The California Electric Transportation Coalition (CalETC) respectfully presents the following comments in response to the three TIAX Draft Consultant Reports on Full Fuel Cycle Assessment as prepared for the AB 1007 (Pavley) Alternative Transportation Fuels Plan Proceeding. For the convenience of the reader, CalETC's discussion and supporting analysis below includes its main recommended changes, where possible, in **bold.**

1. Requirement for New Capacity to Meet EV and PHEV Load

CalETC requests significant new wording be added around the issue of plug-in hybrid electric vehicles (PHEV) and new load. Part of this new wording should reflect the ability of utilities to manage the new load for PHEVs, pure electric vehicles (EV), as well as compression of natural gas or new ethanol plants.

CalETC would like to point out that very recently (from March 13 to 15, 2007), USDOE held a workshop on PHEV grid impacts. The DOE's Pacific Northwest National Lab in its summary slide stated "The idle capacity of the U.S. grid could supply 73% of the energy needs of today's cars, SUVs, pickup and vans without adding generation or transmission."
http://www.energetics.com/phev07/pdfs/Pratt.pdf.

The draft AB 1007 report (page 3-60, Well-to-Tank, last paragraph) is incorrectly saying the opposite: "Regardless of the hourly charging pattern, a key conclusion is that EV charging represents load growth each day of the year that will have to be met by adding capacity to the grid." **CalETC respectfully requests and recommends that this sentence be changed to read along these lines**:

Regardless of the hourly charging pattern, a key conclusion is that EV charging represents load growth each day of the year that will have to be met by adding electricity use. However, as shown on Figures 3-22 and 3-23 virtually none of this new electricity consumption will occur during summer day peaks. In addition, utilities have a number of existing and upcoming methods to eliminate this peak. Utilities today have existing programs to shift electric transportation load for forklifts (rebates and time-of-use rates), and special rates for electric vehicles.

In the near-future (by approximately 2015 if not sooner), all of the major CA utilities will have advanced meters which typically can send signals to individual appliances to reduce or interrupt that specific load. These new advanced meters will also facilitate time of use pricing.

A key conclusion of this study is that there is very substantial idle capacity in the California grid that, given incentives to encourage overnight charging, can be used to supply electric transportation today, without building expensive new infrastructure. Using the existing off-peak idle capacity also has the benefit of exerting a downward pressure on rates by better utilitizing existing resources.

Please see comment 4 for additional information regarding time of charge for EVs and PHEVs.

NOTE - Some of the above suggested language comes from the executive summary of a TIAX report for CalETC on October 2005, which also expresses the utilities clear interest in managing this load to reduce its impact.

2. Statewide Marginal Emissions for PHEV and EV Load

CalETC has several comments on the use of the term "marginal emission factors" for PHEV and EV load. First, we believe there is a nomenclature problem. The utility industry uses the term marginal in a near-term context to mean the next unit to be dispatched. The scenarios that TIAX lays out in 2017, 2022 and 2030 are not marginal scenarios, but rather we would call them long-term average additions for the PHEV and EV load that are well understood and can be adequately planned for in the future. Once a new load is understood it can be adequately and correctly planned for in the utility long-term procurement process but prior to understanding the load effects the load is truly "marginal" and would be served by the marginal resource. **CalETC therefore recommends that references to 'marginal' generation be adjusted to 'long-term average additional' generation.**

CalETC recommends that in the near-term (2012), the emission factors for PHEV and EV load should not include any effects of renewables due to the uncertainty of the load forecast, and the emission factor we believe is correct for this incremental load to the system is approximately 937 pounds per MWh (425 g/kWh) for CO2 based on natural gas-fired combined cycle combustion turbines (NG CCCT)[1].

