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TOYOTA

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January 26, 2012

Re: Toyota Comments on the proposed Amendments to the California Zero Emission Vehicle Regulation

Toyota submits these comments to the staff's proposed amendments to the ZEV regulations, and also incorporate by reference the joint comments of the Large Volume Manufacturers (LVMs) dated January 25, 2012.

With the other automakers, we have worked with ARB's staff and stakeholders over the past several years to improve the ZEV program and to continue to reduce costs of the program while increasing its overall environmental effectiveness. At the core of our efforts is a fundamental principle -- that no advanced environmental technology can truly succeed unless it becomes a mainstream, mass-market technology. Our comments here are offered with this axiom squarely in mind.

Toyota is working on a broad portfolio of advanced technology vehicles that includes fuel cell hybrid vehicles, battery electric vehicles, plug-in hybrids and the next generation of the Prius and Prius family of hybrids. We have high expectations for all of these vehicles, but in this set of comments on the ZEV regulation, focus on the potential benefit of small battery plug-in hybrids.

Small Battery Plug-in Hybrid Vehicles Can Deliver Significant Environmental Benefits at Much Lower Cost to Consumers

Toyota believes there may be an overemphasis within the policy and regulatory community on EV range and battery size, and an under-appreciation of the benefits of smaller battery plug-in hybrids (PHEVs) from both an environmental, energy security and mass-market consumer viewpoint. Analyses conducted by Toyota - described in detail in the Attachment - indicate that smaller battery PHEVs (particularly blended-type) can reduce gasoline consumption and related GHGs at a significant level, even approaching EVs as well as larger battery PHEVs. Because smaller batteries are less expensive than bigger batteries, significant oil savings and GHG reductions can be achieved through the multiplier effect of greater sales volumes.

Technology and Market Review

The revision to the ZEV regulation contains a very aggressive ramp up of the ZEV requirement in 2018MY. Today, many advanced technology vehicles are entering the market. How these

vehicles are received by consumers is the key issue, and Toyota would like to request that the board continually monitor the pace of technology development and acceptance in the market to insure the assumptions on which these regulations are based are correct. This is in addition to working with EPA and NHTSA on the mid-term review contained in the GHG one national program agreement.

TZEV Credit Structure

The Board has previously and explicitly approved the blended PHEV concept which allows intermittent engine on operation during charge depleting operation. Staff is now proposing to limit the use of this technology PHEV with a new AER requirement that on the assumption that battery technology will improve such that vehicles should naturally be able to operate in EV only mode at higher speeds and loads. While Toyota agrees that battery technology will improve for future generation PHEVs, we strongly object to this requirement because it limits market flexibility in the following manner:

- Battery improvements can be used to reduce cost rather than increase range. The market should determine if more EV operation or less cost is more important.
- This requirement may unnecessarily restrict PHEV to smaller vehicles. The customer will ultimately determine the success or failure of PHEVs as a mass market technology. All automakers are trying to build this market and it is inappropriate for CARB to determine winners and losers and reduce flexibility at this very early stage.

Ratio of ZEV/TZEV

Staff is proposing to reduce the portion of the ZEV credit requirement that can be met with TZEVs from slightly over 50% in 2018MY to 28% in 2025. Toyota (like the LVMs) is concerned with this phase-down and believes that the TZEV credit share should remain at 50%. Retaining the 50% credit requirement share will give the market more latitude in choosing between ZEVs (BEVs and FCEVs) vs. TZEVs (PHEVs), thereby increasing the overall chances of success in the marketplace. It also provides OEMs more flexibility in meeting the ZEV mandate by allowing them to better align their choices of ZEV program vehicles with the directions of the market. If battery EVs are more preferred, the requirements would allow them to satisfy a greater share and visa versa. Finally, as the attached battery analysis indicates, TZEV's can provide substantial benefits, and given the lower credit value of TZEVs vs. ZEVs, allowing a greater portion of TZEV compliance might actually result in greater petroleum savings (as well as reductions in GHGS) due to a much larger total volume of vehicles.

