California Electric Transportation Coalition

January 23, 2009

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To: Transportation Committee, California Energy Commission
The Honorable James D. Boyd, Vice-Chair and Presiding Member
The Honorable Karen Douglas, Associate Member

From: California Electric Transportation Coalition
David L. Modisette, Executive Director

Re: Comments on Draft Staff Paper, "Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program" (AB 118), December, 2008, CEC-600-2008-007-D. Docket 08-ALT-1.

David L. Modisette
Executive Director

Julee Malinowski-Ball
Legislative Director

1015 K Street Suite 200
Sacramento CA 95814

916-551-1943
FAX-441-3549
dave@ppallc.com
caletc@ppallc.com

The California Electric Transportation Coalition (CalETC) appreciates the opportunity to provide the following Comments on Draft Staff Paper, "Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program" (AB 118), December, 2008.

Mr. Modisette also made a brief presentation to the Transportation Committee and the AB 118 Advisory Committee on January 8, 2009. A copy of the slides that Mr. Modisette used for that presentation are attached in Appendix A, "Background Slides for Presentation to the AB 118 Advisory Committee, January 8, 2009". Some of these slides are referenced in the comments below.

1. What goal should drive the Investment Plan funding allocation?

CalETC agrees with the comments expressed at the January 8, 2009 AB 118 Advisory Committee by Tom Cackette of the ARB, and several other Advisory Committee members, that the goal should be the 2050 GHG reduction goal (80% reduction). In the December, 2008 Draft Investment Plan, CEC staff proposed using the 2020 GHG reduction goal.[1]

Using the 2050 goal instead of the 2020 goal indicates a much different funding allocation is needed than that proposed in the December Draft Investment Plan. Slide 6 in the attached Appendix A, "Background Slides", shows the percentage GHG emissions reductions summed from 2009 through 2020, 2030, 2040, and 2050 for light-duty vehicles.[2] Note that of the total emissions reductions ending in 2050, 56% of those reductions come from Super Ultra Low Carbon Fuels, which are electric-drive vehicles including plug-in hybrid vehicles, battery electric vehicles, and hydrogen fuel cell vehicles.

[1] See Table 1 on page 6 of the Draft Investment Plan, and Tables 2 and 3 on page 10.
[2] These percentages were calculated by CEC staff based upon the "2050 Vision" analysis from the AB 1007 California Alternative Fuels Plan, which was jointly adopted by the CEC and ARB in December, 2007.

It is also instructive to note that these percentage GHG reductions by fuel category from the 2009-2050 time period ("2050 Vision") are very close to the results of the analysis that TIAX,LLC conducted and presented to the CEC's Transportation Committee and the AB 118 Advisory Committee in July of 2008, in the form of recommended program funding allocations. Table 1 below compares these results.[3]

Table 1

Category	CEC/ARB "2050 Vision" GHG Reductions Light-Duty 2009-2050	TIAX Allocation of AB 118 Funds "Constrained Analysis" July, 2008
Super Ultra Low Carbon Fuels	56%	54%
Ultra Low Carbon Fuels	21%	16%
Low Carbon Fuels	2%	5%
Fuel Economy Improvements	22%	25%
Total	100%	100%

CalETC recommends that the GHG reduction goal, for purposes of determining the AB 118 program funding allocation be the 2050 goal (80% reduction). And that the percentage of funding allocation by category be based upon GHG reductions from the adopted CEC/ARB "2050 Vision" analysis over the 2009-2050 timeframe.

2. CEC should factor into its analysis, and proposed funding allocations, the real-world constraints of fuel supply, fuel feedstock, vehicle market penetration, and other constraints. On page 7 of the Draft Investment Plan, CEC staff indicates that "The initial GHG emission reduction scenario was "unconstrained" in that projections had no limitations for cost, fuel supply, or biomass feedstock availability placed upon them, …". It makes no sense to do projections that ignore realistic constraints that either exist, or are expected to exist in the future. And we know that there are significant constraints for some fuels and technologies in the areas of feedstock supply, fuel supply, and other circumstances.