However, as utilities are able to better understand and forecast future EV, PHEV and other alternative fuel production load in the long-term procurement process, renewables will be added due to the state renewable portfolio standards. At this point, emission factors for the average energy used to charge such vehicles will equate to the 750 lbs per MWh (341 g/kWh) figure, which was referenced in Table 3-32, Well-to-Tank. By 2015, we anticipate EV and PHEV market growth becoming predictable enough to allow accurate forecasting of their load. At this point electric utilities will be able to contract a proportionate amount of renewable resources on an annual basis to achieve the 80% NG CCCT, 20% renewables scenario stated throughout the report. **Therefore, we recommend the stated (Table 3-32, Well-to-Tank) figure of 750 lbs per MWh (341 g/kWh) be used for greenhouse gas emissions resulting from EV and PHEV load starting in 2015.** At some future point, perhaps in 2012, this recommendation must be revisited to ensure electric utilities are in fact able to accurately forecast this load. If the very large numbers of PHEVs in the report are obtained in 2020 and 2030 and charge at night, the emission factors might drop further because the configuration of the system

[1] TIAX LLC, "Full Fuel Cycle Assessment – Well to Tank Emissions and Energy Consumption," CEC Report CEC-600-2007-003-D, February 2007. Table 3-32, 2012 CO2 emissions from NG CCCT + Combustion RPS divided by 0.8 to remove renewables.

will change based on economics and other regulatory requirements. The presence of more off-peak load may facilitate the integration of more night-time wind or other renewable energy, which might otherwise require turning off natural gas generation needed the next day or making other modifications to the system for operational reasons.

CalETC and its member companies are also willing to work with the CEC and other stakeholders more on these very complex questions. As described in the Well-to-Tank report, there are many complex factors relating to retirements, new plant construction, integration of renewable resources, regulatory proceedings and other factors that go into such an analysis, all of which can change the incremental or marginal emission factors as well as the future system average emission factors. CalETC and its members need to better understand the electric industry assumptions behind the TIAX report Well-to-Tank report and in the many competing analyses currently underway.

For example, EPRI and NRDC are jointly working on an important Phase 1 report on PHEV emissions that is very sophisticated and will soon go out for stakeholder review. (Contact Bob Graham at 650 855-2556 for more information.) USDOE's Office of Electricity just released its report on PHEV grid impacts by the Pacific Northwest National Lab.[2] Finally the CEC has been undertaking a large in depth 3 year analysis on the potential effect of alternative fuel pathways in the transportation system into the natural gas and electricity systems, which includes examining PHEV and pure EV emissions as far as 2050[3]. Given all of these reports, CalETC and its members look forward to working with the CEC in the future on the question of PHEV grid impacts, and the societal benefits of PHEVs. The near-term, mid-term, and long-term emission factors associated with forecasting for the expected future PHEV load must be refined in the next few years to accurately assess both the economics of PHEV's and the effects of such implementation on system emissions.

Additionally, the outlook for electrical generation may change due to the proceedings of AB 32. **CalETC respectfully recommends that the assumptions for this report be revisited after AB 32 implementation rules have been established.**

Finally, the draft report mentions electric forklifts and other types of electric transportation (Section 2.3, Tank-to-Wheels). CalETC and its members have much experience with these loads and are willing to work with the CEC to better understand these loads as well, as there are already over 300,000 of these electric forklifts, bag tugs, tow tractors, golf carts and similar non-road electric vehicles in California today. See our comment number 5 below.

[2] Kintner-Meyer, M; Schneider, K; and Pratt, R. Impact Assessment of Plug-In Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids Part 1: Technical Analysis. Pacific Northwest National Laboratory, US DOE Contract DE-AC05-76RL01830.
[3] Advanced Energy Pathway's project of the CEC. Contractors include University of California, GETF, Lawrence Livermore National Lab and others.

3. Criteria Pollutants from Electricity Generation

A. Criteria Pollutant Offset Requirements

CalETC believes the report did not correctly account for required criteria pollutant offsets. On the one hand, the report is correct at page 7-32, Well-to-Tank, noting that there is no increase in NOx or HCs from new power plants because they are offset, and in Table 3-16, Well-to-Wheels, noting NOx and VOC offsets. Additionally, page 2-5, Well-to-Wheel, properly notes that “New Source Review and other offset requirements limit NOx and PM emissions from new power plants and fuel production facilities.” On the other hand, however, these statements ignore the fact that offsets are required for SOx and CO as well. **The report should be modified to expressly mention all criteria pollutant offset requirements.** In addition, these requirements do not just apply to new plants. In non-attainment areas (which is most of California) since 1980, offsets have been required for the life (30 years) of each new plant. The required offsets are based on a worst-case scenario, essentially a month in which the plant is operating at 100% capacity, multiplied by a factor of up to 1.2 to account for regional air quality. Therefore, even existing plants have already offset any additional criteria pollutants that would be emitted as a result of electric vehicle load.

