

Email sent to Tom Cackette from Menahem Anderman June 22, 2007

ADVANCED AUTOMOTIVE BATTERIES

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From the desk of: MENAHEM ANDERMAN, Ph.D., PRESIDENT

June 22, 2007

Dear Tom,

I hope you are doing well during this period of change and uncertainty.

I have read the ARB Expert Panel report and found that several sections of the Report contain much good information and analysis. In contrast with this, I found that the discussion of the PHEV opportunity is off the mark in several respects. Consequently, I wanted to alert you to the discrepancies and inaccuracies that jumped out at me while I was reading it.

- 1) The panel estimate for the size of the PHEV batteries is too small. Essentially all experienced experts in the industry agree that the battery could not be cycled to more than about 60% of its energy (i.e. between about 30 and 90% DOD).
- 2) The panel estimate for the cost of the PHEV batteries is too low.
- 3) The panel estimate for the cost of the existing HEV batteries is too high. Price level is already approaching \$1000/kWh, leading to pack prices between \$1,000 to \$2,000 for the existing HEVs.
- 4) The panel assertion that the cost differential between a PHEV and HEV is only \$800 to \$1200 is off. Our study reveals that for a 10 mile (all electric range), a Camry hybrid will require a 5-6 kWh PHEV battery at a cost of \$3000 to \$4000, versus approximately \$1,600 paid for the existing 1.6kWh HEV battery.
- 5) Since the daily fuel saving of an E-10 hybrid over a conventional hybrid is only 40 cents per day (for \$3/gallon gasoline and 10 cents per kWh), the payback for a battery that costs \$2,500 more than an HEV battery is 20 years (even without discounting back to the time of purchase).
- 6) The panel assertion that there is data that suggests Li Ion batteries can meet the cycle life requirements of PHEV is misleading since it is calendar life at high state of charge particularly at above room temperature that is most eroding to Li Ion battery life. The

data that the panel refers to from the Southern California Edison test avoided that condition and is thus of limited relevance and should not be extrapolated to life in an operating vehicle.

7) The panel assertion that PHEV offers no consumer compromise is flatly wrong. Cargo volume is a significant consumer attribute and PHEV batteries, if installed in an existing platform, will occupy much of the cargo space. In fact the few companies with field experience with strong HEVs (Toyota, Honda, and Ford, PEVE, and Sanyo) unanimously agree that fitting in an existing sedan a battery that will support even a 10 mile PHEV is very challenging. For over 10 miles it is impractical.

Finally the Panel statements at the end of the executive summary that: “***The Panel’s projection is that PHEVs...will proliferate rapidly, ..leading to commercially viable PHEVs***” is highly doubtful. The issue of battery warranty alone prohibits any commercial basis for PHEV in the short term.

I also would like to bring up a regulatory issue.

I encourage the ARB to look at the big picture and ask what can be done to make the most impact on the environment inside a 10 to 15 year time frame that has high likelihood of success. To me the obvious answer is pushing forward with the ATP PZEV component of the Mandate. Why not extend it to 20% (or more)? It is technologically proven, commercially viable and environmentally much more significant than whatever will be done inside the 2% Gold Category. I have no specific recommendation regarding PHEV except for alerting you to the fact that PHEV will not achieve commercial volumes (that is more than 10,000 cars) inside the next 8 years unless regulated.

Tom, due to the significance of the subject and the large amount of non-credible information in the public domain, I feel it would be negligent on my part not to provide you with this input, especially since I am called upon to communicate these understandings in public forums.

I hope you will accept this in the spirit in which it is offered, that is as an impartial contribution from my intimate understandings of the subject matter, for the good of society, the environment and our beautiful state that your agency is working so hard to conserve.

With kind regards,

Menahem Anderman

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