Promote Fuel Cell Hydrogen Infrastructure and Support of the Proposed Revisions to the Clean Fuel Outlet Regulation

Toyota has announced the commercial launch of a fuel cell sedan in 2015. Japan, Germany and now the UK have announced coordinated hydrogen infrastructure efforts in anticipation of fuel cell vehicle introduction. We need certainty in California that hydrogen infrastructure will be available to match vehicle introduction. Therefore, we believe the board should adopt the proposed staff changes to the Clean Fuels Outlet program to help provide such certainty. Regarding the recent addition of a penalty provision for automobile manufacturers for discrepancies in volume projections, Toyota believes that this should not apply if a manufacturer's projections were made in good faith.

Section 177 State ZEV Requirement

Toyota supports the optional compliance path as agreed between the section 177 state and the LVM with the help of CARB staff. This compromise addresses the States' request for certainty

of ZEV product in those states in the 2016-2017MY while acknowledging the market differences in each state by providing flexibility for compliance and a more gradual phase-in of the California requirement.

Carry Forward/Carry Back

While Toyota would prefer 2 yr carry back from 2018MY, Toyota appreciates the additional flexibility provided by Staff with the return of unlimited carry forward and does not object to the 1 year carry back provision.

Use of Converted TZEV Credit 18-25MY

Staff has proposed limiting the use of TZEV credits, obtained by converting PZEV/ATPZEV credits, to 25% of the TZEV requirement for MY18-25. Toyota supports the ability to convert excess PZEV/ATPZEV credits to TZEV even though the proposed discounting (PZEV = 97.5%, ATPZEV 75%) is overly severe. However, Toyota believes the further limitation of these "converted" TZEV credits at 25% is overly restrictive. Toyota believes one way to address this would be to raise the limit on usage of converted credits to 50% from 25%.

Additional FC Incentives 2015-2018MY

Toyota supports the increase in the FC credit value in 2015MY as a way to achieve the appropriate credit balance BEV and FC with the extension of BEV travel to 2017MY.

Thank you for your consideration of our comments.

Sincerely,

Michael Lord
Manager, Vehicle Regulation and Certification Engineering
Toyota Technical Center

Benefits of Smaller Battery Size Plug-In Hybrid Vehicles

Toyota conducted extensive analysis of actual driving patterns nationwide and at the state level using data from the 2009 National Highway Traffic Survey (NHTS) conducted by the U.S. DOT. Results are very similar between the nationwide analysis and the state-level analyses. Because a host of other states have adopted or will adopt CARB's ZEV program (representing nearly 40% of U.S. auto sales), we utilize the nationwide results in these comments.

As shown in Figure 1, 70% of the NHTS survey respondents reported daily driving distances of 40 miles or less. Such data is often cited as justification for developing a 40-mile range EV or PHEV, and proponents claim that such a vehicle can "cover" 70% of all people's daily needs. However, when viewed in the inverse (Figure 2), it becomes apparent that only 30% of NHTS survey respondents reported driving more than 40 miles per day. Thus, only 30% of NHTS survey respondents could fully utilize the battery capacity required to achieve a 40-mile range PHEV or EV. In the case of a 40-mile-range vehicle, the 70% of NHTS respondents who reported driving less than 40-miles per day would be paying for some level of battery capacity that largely remained unused. For a 50-mile battery, only 20% of NHTS respondents would generally be able to utilize the full investment in battery capacity. As long as battery costs remain high and purchase price remains the chief hurdle to mass-market consumer acceptance of plug-in vehicles, battery utilization (and non-utilization) will remain key factors.