For example, if an NG CCCT is dispatched to serve a new load such as PHEVs at night, the CCCT’s capacity factor will increase, perhaps from 50% to 60%. Whatever the case, the emission increase from the PHEVs is more than offset through the prior purchase of the New Source Review (NSR) offsets (even if they were purchased soon after the offset law was enacted). Based on the work in this study, and several prior studies, very little of the marginal emissions will be from steam plants or other older plants built prior to NSR offset requirements, or from generating units in other states or attainment areas.

Although the report concedes that NOx, HC and PM emissions are offset, this is not evident in Figure 3-21, Well-to-Wheels, or A-7, Well-to-Wheels, which associate NOx, VOC, CO and PM emissions with electric miles powered by natural gas plants and renewables. We acknowledge that some criteria pollutant emissions will result from marginal load due to feedstock transportation within and near California, but the current figures and tables seem to go well beyond this. Additionally, the majority of these increases in feedstock transportation will not result in urban emissions. **Since marginal load is served by plants with emissions that must be offset, electric vehicles should be considered as emitting near zero grams of criteria pollutants per mile. Additionally, language within the report referring to offsets must be clarified to indicate that offsets result in only minute net increase in any criteria pollutant. For example, the fourth bullet in Table 3-16, Well-to-Wheels, should be changed to:**

Offset requirements on stationary sources result in zero net increase in NOx, VOC, PM, SOx or CO emissions from power plants

Additionally, where criteria pollutant emissions from new natural gas combined cycle combustion turbines are noted, such as in Tables 3-30 and 3-31, Well-to-Tank, CalETC recommends that a footnote be added to clarify that these emissions are pre-offsets.

B. Validation of Table 3-32 (WTT)

Using the criteria pollutant emission factors from Table 3-30, Well-to-Tank, we attempted to validate the numbers presented in Table 3-32 and were unable to do so. Starting with the emissions from NG Fired Combined Cycle CTs (LHV Basis), we converted to g/GJ, accounted for powerplant efficiency and transmission losses, and finally accounted for the fact that 79% of electricity comes from these plants in the lower half of Table 3-32 and 21% comes from zero-emission, non-combustion sources. Our calculations resulted in significantly lower values for both NOx (11% difference) and CO (53% difference). Our calculations resulted in roughly 9% higher values for PM and VOC. If we had missed a critical conversion factor, we would expect our values to be all off by the same magnitude and in the same direction, but this is clearly not the case. CalETC believes that, because the values in Table 3-32 should be able to be duplicated by others using data presented elsewhere in the report, it is of concern that this is not the case here, and therefore **CalETC recommends that a careful check should be performed by TIAX, and any necessary changes made, or clarifications should be provided in annotations to existing tables to make duplication by others possible.**

Further, there appears to be a discrepancy between the criteria pollutants reported for electricity production between Table 3-32, Well-to-Tank, and Figure 7-21, Well-to-Tank. Specifically, in Table 3-32 the NOx and CO emissions from the NG CCCT + Combustion RPS Scenario in 2012 are 19 and 49 g/GJ respectively, while in 7-21 the urban emissions are presented as roughly 1 and 16 g/GJ for NOx and CO, respectively (NG/RPS Scenario). This discrepancy may be due to the delineation between total and urban emissions, but the methodology for calculating urban emissions from total emissions was unclear. **CalETC recommends increased transparency throughout the calculations and discussions regarding criteria pollutants to ensure a clearer understanding of the assumptions involved.**

C. Further Investigation into PM Emissions

On page 8-3, Well-to-Tank, it is noted in point 5 that additional investigation is required to assess PM emissions associated with combined cycle power plants, and in Table 3-16, Well-to-Wheels, it is noted that the effect of ambient PM on emitted PM should be assessed. **CalETC strongly agrees, and recommends that further investigation is required to better understand the PM emissions from combined cycle natural gas plants. We further recommend that the CEC look into prior studies done for CEC and CARB that did not point to PM as a problem for EVs.** For example, the emission factor used by TIAX in the AB 2076 report for the CEC and CARB, used an emission factor of 0.007 grams per kWh for PM (appendix A table 2-4) and TIAX used this in later reports for CalETC. This is much less than the number on the Well-to-Tank report, table 3-32. For an efficient EV at 0.25 kWh per mile, this translates to 0.0018 grams per mile of PM, which is much less than the 0.028 grams per mile in the Well-to-Wheels report page A-7. According to the WTW Processors program, the electric power plant contribution is 0.008 grams per mile of PM 10, and 0.02 grams per mile of tire and brake wear PM emissions have been added to all of the various scenarios. **However, with EVs brake wear is less, and this should be accounted for, as this should somewhat offset the higher urban power plant emissions from PM10. At minimum CalETC respectfully recommends that the values be shown with and without tire wear (at least as a footnote).** This would increase the transparency of the report.