These real-world constraints can significantly affect the outcome of the analysis and recommendations, as can be seen in the analysis done by TIAX, the results of which are shown in slide 7 from Appendix A. This slide shows the percentage allocation based upon an

[3] See Slide 7 in Appendix A. The terminology used by TIAX to describe the fuel/technology categories in July, 2008 is different than that adopted by CEC staff in the December Draft Investment Plan. The TIAX category of "Advanced Vehicle Technologies" is the same as what the CEC staff calls "Super Ultra Low Carbon Fuels"; and TIAX's "Blended Biofuels" is very similar to the "Ultra Low Carbon Fuels" category; and TIAX's "Nonrenewable alternative Fuels" is the same as "Low Carbon Fuels"; and finally TIAX's "Improved Vehicle Efficiency" is the same as "Fuel Economy Improvements".

"unconstrained" scenario, and then the allocation after real-world constraints are factored in (i.e., "constrained" scenario).

CalETC recommends that the CEC factor these real-world constraints into its analysis and proposed funding allocations.

3. The CEC should increase the funding allocation to the Super Ultra Low Carbon fuel/technology category.

The percentage allocations from the CEC/ARB "2050 Vision" (2009-2050 timeframe) described in #1 above, and from the TIAX analysis of July, 2008, are strikingly different than the CEC staff proposed AB 118 program funding allocations in the Draft Investment Plan. Table 2 below compares these percentages.

Table 2

Category	CEC/ARB "2050 Vision" GHG Reductions Light-Duty 2009-2050	CEC Staff Proposed Funding Recommendations (Two Year)
Super Ultra Low Carbon Fuels	56%	23%
Ultra Low Carbon Fuels	21%	13%
Low Carbon Fuels	2%	35%
Fuel Economy Improvements	22%	13%
Non-GHG Categories	na	11%
Production Incentives	na	6%
Total	100%	100%

Note that the majority (56%) of the GHG reductions in the CEC/ARB adopted "2050 Vision" during the 2009-2050 time period, come from the Super Ultra Low Carbon Fuel category. But CEC staff is proposing to allocate less than one fourth (23%) of the program funding to this category. Other categories that have a very small impact in terms of total GHG reduction, are proposed to receive much larger funding allocations.

Based upon the clear need for large GHG reductions to come from the Super Ultra Low Carbon Fuel category, CalETC recommends that the funding allocation to this category be significantly increased. As Tom Cackette said in his January 8th presentation, "Allocations should favor fuels/technologies with the greatest need and large market potential." Any increase in funding should not go only to support the "Hydrogen Highway" fueling stations, but also to support less costly and more near term technologies such as plug-in hybrids (both light-duty and medium/heavy duty), truck stop electrification, alternative marine power (aka cold ironing), electric truck

refrigeration units, electric industrial vehicles such as lift trucks, airport ground support equipment, tow tractors, etc. CalETC has developed a detailed list of AB 118 Funding Recommendations for Electric Transportation which is attached in Appendix B.

4. CalETC disagrees with the statement in the "Gap Analysis" (page 11) that, "Public and private R&D for … battery electric vehicles (including battery development) also seem to be adequately funded, and funding from the Program for these areas is unneeded and unlikely."

The societal benefits of plug-in vehicles, including plug-in hybrids and battery electric vehicles, are well known and well documented. California needs large numbers of these vehicles in the future in order to meet its 2050 GHG reduction goals, as shown in the adopted CEC/ARB "2050 Vision" and as described in #1 above. These vehicles are known to be technologically feasible and perform well, as demonstrated by several vehicles models in the 1990's. The question is whether these vehicles will be ***economically*** competitive with internal combustion engine vehicles in the future.

The major item of additional cost for these on-road plug-in vehicles is the advanced batteries that they contain. And the cost of these advanced batteries (together with issues of life and durability, which is part of the cost equation) appears to be the major stumbling block at this time to widespread market penetration in the future.

With these issues in mind, CalETC believes that it is critically important that California State government (CEC and ARB) have an on-going and up-to-date, in-depth knowledge and understanding of the status of advanced battery technology development and cost developments. In order to acquire this level and detail of in-depth knowledge and understanding, California should become a co-participant (perhaps in partnership with national laboratories, and federal agencies) in efforts to reduce cost, and improve the life, durability, and reliability of advanced batteries for PHEV/EV applications. Investment at this level of participation is not high-cost; and in this way the State of California can understand in detail where investments are being made, and where they are not. This will allow the State of California to decide whether further investments are necessary or beneficial to our GHG reduction goals.

