AIR PRODUCTS

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California Energy Commission
Dockets Office, MS-4
ATTN: Docket No. 06-AFP-1
1516 Ninth Street
Sacramento, CA 95814-5512

RE: Docket No. 06-AFP-1 Alternative Fuels Transportation Plan

On behalf of Air Products and Chemicals, Inc. we are pleased to provide comments concerning AB 1007 State Alternative Fuels Plan reports: 1) Alternative Fuels Plan Storylines, and 2) Alternative Fuels Economic Analysis. Both reports were issued on October 14, 2007.

In review of the information contained in these reports, Air Products firmly believes the reports require further review and understanding by the CEC in the following key areas:

- Update Hydrogen Fuel Cell Vehicle (H2 FCV) greenhouse gas emissions and analysis to reflect the higher Energy Equivalent Value (EEV) for H2 FCV's in the latest report.
- Update Hybrid Electric Vehicle/Plug-In Hybrid Electric Vehicle (HEV/PHEV) greenhouse gas emissions and analysis to reflect the lower EEV for HEV/PHEV's in the latest report.
- Provide a consistent baseline vehicle miles traveled assumption to all alternative fuel transportation platforms.
- Incorporate long-term hydrogen supply evolving to alternate feedstock sources into the Hydrogen Fuel Cell Vehicles (H2 FCV's) pathway and analysis.

The attached tables provide specific detail regarding these major areas of concern along with additional comments. Table 1: Alternative Fuel Storylines Comments, and Table 2: Alternative Fuels Economic Analysis Comments. Our comments are based on a 50 year plus experience in providing hydrogen to the industry and constructing over 75 fueling stations around the world.

Air Products would like to thank the California Energy Commission for taking the initiative to understand the underlying facts on hydrogen and other alternative transportation fuels and taking a leadership position to effect such. We appreciate this opportunity to submit comments concerning these reports supporting the AB 1007 Alternative Fuels Transportation Plan. We welcome the opportunity to discuss our comments and viewpoints further with the Energy Commission.

Please feel free to contact me at (610)481-5222 if you have any questions or would like to discuss further.

Sincerely,

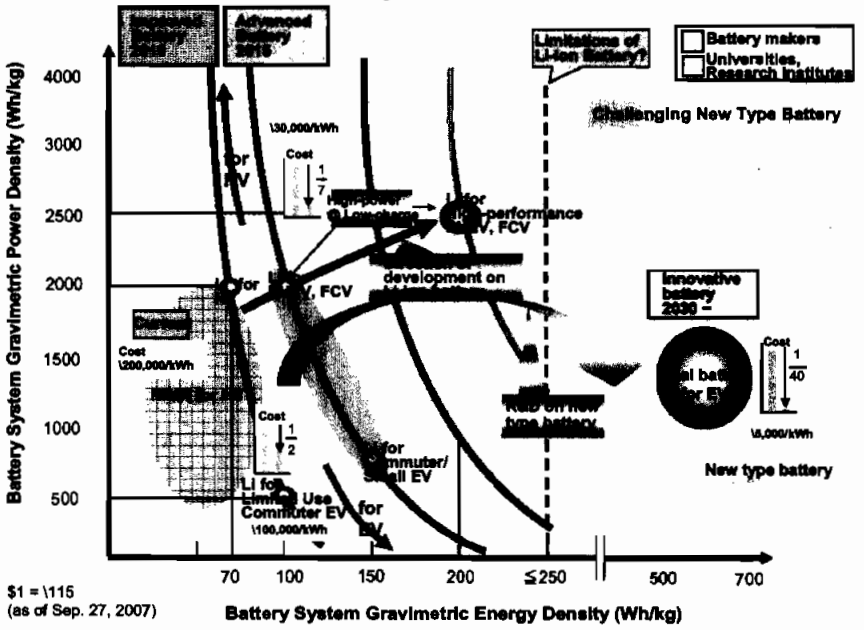
Brian B. Bonner
Product Manager
Hydrogen Energy Systems