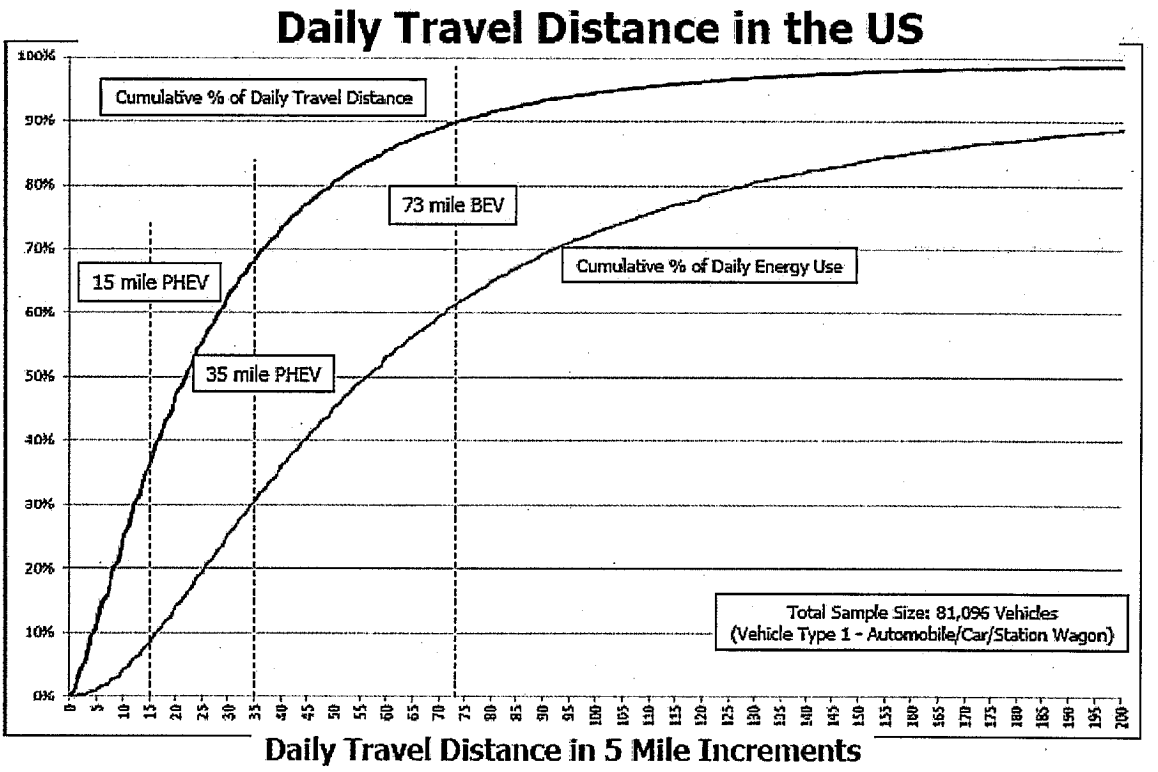


Figure 1

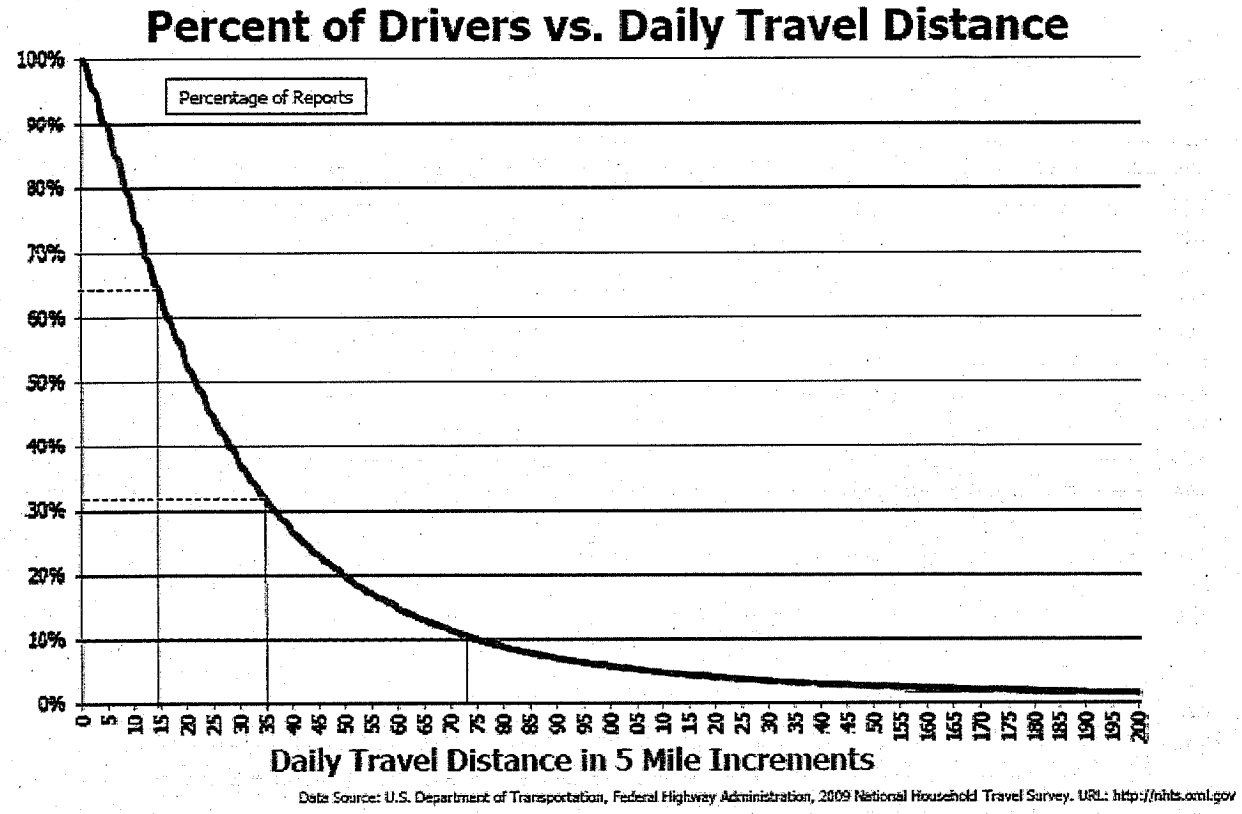


Figure 2

This part of our analysis highlights a fundamental difference in the design approach of a pure EV compared to a PHEV. Pure EV drivers *never* want to fully deplete the battery, as this would leave them stranded. To the contrary, a PHEV driver has every incentive to fully deplete the battery *every time* the vehicle is driven. This maximizes the investment in battery capacity of the PHEV. If only 30% of NHTS respondents would generally deplete a 40-mile PHEV battery each day, then 70% generally have too much battery capacity. A PHEV with a 15-mile range will generally be fully depleted by 65% of all NHTS respondents.

To illustrate the potential oil and GHG savings from smaller battery PHEVs, Toyota further analyzed the NHTS data. Figure 3 shows the percentage of fuel burned by drivers depending on their daily driving distance. This chart is created by multiplying the daily driving distance reported in NHTS by the frequency of those who report driving that distance. For example, this chart indicates that ~5.8% of all gasoline is consumed by drivers who drive between 16-20 miles per day.[1] Interestingly, over 11% of all fuel is burned by those who drive more than 200 miles per day.

[1] For visual simplicity, we have grouped the data into 5-miles bins.