CalETC and its member utilities believe the PM emissions attributed to combined cycle natural gas plants are generally significantly higher than actual emissions, and we look forward to working with the CEC to research this issue. **CalETC requests that the PM 10 from power plant issue be put in context.** Specifically the new number of 0.008 grams per mile versus the prior AB 2076 number of 0.002 grams per mile is in both cases very small. Compare these numbers to tire and brake wear at 0.02 grams per mile.

4. Time of Charging for EVs and PHEVs

A. Figure 3-12, Well-to-Tank Report

Page 3-51, Well-to-Tank, states that the charging profile of electric vehicles and plug-in hybrid electric vehicles will be a blend of the nighttime and daytime charging scenarios (Figure 3-12), with the nighttime charging scenario only including 70% nighttime charging. This seems to ignore the significant pricing incentives for off-peak (12:00AM – 7:00AM) charging. EV and PHEV owners pursue time-of-use (TOU) electric rates to take advantage of relatively low priced electricity in the off-peak hours. Most TOU rates in California include an on-peak (2:00PM - 9:00PM, M-F, Summer Months) rate that is approximately five times as high as the off-peak rates, meaning rational customers will always charge off-peak or at worst partial-peak except when necessary to do otherwise. Low rates are easily taken advantage of using a basic timer connected to the EV outlet. A study of EV customers conducted by PG&E[4] showed that 88% of charging occurred off-peak (12:00AM – 7:00AM M-F, 9:00PM – 5:00PM S-S), and only 4% occurred on-peak (2:00PM – 9:00PM M-F, May – Oct). Understanding time of use rates and rational charging patterns, the nighttime charging scenario is a worst-case scenario. **CalETC recommends that the daytime charging scenario, or any combination of the two scenarios, should not be assumed.**

Additionally, Figure 3-12 shows that nighttime charging ramps up to a peak at 11PM, followed by a slow decline until 8AM. At the beginning of the analysis timeframe, charging will begin as soon as the vehicle owner plugs in (or when the timer closes the

[4] Jennings, Christina; Ornelas, Efrain; and Schurhoff, Robert. *PG&E's Residential Electric Vehicle Customers and Their Response to Time-Of-Use Electricity Prices*

connection), and it is reasonable to assume the displayed scenario. However, CalETC requests TIAX assume that smart-charging will eventually be implemented by the larger California electric utilities, likely well before 2020. With smart-charging, the utilities will assess the vehicular load, and will stagger charging such that the load is even throughout the off-peak hours. All vehicles will be fully charged when needed, but there will be no sharp peak as shown in Figure 3-12.

B. Figure 3-23, Well-to-Tank Report

Although the report seems to portray an unrealistic expectation for vehicle charging times as discussed above, Figures 3-21 through 3-24 in the Well-to-Tank report show an accurate accounting for charging load for the two (daytime and nighttime charging) scenarios in 2030. While the daytime charging scenario is unlikely, TIAX correctly assumes that daytime charging will not correspond with the load peak. The bulk of charging seems to occur before 1:00PM, perhaps because most vehicle batteries are full at this point after having plugged in upon arrival at work. This is an important conclusion because it suggests additional generation will not be needed to meet electric vehicle load per se, but that existing generation sources can be ramped up to meet the non-peak demand.

5. Non-Road Emissions

The Full Fuel Cycle Analysis contains some estimates of the fuel consumption of the non-road sector. CalETC has long asked that this sector be included in CEC analysis, and appreciate the CEC starting to work in that area. **CalETC recommends CEC solicit a report done by TIAX for us in October, 2005 titled "Electric Transportation and Goods-Movement Technologies in California: Technical Brief."** CalETC also has a consultant working an update to this report, and we can provide results soon to the CEC. We have concerns with the data in the current report. For example, Table 3-9 in the Tank-to-Wheels Report does not include electric forklifts or propane forklifts which tend to dominate the forklift market (not the gasoline, CNG and diesel referenced in this table). We believe AB1007 would benefit through the full inclusion of non-road sources.