TABLE 1: Alternative Fuels Plan Storylines Comments

1. Page 6 states: It should be noted that adding 2,000 million gallons of gasoline equivalent (GGE) of hydrogen production.....requires only a 22 percent increase over present U.S. capacity.	1. In reference to Figure 4 on page 6, California's FCV Hydrogen Consumption alone is approximately 1,500 and 2,000 million gasoline equivalent in 2050 for DOE scenarios 2 and 3, respectively. Is the 22 percent increase for California only?
2. Figure 6, page 9: Relative GHG Emissions, WTW – The relative GHG reductions for hydrogen FCV in the latest storyline report does not reflect the improvement in the FCV Hydrogen EER from the previous storyline report issued 31 May 2007.	2. Basis: One of the key drivers for the GHG emissions reduction for hydrogen is the Energy Equivalent Value (EEV) of the alternative energy pathways in comparison to gasoline. As illustrated in Figure 4 on page 25, the EER for the FCV Hydrogen is 2.4 in comparison to the gasoline baseline. In the previous CEC storyline report AB 1007 Scenarios Hydrogen Fuel Cell Vehicles issued 31 May 2007, the EER for FCV Hydrogen was established at 2.0. The latest storyline reflects a 20% EER improvement (2.4/2.0) for FCV Hydrogen; however, the values for WTW GHG emissions in the current report (Figure 6) are identical to the values for WTW GHG emissions in the May 2007 report (Figure 1-6). By properly reflecting the latest EER for the FCV Hydrogen pathways (FCV SMR/LH2, FCV Coal w/CCS, FCV SMR/Pipeline, FCV Biomass/Pipeline, FCV On-site SMR, FCV Grid Electrolysis, FCV 70% Renewable Electrolyses) the WTW GHG emissions in Figure 6 of the latest report will be 20% lower than the values illustrated. The latest report should be revised to reflect this change AND all other associated analysis that involves Hydrogen GHG emissions data in AB 1007 should be reviewed and revised as necessary.
3. Figure 6 page 9: Relative GHG Emissions, WTW – The relative GHG reductions for PHEV's in the latest storyline report does not reflect the reduction in the PHEV's EER from the previous storyline report issued 31 May 2007.	3. Basis: As illustrated in Figure 14, page 25, the EER for the HEV/PHEV Gasoline vehicle is 1.5 in comparison to the gasoline baseline. In the previous CEC storyline report AB 1007 Scenarios Hydrogen Fuel Cell Vehicles issued 31 May 2007, the EER for HEV/PHEV's was established at 1.65. The latest storyline reflects a 9% EER reduction (1.5 versus 1.65) for HEV/PHEV's; however, the values for WTW GHG emissions in the current report (Figure 6) are identical to the values for WTW GHG emissions in the May 2007 report (Figure 1-6). The latest report should be revised to reflect this increase in GHG's for HEV/PHEV's AND all other associated analysis that involves HEV/PHEV GHG emissions data and analysis in AB 1007 should be reviewed and revised as necessary.
4. Page 22 – Pipeline cost of $783 million/TPD.	4. Air Products has installed and currently operates over 500 hundred miles of hydrogen pipelines and we cannot relate to the hydrogen pipeline infrastructure pipeline cost as presented in the report. The cost of pipeline as defined is excessively high and requires further clarification.

5. Comment: Hydrogen Fuel Cell fork-trucks are not addressed in the Hydrogen Fuel Cell Storyline; however, fork-trucks are one of the main themes in the Electric Drive Technologies Storyline.	5. The fuel cell industry is making inroads into the Motive/Traction Power market that includes fork trucks, material handling, tugs, and other rolling stock. Hydrogen Fuel Cell fork-trucks as an alternative energy carrier should be included in the Hydrogen Fuel Cell Storyline.
6. Hydrogen FCV vehicle miles traveled (VMT) assumption is 12,500 miles per year (page 34). In comparison, PHEV operation is approximately 149,322 miles over 10 year life (page 68) or approximately 15,000 miles per year.	6. Baseline VMT assumptions in AB 1007 need to be held consistent across vehicle platforms. A difference in the VMT across platform will impact: 1) the avoided lifetime fuel consumption and cost of gasoline/diesel of conventional vehicles, and 2) the value of greenhouse emissions avoided over the lifetime of the alternative vehicle purchased during the period. This 20% difference in VMT is significant and the latest report and analysis needs to be changed accordingly.
7. Page 70 - PHEV ownership costs - Regularly scheduled maintenance costs were estimated to be 4.8 cents per mile for a baseline ICE and 0.036 cents per mile for configurations of PHEV's.	7. Considering the major barrier to PHEV commercialization is battery cost and battery life the PHEV ownership costs in regards to maintenance costs can be considered to be overly optimistic.
8. Page 50: The major technical hurdle facing PHEV's is battery performance, as a significant amount of energy storage and battery durability may be necessary to withstand large numbers of deep cycle discharges in operation.	8. According to Japan's MITI battery technology does indeed require significant advancement to achieve the desired characteristics. The necessary advancements are illustrated in the chart Direction of Battery Development for Vehicles. Is this adequately accounted for in the PHEV Storyline?

