



18 January 2008

ETAAC
c/o Steve Church <schurch@arb.ca.gov>
Research Division
California Air Resources Board
1001 I Street, PO Box 2815
Sacramento, CA 95812

Re: ETAAC Discussion Draft 12/21/2007, Appendix IV

Dear Mr. Church,

We are pleased to make three comments on the 12/21/07 ETAAC Discussion Draft. We plan to submit these by topic in three separate emails, rather as one large item. This submission concerns "Appendix IV: Background Status Report on Energy Technologies", section "I. Enabling Technologies: Plug-in Electric Vehicles" and in particular the discussion of PHEVs technology. A related comment is being submitted on Appendix V.

Page 9-52, Technology-Specific Barriers, discusses two issues intertwined that would best be separated. In this section it is appropriate to discuss V2G issues. PHEV/BEV issues belong elsewhere.

Wherever the existing PHEV/BEV discussion is placed, it should be made accurate. It is currently inaccurate and misleading.

Page 9-52 says that additional R&D is needed for longer-lasting batteries. The report then goes to point out that "Nano-batteries promise to boost these numbers to 9,000 cycles and a 20 year lifespan." The report should add that such batteries are not future products, but exist in consumer products and are being produced today in quantity. The cited lifetime is more than adequate, and directly contradicts the need for lifetime R&D. Future R&D will no doubt lead to still better technology (a call for R&D could be added to every single item in the ETAAC report), but it is inaccurate to say it is needed; the 9,000 cycles of existing advanced lithium batteries is more than sufficient for PHEV/BEV applications. NiMH battery technology from the 1990s is likewise capable of battery pack lifetimes that are sufficient for PHEV applications, as evidenced by the HEVs and BEVs still in service after many years and miles. Again, to say that R&D is needed is inaccurate. This section should be written to clearly state that existing technology is sufficient.

Page 9-52 could also be misleading in its discussion of conventional lithium cobalt oxide (LiCoO₂) battery shortcomings, coming as they do after the discussion of advanced lithium technologies (e.g. Lithium iron phosphate/LFP/LiFePO₄ or Lithium Titanate Spinel - Li₄Ti₅O₁₂), the reader could be misled that this applies to the advanced technologies. It is unclear that LiCo safety needs to be discussed at all when inherently safe lithium batteries now exist.

Page 9-52 also says that additional R&D is needed for greater electric-only range. It is unclear what the ETAAC means by this. Electric-only range is a linear function of battery pack capacity.

Existing battery technology can provide electric-only range that is sufficient. The only issue that the ETAAC may be raising is one of cost. Deployment of existing technology will lower battery pack cost far more than R&D will, as volume appears to be the most significant driver of cost. The cost reductions (and capacity increases) of 18650 LiIon cells over the last 15 years illustrate this well. What is needed is not research but deployment of PHEVs to begin to drive volume for the NiMH and advanced lithium batteries that already exist. This section should be written to recommend barriers to immediate deployment be removed.

Page 9-52 adds that “When operating on liquid fuels, the heavier batteries can pose a weight penalty.” What is misleading about this statement is that it ignores the significant improvement that results from this “weight penalty”. As after-market conversions clearly demonstrate, the weight penalty is not significant and the benefits are large. The misleading statement should be removed.

Page 9-52 also says “The operating costs of PHEV/EV in electric-only mode are much lower than liquid fuel vehicles, but the upfront costs for a PHEV/EV are much higher. At present, the price premium is in the \$7,000-10,000 range. Much of the higher upfront cost can be traced to batteries.” The \$7,000-\$10,000 estimate is inaccurate and misleading for a PHEV. It should either be removed or accurate information substituted. Of course an after-market conversion of a HEV into a PHEV has a large cost, much of which is labor to accomplish something that was not intended in the original design, and much of which is the purchase of batteries in very small quantities. Conversion costs are not indicative of what it would take an automaker to add a plug to a hybrid, which consists of additional batteries and a AC to DC converter for charging from the plug. To add 20 miles of electric range to a HEV requires increasing the capacity of the existing battery pack by approximately 5400 Wh. With volume, NiMH batteries from an American supplier are currently \$0.60/Wh, which gives an additional battery cost of \$3,240. Current LiCo batteries (18650 cells) cost approximately \$2 for 2Ah, or \$0.27/Wh, giving an incremental cost of \$1,458, but having safety issues to deal with. Inherently-safe lithium batteries with very long lifetimes, such as those in current power tool products, do exist and are close to the NiMH price cited above. The inaccurate and misleading data should either be deleted or corrected.

What the PHEV discussion does not say, but should, is that the cost of additional batteries is recovered by the reduction in operating cost of the vehicle. Thus PHEVs benefit the environment/climate, national security, and at the same time do not cost the consumer money over the vehicle lifecycle.

While the “Institutional” paragraph is true, it is unclear what it is doing under “Technology-Specific Barriers” except to cast further Fear, Uncertainty, and Doubt upon PHEVs. It really adds nothing to the report. If moved rather than deleted, then if ETAAC won't do its own analysis, it should cite the analysis of others, such as EPRI, rather than simply using a general statement.

Sincerely,



Jay Friedland
Legislative Director
Plug In America