6. Energy Economy Ratios for Electric-Drive Vehicles

A. Choice of EERs for PHEVs

In choosing EERs for plug-in hybrid electric vehicles (PHEVs), TIAX in their tank to wheels report[5] did not use the findings from the EPRI HEVWG report[6] and assigned the charge depleting (all-electric) EER of PHEVs based upon their electric vehicle EER

[5] TIAX LLC, "Full Fuel Cycle Assessment – Tank to Wheels Emissions and Energy Consumption," CEC Report CEC-600-2007-003-D, February 2007.
[6] EPRI, "Comparing the Benefits and Impacts of Hybrid Electric Vehicle Options," EPRI, Palo Alto, CA, 2001.

analysis. The EPRI HEVWG report was a peer reviewed apples-to- apples comparison of a mid-size vehicle with various states of hybridization. The modeling for the HEVWG report was conducted collaboratively by the National Renewable Energy Lab and University of California, Davis with substantial input and review by General Motors, Argonne National Lab, California Air Resources Board, EPRI, South Coast Air Quality Management District, TIAX, Southern California Edison and others. All hybrid vehicles had the exact performance and size of the conventional vehicle. In fact, the conventional vehicle was assumed to have many of the Pavley improvements discussed in the staff report for AB 1493[7]. The baseline fuel economy for the conventional vehicle was 28.9 miles per gallon which is TIAX's estimate for the conventional mid-size car in 2017 with Pavely modifications.

The EER for a PHEV 20 in the EPRI report is 4.05 for the all-electric (charge depleting) mode and 1.50 for the gasoline (charge sustaining) mode. Using the mileage weighted probability derived from the 2001 National Highway Transportation Survey[8] of 40.61% (40.61% of an average person's trip can be in all-electric mode with a PHEV 20), the combined EER is 2.54, significantly higher than the 2.28 that TIAX uses in its calculation of greenhouse gas emissions. It should be further noted that the EPRI study models nickel metal hydride (NiMH) batteries, which are older technology. In a recent paper, Andrew Simpson of the National Renewable Energy Laboratory (NREL)[9] compared fuel economies for various PHEVs with NiMH and lithium ion (LiON) batteries using the ADVISOR model. For a PHEV 20, Simpson found that LiON batteries reduced the vehicle curb weight from 1678 kg to 1531 kg which resulted in a 3.4% increase in charge depleting fuel economy and a 5.3% improvement in charge sustaining fuel economy. **We believe all plug in hybrids will use LiON batteries, thus EERs for PHEVs for 2012 should be 4.20 for charge depleting mode and 1.58 for charge sustaining mode with a 40.62% electric use factor, resulting in a combined EER of 2.64**.

It should also be noted that it is very likely with the use of LiON batteries that PHEVs will have extended all-electric range as we approach 2030. The fixed EER over time used in the TIAX analysis does not capture this fact. It is very likely that the PHEV 20 in 2012 will be a PHEV 40 or higher by 2030. By interpolating between the PHEV 20 and PHEV 60 in the EPRI report for a mid-size car and applying the increases in fuel economy by use of LiON batteries as specified in Simpson's paper, a LiON PHEV 40 would have a charge depleting EER of 4.33 and a charge sustaining EER of 1.64. In addition, the mileage weighted probability factor increases from 40.61% to 62.78%, thereby resulting in a combined EER of 3.33. This is because the vehicle can now operate a larger portion of its miles in all-electric mode. **We suggest this value of a combined EER of 3.33 be used for the 2030 analysis.**

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[7] ARB, "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 2004.
[8] http://nhts.ornl.gov/
[9] Simpson, Andrew, "Cost-Benefit Analysis of Plug-In Hybrid Electric Vehicle Technology," presented at the 22nd International Battery, Hybrid, and Fuel Cell Electric Vehicle Symposium, Yokohama, Japan, October 2006.