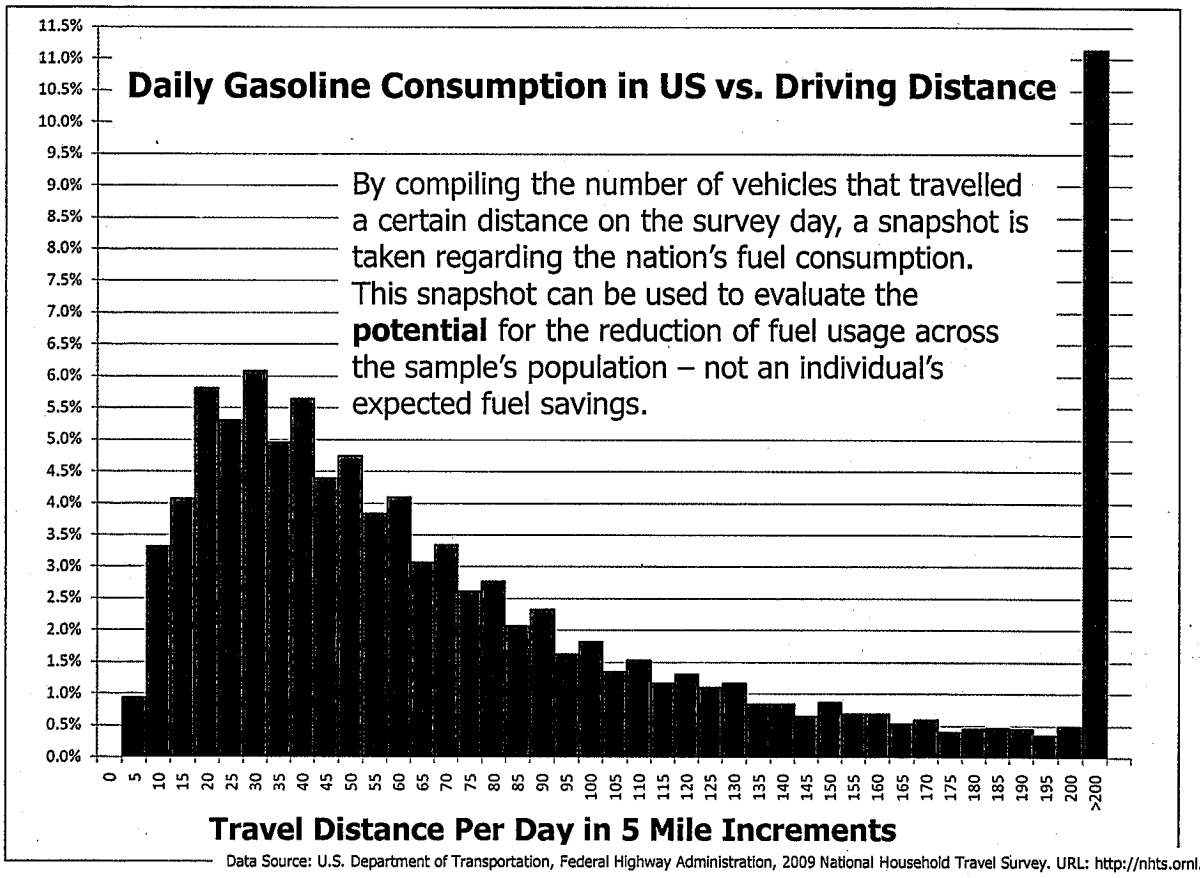


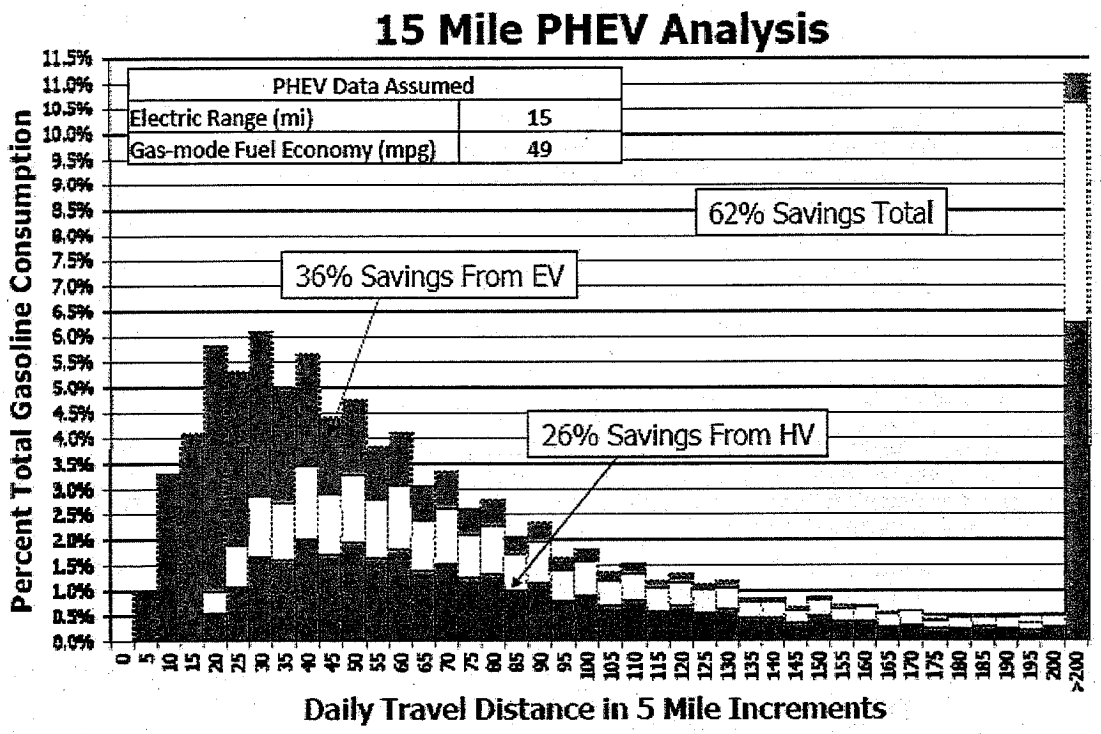
Figure 3

Using Figure 3, one can then estimate the fuel savings (and vehicle GHG reductions) from various vehicles based on the EV range and gasoline fuel economy of each vehicle. Toyota conducted this part of our analysis using EPA estimates shown in Table 1 for EV range and gasoline fuel economy of three vehicles: the Toyota Plug-in Prius, Chevrolet Volt, and Nissan Leaf. Given that all of these vehicles are small-to-mid-sized passenger cars, we used a baseline ICE fuel economy of 29 mpg for comparison purposes. The analysis also assumes once-per-day charging, which is consistent with Toyota's understanding of vehicle charging infrastructure today and over the next several years. To the extent access to charging infrastructure improves and/or charging times are reduced in the future, the need for larger batteries is lessened even further.