Funding for this type of information and expertise would not necessarily have to come from AB 118 funds. There may be other funding sources, such as PIER funding, for this information.

CalETC recommends that the CEC the quoted sentence above, and instead indicate that the CEC understands the need to have up-to-date, detailed information in this rapidly changing technology, and wants to explore ways to acquire this information and knowledge.

5. The CEC should consider the detailed funding recommendations for electric transportation technologies and fuels made by CalETC in its August 29, 2008 document, entitled, "Electric Trasportation and Goods Movement Funding Recommendations for AB 118 Funding".

This document is attached in Appendix B. CalETC would be happy to do additional work for the CEC on these items, including projections of cost and market penetration for the different technologies, if this would be helpful to the CEC and the Investment Plan.

We have also discussed with CEC staff several concepts for co-funding of certain activities using funds from both AB 118 and utility funding in combination. We would be interested in forming such partnerships with the CEC and are willing to pursue these opportunities if the CEC is interested.

6. The carbon content of electricity in the analysis and in Table B-1 should be revised to reflect the inherent energy efficiency of electric drive vehicles. It is well known that electric drive vehicles are four to five times more energy efficient than internal combustion engine vehicles. This has been reflected in all past evaluations of electricity as a transportation fuel, including the Full Fuel Cycle Analysis performed as part of the AB 1007 California Alternative Fuels Plan. Usually this increased efficiency is expressed in an "Energy Economy Ratio" (EER) with a value usually between 4.0 and 5.0. So in this case the carbon content numbers for electricity would be divided by the EER.

7. **The analysis in to estimate future GHG emissions for electricity, as described in Appendix A, should use "marginal" sources of electric generation in the future rather than the statewide "average" generation mix.** The description of the analysis for electricity on pages A-5 and A-6 indicates that staff used a forecasted "average" generation mix. However, all previous analyses by both the CEC and ARB, including the Full Fuel Cycle Analysis performed as part of the AB 1007 California Alternative Fuels Plan, have been based upon future "marginal" generation sources and their emissions, for future EVs and PHEVs. This is because there is basically no electric generation today going to EVs and PHEVs; all of the electric generation today is going for other purposes. So any new electric transportation load in the future will be met by "marginal" sources of generation. These marginal sources of generation are usually assumed to be (or assumed to have emissions that are the same as) a natural gas fired combined cycle powerplant, plus some percentage of renewables as required by the Renewable Portfolio Standard.

CalETC appreciates this opportunity to provide these comments. If you have any questions about these comments please do not hesitate to contact me.

Background Slides for Presentation to the AB 118 Advisory Committee

January 8, 2009

David Modisette

California Electric Transportation Coalition

Table 1. Light Duty GHG Emissions Reductions (2009 to 2020)

Category	GHG Emission Reduction ($MMTCO_2e$)[4]	Percent GHG Emission Reduction
Super Ultra Low Carbon Fuels	11	33%
Ultra Low Carbon Fuels	9	27%
Low Carbon Fuels	3	10%
Fuel Economy Improvements	10	30%
Total	33	100%

Source: California Energy Commission

Table 3. Summary of GHG Emissions Reductions (2009 to 2020)

Category	GHG Emission Reduction ($MMTCO_2e$)	Percent GHG Emission Reduction
Super Ultra Low Carbon	12	**16%**
Ultra Low Carbon	9	**12%**
Low Carbon	25	**33%**
Fuel Economy Improvements	29	**39%**
Total	75	**100%**

Source: California Energy Commission

Draft Investment Plan Proposed Funding Recommendations		
Category	Percent GHG Emission Reduction (2009 to 2020)	Proposed Funding Recommendations (Two Year)
Super Ultra Low Carbon	16%	23%
Ultra Low Carbon	12%	13%
Low Carbon	33%	35%
Fuel Economy Improvements	39%	13%
Non-GHG Categories	na	11%
Production Incentives	na	6%
Total	100%	100%