Additionally, the EERs for large SUVs are generally higher for PHEVs when compared against conventional vehicles than they are for mid-size passenger cars. In the EPRI HEVWG report, the charge depleting EER for a large SUV with a 20 mile all-electric range was 4.24 compared with 4.05 for a mid-size PHEV 20 passenger car. Similarly for the charge depleting mode, the EER for the SUV was 1.62 compared with the 1.50 for the mid-size car. This increase is due to the fact that the battery weight is less significant in a heavier vehicle. Per the California DMV, in October 2005 there were over roughly 14.5 million light-duty cars registered in the state and roughly 11.5 million light-duty trucks. **Due the significant market share of light-duty trucks, CalETC recommends that this sector be evaluated separately in the proceedings. We further suggest using higher EERs for heavier light-duty trucks than were used for light-duty cars. Alternatively, the EER could be raised to a point that is somewhere in between the values for a light car and light truck, in order to represent an average light duty vehicle.**

A further argument can be made when comparing PHEV technology to hydrogen fuel cells (H_2FCV). Current hydrogen fuel cell technology, such as that used in buses operated by the Santa Clara Valley Transportation Authority and San Mateo County Transit District have been reported by NREL as having less than an EER of 1.0 when compared to a diesel transit bus.[10] Even Toyota shows their current hydrogen fuel cell vehicle to be less efficient on a well to wheels basis than their Prius when compared to a like conventional car.[11] TIAX's tank to wheels report argues that fuel cell vehicle technology will improve in the following ways from current prototypes:

- Large battery hybridization
- Plug-in hybrid operation
- Reduction in weight, size, and drag

No current OEM fuel cell group believes in either plug-in FCVs or large battery hybridization[12]. Reducing mass, size and drag all apply just as well to EVs and PHEVs and to a lesser extent HEVs. Only dedicated improvements to the fuel cell system can improve FC EER. Therefore, to maintain a level playing field for all alternative fuels, reasonable changes applied to one should be carried forth on a like technology. We therefore recommend that the EERs for PHEVs should be increased as set forth above.

As another note, there is an inconsistency of GHG benefits given for PHEVs in the ARB staff report for AB 1493 regulation and this full fuel cycle draft analysis The TIAX Well to Wheels Report[13] shows a well to wheels GHG reduction of 40% for PHEVs[14] while

[10] Chandler, K. and L. Eudy, "Santa Clara Valley Transportation Authority and San Mateo County Transit District – Fuel Cell Transit Buses: Preliminary Evaluation Results," Technical Report NREL/TP-540-39365, March 2005.
[11] http://www.toyota.co.jp/en/tech/environment/fchv/fchv11.html
[12] Personal conversation with Mark Duvall, PhD, Technology manager for Electric Transportation, EPRI
[13] TIAX LLC, "Full Fuel Cycle Assessment – Well to Wheels Energy Inputs, Emissions, and Water Impacts, Preparation for the AB 1007 (Pavley) Alternative Transportation Fuels Plan Proceeding," CEC Report CEC-600-2007-004-D, February 2007.
[14] Well-to-Tank report Table 3-15.

the ISOR for AB 1493 shows a GHG reduction of 62% for a PHEV20[15]. While it would take a very high EER to reach a 62% benefit, the 40% benefit which TIAX calculates is too low. We were unable to determine exactly the cause of this inconsistency.

B. Choice of EERs for EVs

The TIAX's analysis of EVs to determine EERs mainly compares a lot of older technology. Of the newer technology listed in Table 3-6 of their tank to wheels report, the EVs with LiOn batteries have EERs from 4 to 6.5. There is one vehicle currently being produced by AC Propulsion called the eBox which compares directly to a Scion xB. In conversations with Tom Gage of AC Propulsion[16], he indicated that the DC fuel economy for the eBox was 0.19 kWh/mi for city and 0.22 kWh/mi for highway. Applying an 85% efficiency to obtain AC fuel consumption and applying the federal test procedure weighting to obtain composite fuel economy, the eBox has a gasoline equivalent fuel economy of 139.3 mpgge. Comparing that to the 2006 Scion xB with a fuel economy of 31 mpg gives an EER of 4.5. Since this is not particularly an aerodynamic vehicle, further improvements can be seen in other newer electric vehicles compared in Table 3-6, Tank-to-Wheels, of the TIAX report. These include the 2006 Tesla Roadster with an EER of 6.5 and a 2004 GM EV-1 with a LiOn battery with a EER of 5.12. **We therefore recommend an EER of 5.0 be used for EVs as any electric vehicles produced in the near future will most likely have LiOn batteries.**