	PHEV15	PHEV35	BEV73
Electric Range	15	35	73
Gasoline Fuel Economy	49	37	NA

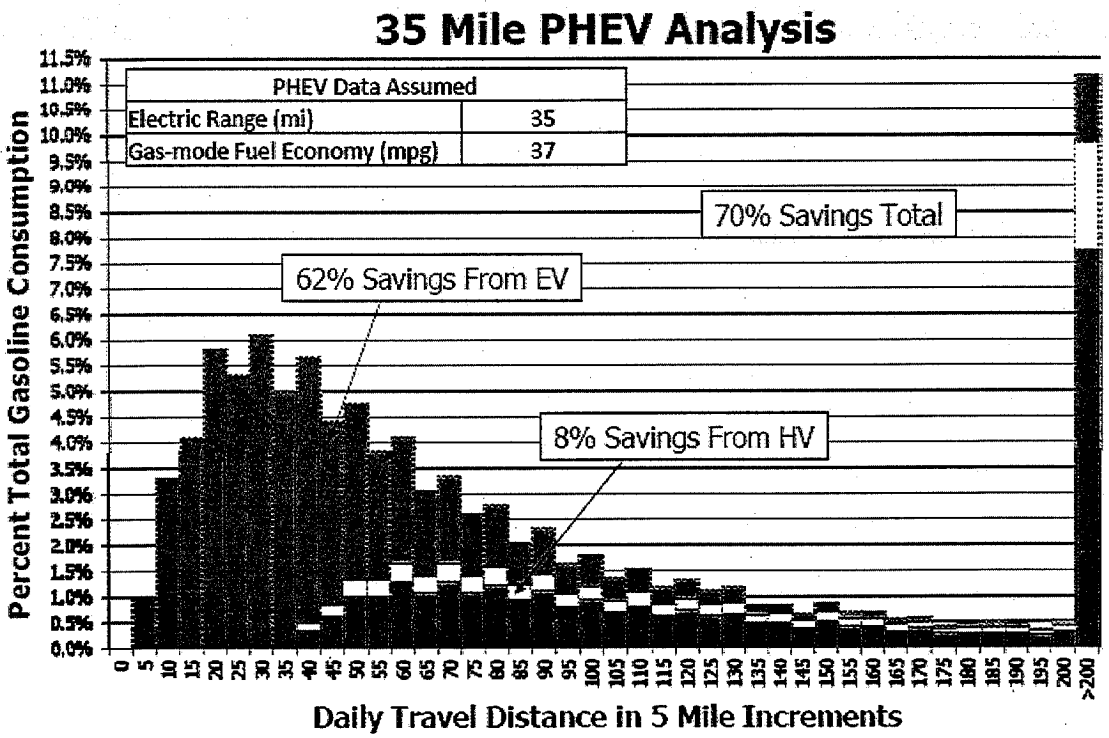
Table 1

Figures 4-6 show the results for the various vehicles. Fuel savings (and vehicle GHG reductions) achieved through EV operation are shown in dark gray. For pure EVs, no additional fuel savings are possible beyond the EV range of the vehicle (with once-per-day charging), and we assumed those driving more than the EV range would use a 29 mpg ICE from the outset of the day. For PHEVs, additional savings from hybrid (or range extended) operation beyond the EV range are shown in light gray. Finally, the remaining gasoline used is shown in blue.



