	\$3		\$3	\$3	\$3	\$3	\$3
Externality Value		\$2	\$2	\$2	\$2		\$2	\$2	\$2	\$2	\$2
Discount Rate		7%	7%	7%	7%		7%	7%	7%	7%	7%

Exhibit A-2

COST BENEFIT CALCULATIONS FOR VARIOUS VEHICLE/TECHNOLOGY BUNDLES											
Author		CARB	CARB	CARB	CARB	UCS	UCS	UCS	UCS	UCS	
Date		2004	2004	2004	2004	2007	2007	2007	2007	2007	
ORIGINAL CASE											
<u>Pocketbook Analysis</u>											
Monthly Cost		\$20.08	\$19.42	\$7.00	\$84.93	\$3.40	\$10.25	\$5.64	\$5.62	\$12.64	
Monthly Savings		\$23.61	\$24.66	\$11.71	\$60.95	\$6.20	\$4.23	\$10.20	\$10.07	\$8.39	
Net Monthly Savings		\$3.53	\$5.24	\$4.71	-\$23.98	\$2.80	-\$6.02	\$4.56	\$4.45	-\$4.25	
Life of the Loan + Resale		\$457	\$559	\$528	-\$1,110	\$413	-\$116	\$519	\$512	\$74	
<u>Societal Analysis</u>											
Payback		5	3.8	3	8	1.6	5.2	1.6	1.6	3.7	
Net Life Cycle Savings (16 yr)		\$2,676	\$3,486	\$1,161	\$3,824	\$629	\$9	\$1,034	\$1,019	\$426	
RECALIBRATE TO 2007											
<u>Pocketbook Analysis</u>											
Monthly Cost		\$21.07	\$19.01	\$5.94	\$89.11	\$3.56	\$10.75	\$5.92	\$5.90	\$13.27	
Monthly Savings		\$40.71	\$42.51	\$20.19	\$105.09	\$7.29	\$4.98	\$12.00	\$11.85	\$9.87	
Net Monthly Savings		\$19.64	\$23.50	\$14.25	\$15.98	\$3.73	-\$5.77	\$6.08	\$5.95	-\$3.40	
Life of the Loan + Resale		\$1,423	\$1,655	\$1,100	\$1,288	\$469	-\$101	\$610	\$602	\$125	
<u>Societal Analysis</u>											
<u>Fuel Savings Only</u>											
Payback		2.3	2.2	1.5	4.2	2.2	14.3	2.2	1.3	7.4	
Net Life Cycle Savings (16 yr)		\$3,583	\$4,851	\$1,935	\$7,495	\$729	\$25	\$1,071	\$1,054	\$454	
Total Benefit/Cost Ratio		4.37	5.71	6.23	2.67	5.05	1.05	4.58	4.54	1.68	
<u>Fuel Savings + Externality Value</u>											
Payback		1.4	1.3	1	2.3	0.8	2.5	0.8	0.8	1.8	
Net Life Cycle Savings (16 yr)		\$6,681	\$7,058	\$3,470	\$15,492	\$1,207	\$404	\$1,984	\$1,956	\$1,208	
Total Benefit/Cost Ratio		7.28	7.86	10.38	4.44	7.71	1.74	7.64	7.56	2.80	