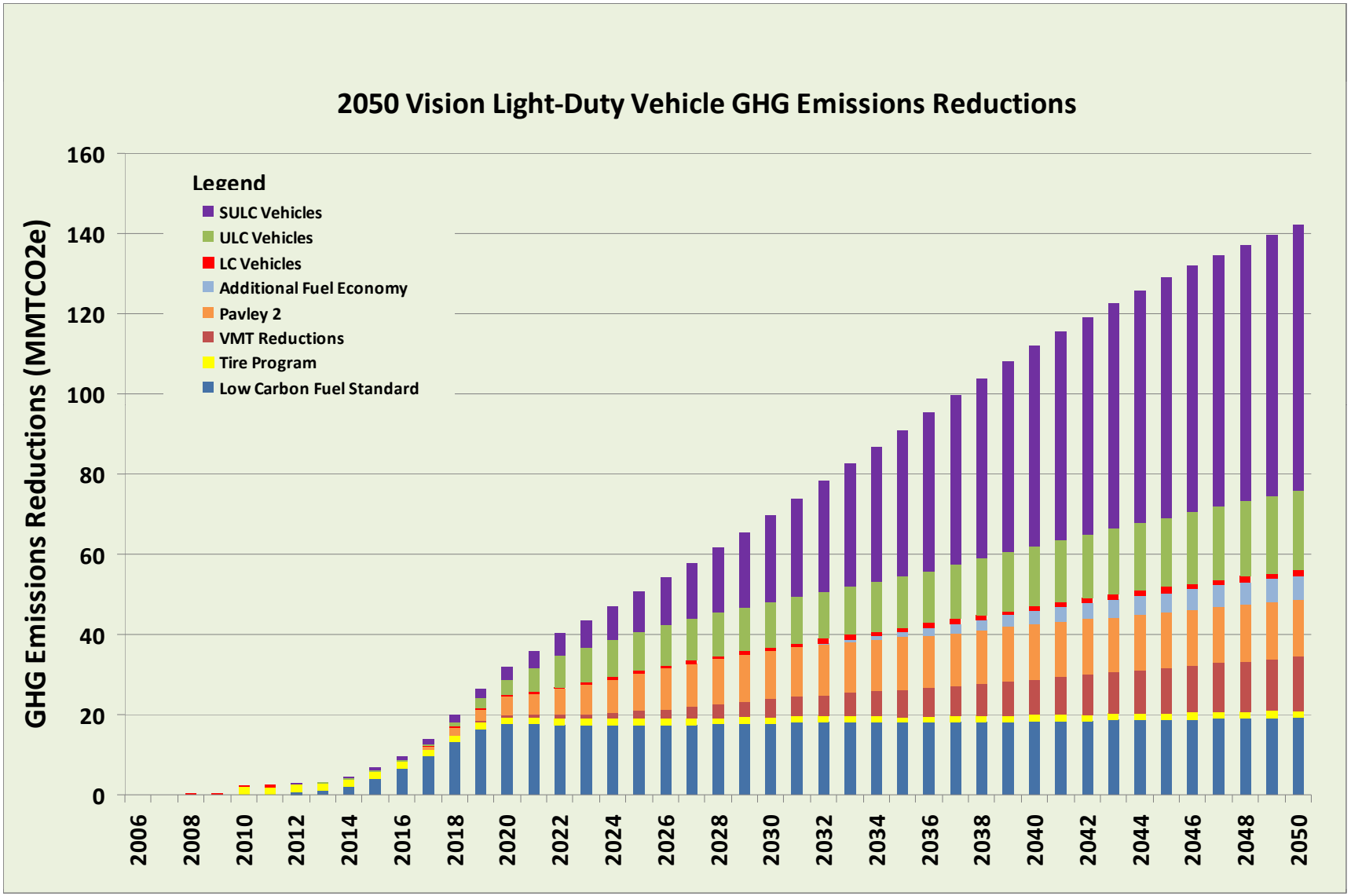
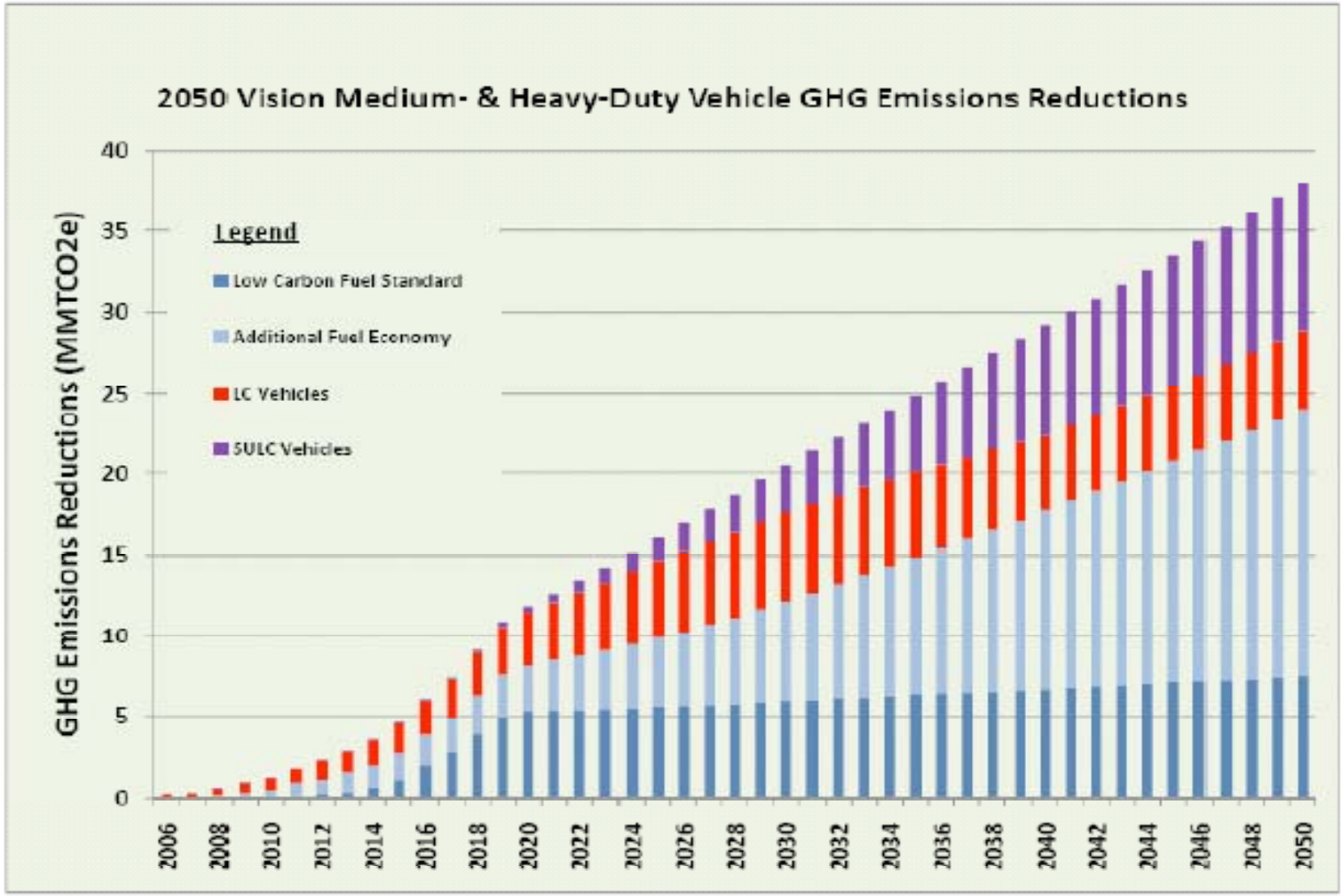