In addition, there were side by side tests done on the SCE loop for both the Toyota RAV4 EV with a NiMH battery and the Ford Ranger with a lead-acid (PbA) battery. The results are given in Table 1, which shows higher EERs than cited in the TIAX report in table 3-6 in the Tank to Wheels report. **CalETC respectively requests and recommends that the incorrect data in the table 3-6 be replaced with the correct data we have provided.**

Table 1. SCE Loop Comparisons

Electric Vehicle	SCE Loop AC FE (kWh/mi)	Gas Equiv FE (mpg)	Gasoline Vehicle	SCE Loop FE (mpg)	EER
Toyota RAV4 Ni-MH	0.29	115.5	Toyota RAV4 - 2WD - Auto 2.0L	29	3.98
Ford Ranger EV PbA	0.397	84.3	Ford Ranger - 2WD - Auto 2.5L	21.6	3.90

CalETC also believes there is an incorrect statement in the first paragraph on page 3-14 of the Tank-to-Wheels report, and we respectively request and

[15] Same as footnote 6.
[16] Personal communication with Tom Gage of AC Propulsion, March 16, 2007.

recommend that it be deleted. The 2nd sentence states: “Unfortunately, energy consumption data for electric vehicles is not available from comparable test methods with gasoline vehicles.” We believe the opposite is true, and TIAX even provides some examples in Table 3-6. Here are examples of why we make this point:

1) Southern California Edison, for example, has been conducting side-by-side tests on the Pomona urban and freeway test loops between EVs and their gasoline counterparts for many years. Much of this data was done for USDOE and is on the Idaho National Engineering Laboratory website.

2) The HEV Working Group produced peer reviewed, consensus analysis, using the Advisor model which is an apples-to-apples fair comparison (see above comments on this report).

3) Other examples include side-by-side dynamometer testing, and analysis by Argonne National Lab which helps run road testing in the NESEA Tour de Sol each year.

7. **Comparison to Prior Reports**

There have been many prior reports by CEC, CARB, utilities, and environmental groups comparing gasoline vehicles to electric vehicles and plug-in hybrid vehicles. We did not have time to do a full comparison between them and this report. However, this is needed.

As today’s vehicles become cleaner for criteria pollutants, we have noticed that the upstream NMOG emissions from refueling, spillage, and other upstream sources can be larger than the tailpipe and evaporative emissions from vehicles. We wonder if this was done correctly in this draft report. For example is in our comment section 6A on the different GHG reduction numbers in AB 1493 staff report for PHEV 20s. Another example, in the Well-to-Tank report page A-7, the grams per mile of VOC is 0.048 grams per mile for the conventional gasoline car. However, this is much lower than the 0.078 grams per mile NMOG in the CARB staff report, August 7, 2000 (table 9-3 for a SULEV II DR), and the 0.071 grams per mile NMOG for a mid-size car (SULEV) in the HEVWG report (page B-9). If a full size SUV (SULEV) is used, the NMOG is even higher - 0.101 grams per mile (see HEVWG report page A-11). At minimum, CalETC recommends that there be more transparency, and that the data be provided for all of the upstream NMOG emissions, including spillage, refueling and similar emissions. This becomes very important for gasoline, ethanol and other fuels.

8. Vehicle-to-Grid Potential

Page 4-2, Well-to-Wheels, notes a counterproductive effect of Renewable Portfolio Standards (RPS): additional windpower can necessitate idling natural gas boilers because windpower is intermittent and therefore requires immediate backup to be available. It should also be noted that penetration of electric-drive vehicles may allow for vehicle-to-grid power, which will counteract this problem, potentially also offsetting the necessity for peaker plant construction. If electric drive vehicles contain an excess of energy (from off-peak generation) when wind generation is unavailable or during peak hours, utilities may be able to purchase this power back from vehicle owners. Additionally, since EVs and PHEVs can be charged with intermittent generation, market penetration of these vehicles will facilitate additional wind generation. **We suggest the following language be added after the last sentence in Section 4.1.3 of the Well-to-Wheels Report:**

However, using vehicle-to-grid technology and smart-charging, electric vehicles, and plug-in hybrid electric vehicles, have the capacity to counteract this result. EVs and PHEVs can be charged with intermittent generation, and market penetration of these vehicles will therefore facilitate additional wind generation to be brought online. Within the timeframe of this report, vehicle owners will likely also be able to sell power to the grid, further offsetting the need to provide backup for intermittent resources.