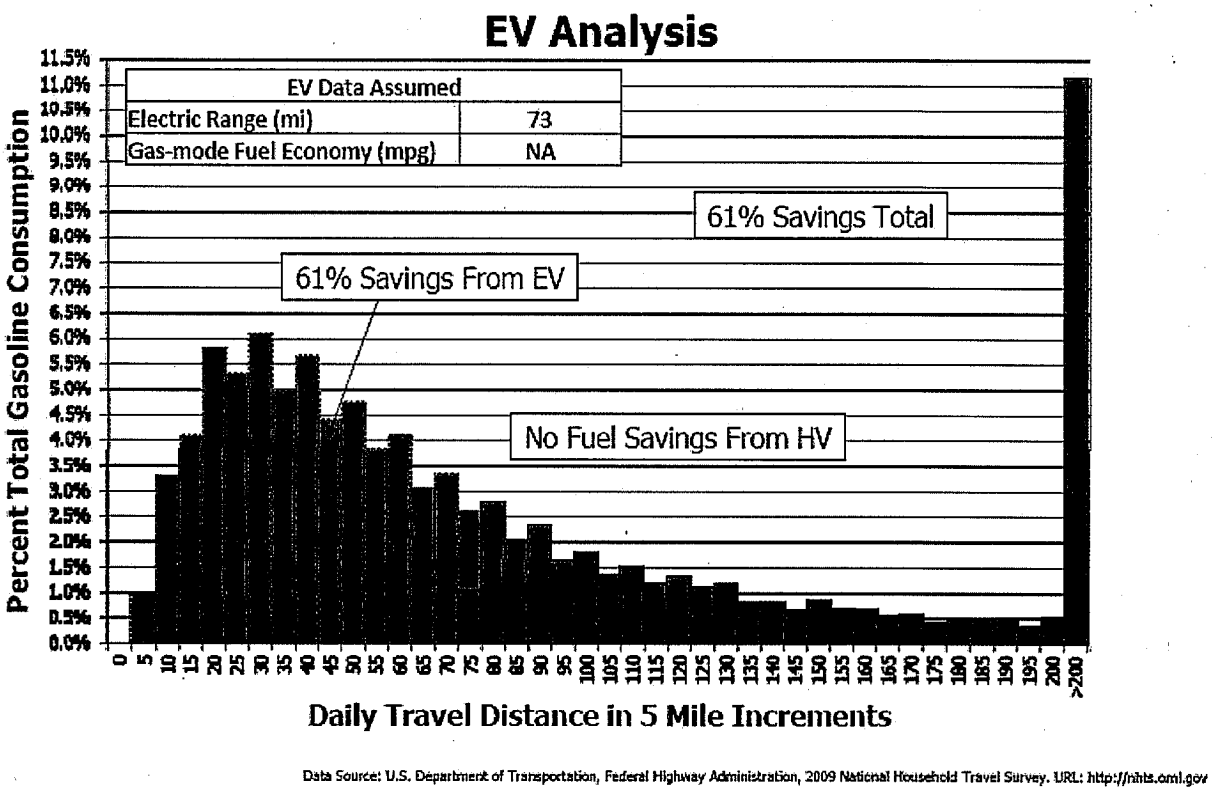
Data Source: U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey. URL: http://nhts.ornl.gov

Figure 4



Data Source: U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey. URL: http://nhts.ornl.gov

Figure 5



Data Source: U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey. URL: http://nhts.ornl.gov

Figure 6

The overall results are summarized in Table 2 and highlight five key points for policy consideration:

- PHEVs can offer significant fuel savings (and vehicle GHG reductions), since they can be used for *all* daily driving distances without the need to recharge or without the need for a second vehicle for longer drive distances.

- Smaller battery blended PHEVs can provide significant per-vehicle fuel and GHG savings, approaching PHEVs and EVs with much larger batteries and longer EV ranges.

- Smaller batteries are more fully utilized and thus the amount of EV-driving per unit of battery capacity is higher than for larger batteries.

- PHEVs can provide a significant portion of EV operation (as shown in the dark gray bars in Figures 4-5 even when they have "smaller" EV ranges. In discussion with various policy and advocacy people throughout the country, there remains a general misunderstanding that a PHEV with a 15 mile EV range provides no benefits for daily drives longer than 15 miles. As can be seen in the charts, this is simply not true.

- Smaller batteries directly translate into lower battery cost for the consumer, which means greater potential market penetration and greater *overall* fuel savings and GHG reductions.

	PHEV15	PHEV35	BEV73

Savings from EV	36%	62%	61%
Savings from HV	26%	8%	NA
Total Savings	62%	70%	61%

Table 2

From a policy perspective, these results shown in Table 2 highlight two important points. First, incentivizing or crediting EV-drive systems in a linear fashion, as Staff has proposed, based on EV-range and/or battery capacity alone may significantly over-value large battery vehicle fuel and GHG reductions by assuming full battery capacity is always utilized. Second, to the extent a linear function remains, CARB should consider adjusting the slope or intercept of the line to more accurately reflect the value of smaller batteries.