2050 Vision Light-Duty Vehicle GHG Emissions Reductions
GHG Emissions Reductions (MMTCO2e)
160
140
120
100
80
60
40
20
0
Legend
SULC Vehicles
ULC Vehicles
LC Vehicles
Additional Fuel Economy
Pavley 2
VMT Reductions
Tire Program
Low Carbon Fuel Standard
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050

Figure 3. Estimated GHG Reductions From Each Of The Four Categories



Light Duty Percent GHG Emissions Reductions
(Values are summed from 2009 through year indicated)

Category	2020	2030	2040	2050	
Super Ultra Low Carbon Fuels	33%	37%	50%	56%	
Ultra Low Carbon Fuels	27%	30%	23%	21%	
Low Carbon Fuels	10%	3%	2%	2%	
Fuel Economy Improvements	30%	30%	25%	22%	
Total	100%	100%	100%	100%	

TIAX, LLC Analysis July, 2008

Light-duty + Heavy-duty **Buckets**	**Percent Allocation of AB 118 Funds**	
	Unconstrained	**Constrained**
Improved vehicle efficiency	21%	**25%**
Blended biofuels	22%	**16%**
Nonrenewable alternative fuels	17%	**5%**
Advanced vehicle technologies	40%	**54%**
Total	100%	**100%**

"Advanced Vehicle Technologies" include on- and off-road, electric-drive applications and include vehicle technologies such as battery-electric, plug-in hybrids, and hydrogen fuel cells.