Direction of Battery Development for Vehicles



Source: http://www.meti.go.jp/policy/automobile/LEV/battery-report.pdf

Table 2: Alternative Fuels Economic Analysis Comments

1. Page 1 states: All hydrogen included in the alternative fuel examples is assumed to be produced through steam reformation of methane.	1. The business premise that all hydrogen be produced through steam reformation is not consistent with Hydrogen Fuel Cell Storyline contained in the State Alternative Fuels Plan Storylines – Staff Working Paper California Energy Commission dated October 14, 2007. Furthermore, the assumption of hydrogen production sourced entirely from steam methane reforming is not aligned with SB 1505 requiring the production and use of hydrogen fuel for transportation purposes be partially sourced from renewable sources of energy. We believe the end game hydrogen economy will involve a different portfolio of feed stocks from today and that nuclear and renewable hydrogen will have to be part of the equation to meet our energy and emission requirements of the future. In fact today's mix of hydrogen production is approximately 80% SMR supplied.
2. Page 2 – 'displace one billion gallons of gasoline equivalent'	2. Time period needs to be defined (i.e. one billion gallons/year of gasoline equivalent).
3. Page 14 Infrastructure Costs - pipelines ($783 million per ton-per-day capacity, beginning in 2031).	3. Air Products has installed and currently operates over 500 miles of hydrogen pipelines and we cannot relate to the hydrogen pipeline infrastructure pipeline cost as presented in the report. The cost of pipeline as defined is excessively high and requires further clarification.
4. Page 14 Infrastructure Costs – SMR stations ($3.3 million per station through 2018, dropping to $2.0 million by 2030); pipeline fueling stations ($2.3 million each, beginning in 2031).	4. The cost of a distributed SMR fueling station will be lower than a pipeline fueling station in the 2030-2031 time period is inconsistent with industrial gas thinking and detailed analysis. Onsite gaseous storage alone is a significant cost required to meet the variable demand pattern. The cost of pipeline fueling stations will be lower than the cost of distributed SMR fueling station for the following reasons: 1) A pipeline station eliminates the cost of the distributed SMR hydrogen generator at the forecourt, 2) Hydrogen supplied to a pipeline station will requires less compression, 3) The amount of high pressure gas storage at a pipeline station will be significantly less than a distributed SMR station, 4) Plot size of a pipeline station will require far less real estate than a distributed SMR station.
5. Page 19 Table 10 and Table 11. For the Electric Drive alternative transportation pathway the maximum cost-effectiveness (net savings) relative to gasoline/diesel exceed the gasoline and diesel fuel price forecasts (Page 8 Table 4) for the 2018-2022 and 2023-2030 time periods.	5. It is not transparent on how the cost-effectiveness of Electric Vehicles on a gasoline gallon equivalent (GGE) basis can exceed the cost gasoline and diesel. This is especially true in Table 11 where no emission benefits are accounted for in the cost effectiveness of the Electric Drive alternative vehicle, and 1) the incremental cost of Electric Drive vehicles purchased during the time period are greater than gasoline vehicles (Table2, Table 6, and Table 7), 2) there is a lifetime fuel cost associated with the Electric Drive vehicle (Table 5), and 3) there is both distribution infrastructure investment and R&D required for the Electric Drive Vehicle (Table 1).