Conclusion

- The analysis demonstrates a large need for successful SULC Vehicles to meet California's GHG reductions goals.

- AB 118 investment in SULC vehicles should be increased to better reflect their contribution to meeting the 2050 goal.

Breakout of estimated Achievable reductions in GHG and Criteria Pollutant emissions by category / application

GHG (million tons per year, CO2 equivalent); Criteria (tons per day)

	Pollutant / Year	
Electric Drive Technology or Application	**GHG / 2020**	**Criteria / 2020**
Plug-In HEVs	10.8	5.72
Truck Stop Electrification	0.50	21.1
Off-Road Industrial Vehicles	2.90	17.1
On-Road Battery Electric Vehicles	1.24	1.23
Hydrogen FCVs	0.65	1.08
Lawn & Garden Equipment	0.39	18.6
Alternative Marine Power	0.85	49.6
Electric Transport Refrigeration Units	0.13	3.4
Other	0.23	2.24
TOTAL of Estimated Avg. Reductions	**17.5**	**120**

Electric Transportation Vehicle Deployment Funding

- Consumer incentives (grants) based upon advanced battery pack capacity (example: $200-$300 kW).
- Light-Duty PHEVs and EVs.
- Medium and Heavy-Duty PHEVs and EVs.
- Loans/grants for non-road ET.
- On-ship Alternative Marine Power grants.

Electric Transportation Infrastructure Deployment Funding

- Consumer incentives (grants) for on-road vehicle infrastructure.
- Infrastructure for multi-family buildings, workplace, and public charging.
- Non-road vehicle infrastructure grants.
- Off-ship Alternative Marine Power infrastructure grants.

Electric Transportation Demonstration Funding

- Advanced battery PHEVs in extended use.
  - Medium and Heavy-Duty.
  - Light-Duty.
- “Smart” Infrastructure
- New applications of non-road electric vehicles and equipment.

Electric Transportation R&D Funding

- Sub-metering hardware and software.
- Vehicle-to-home/grid energy transfer.
- Impacts of ET on CA electricity system/grid.
- Advanced battery cost-reduction, durability, secondary use.

Other Funding Recommendations

- Information and Education Program.
- “Adder” for vehicles and equipment made in California.
- Partner with utilities and other industries.

Other Comments

- The AB 118 Program should use “marginal” electric generation emissions, rather than “average” emissions, consistent with past CEC and ARB analysis.
- FFCA should reflect the inherent efficiency of electric vehicles (EER), consistent with past CEC and ARB analysis.

Appendix B

Electric Transportation and Goods Movement Funding Recommendations for AB 118 Funding.

August 29, 2008

California Electric Transportation Coalition

Note: The state financial incentives described below were designed to be additive to any federal and other incentives available.

1. Vehicle Deployment.[1]

a. On-Road light-duty PHEV and EV: consumer incentives in the form of vehicle incremental cost buy-down grants from $3,000-$7,000 per vehicle, depending upon battery pack capacity.

b. On-Road medium- and heavy-duty PHEV and EV consumer incentives in the form of vehicle incremental cost buy-down grants.

c. Non-Road Electric Vehicles and Equipment[2]: consumer loan guarantees and/or low-interest loans.

d. Non-Road Electric Vehicles and Equipment *where the up-front incremental cost does **not** pay back in 2 years or less*: consumer incentives in the form of vehicle incremental cost buy-down grants of up to 50 percent of the incremental cost. This would be in addition to (b) above.

e. On-Ship Electrification Equipment for Alternative Marine Power: grants designed to partially mitigate gaps in funding from other sources, not to exceed 25 percent of total cost, as approved on a case-by-case basis.

2. Infrastructure Deployment.

a. Electric Sub-metering Equipment for On-Road and Non-Road Vehicles and Equipment (including any special connectors, and necessary wiring): consumer incentives in the form of grants not to exceed 75 percent of the cost of purchase and installation.

b. On-Road PHEV and EV Infrastructure in Apartment and other Multi-Family Buildings, Workplace and Public Charging Infrastructure (including wiring, charging equipment, voltage regulation, sub-panels, etc): incentives in the form of buy-down grants not to exceed 75 percent of total cost of purchase and installation.

c. Non-Road Electric Vehicle and Equipment Infrastructure (including wiring, charging equipment, voltage regulation, sub-panels, etc): consumer incentives in the

[1] Note that both Vehicle Deployment and Infrastructure Deployment incentives for electric transportation and goods movement could be administered by electric utilities, in combination with other services that the utilities may be providing, such as off-peak rates, information and assistance, etc.

[2] Includes: truck stop electrification, electric standby truck refrigeration units, cargo handling equipment, airport ground support equipment, lift trucks, burden and personnel carriers, tow tractors, turf trucks, sweepers, scrubbers, burnishers, and electric lawn and garden equipment.

form of buy-down grants not to exceed 50 percent of total cost of purchase and installation.

d. Off-Ship Electrification Infrastructure for Alternative Marine Power (including wiring and cableing, connection equipment, voltage regulation, sub-panels, etc): grants designed to partially mitigate gaps in funding from other sources, not to exceed 25 percent of total cost, as approved on a case-by-case basis.

3. Demonstrations.

a. Advanced PHEV demonstrations – funding to help buy down the incremental vehicle cost of demonstration projects that place advanced prototype plug-in hybrid or electric on-road vehicles in extended (2-3 years) fleet use. Demonstrations should be categorized by vehicle size and application:

i) Medium and heavy-duty fleet vehicles

ii) Light-duty passenger vehicles

b. Non-road electric transportation market expansion – for applications where either commercial products do not exist (e.g. > Class 3 electric lift trucks, electrified container loaders) or existing products have not been proven, fund cost-shared development and demonstration activities utilizing existing commercial technologies in new equipment or new applications.

c. Smart Infrastructure – fund cost-shared demonstrations of plug-in hybrid and electric vehicles implementing "smart charging" technology where communication with the electric grid facilitates the scheduling of vehicle charging, tracks electricity as a transportation fuel, and enables demand response and other grid enhancing activities.

4. Research and Development.

a. Advanced battery system development and testing – Fund cost-shared advanced battery development and testing activities focused on improving the performance of and validating the lifecycle durability of PHEV and EV battery systems. Priority should be given to projects that link in-vehicle field testing with laboratory testing.

b. Emissions system development for PHEVs – for existing PHEV demonstration programs, fund emissions development and system optimization activities designed to minimize vehicle emissions in real-world operation.

c. Electric-drive system development for PHEVs – for existing PHEV demonstration programs, fund development work that maximizes the performance capability of the electric-drive systems (electric motors, inverters, etc) to enable expanded capability for zero-emissions operation and efficient use of electricity.

d. Impact of electric transportation on the California Electricity Market. Fund a multi-stakeholder study of all aspects of electric transportation that impact the state of California and the electric system, including air quality, greenhouse gas emissions, water usage, generation, transmission, and distribution system, economic impacts, and public infrastructure. Priority should be given to the team that can best assemble key stakeholders (utility, automotive, regulatory, NGOs, etc) into a working group.

e. Distributed generation from vehicles – fund research that develops, demonstrates, and analyzes bi-directional energy transfer aspects of plug-in hybrid and electric vehicles, including Vehicle-to-Home (V2H) and Vehicle-to-Grid (V2G). Projects should be closely coordinated with state utilities and CalISO and include detailed system level impacts and assessment of benefits of proposed technologies and application.

5. "Buy Green" Information and Education Program.

The electric drive vehicles will need broad consumer support and a strong "right thing to do" image in order to succeed in the early years. Funds from AB118 should be used to communicate the positive impact these vehicles will have on reducing GHG, on addressing energy independence, and in reducing life-time vehicle operating costs.

6. Adder for vehicles and equipment made in California.

a. There should also be some additional financial incentive that would be added on to the individual incentives described above for vehicles and equipment that have significant content that was manufactured or produced in California.