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March 23, 2007

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Subject: AB1007 Full Fuel Cycle Analysis Docket Number 06-AFP-1
Comments on the Full Fuel Cycle Assessment Well to Wheels Energy Inputs, Emissions, and Water Impacts – TIAX Draft Consultant Report dated February 2007 prepared for the California Energy Commission

Ford appreciates the opportunity to submit comments on the CEC Full Fuel Cycle Assessment as presented in draft form in the TIAX February 2007 Draft Consultant Report. Since this report is a monumental effort which integrated comprehensive Well- and Tank-to-Wheel cycle analysis data, Ford's comments in this document reflect limited analysis due to the shortened review period and may change upon more elaborate in-depth analysis and comparison to internal data.

In reviewing the February 2007 Draft Consultant Report, Ford highlights the following main areas of concern: Marginal and Cost Analysis, Carbon Sequestration, E85 HEV, Hydrogen -ICE and -HEV, Electricity, Projected Future VOC and Diesel Emissions. Our recommendations are as follows:

- CEC should include a cost analysis for the fuel types
- CEC should provide WTW analysis on E85 flexible fuel HEV and carbon sequestration applied to fuel types other than H_2 via coal
- CEC should consider revisions to the H_2-ICE WTW analysis based on advanced data and also include a HEV option
- CEC should revisit scenarios for RPS electricity generation, projected future VOC and diesel emissions.

We will be pleased to discuss this information with you or members of your staff. Should you wish to do so, please contact me at 313-322-0033 or Dominic DiCicco at 313-594-2916.

Sincerely,

Robert Brown

Enclosures
cc: docket@energy.state.ca.us

FORD MOTOR COMPANY COMMENTS ON THE STATE OF CALIFORNIA ENERGY COMMMISSION

AB1007 Full Fuel Cycle Analysis - Docket Number 06-AFP-1

Ford appreciates the opportunity to submit comments on the California Energy Commission Full Fuel Cycle Analysis as presented in the Draft Consultant Report dated February 2007. As exemplified by the contents of all three cycle analysis documents, there was a tremendous amount of effort expended in performing this type of analysis. In addition, the assumptions for non-existent data places even greater burdens upon the representation of the final product. Ford is pleased to see such an important study in support of future sustainability efforts. Ultimately, the summary of the Full Fuel Cycle Analysis ought to link together conclusions from other studies that involve cost and feedstock availability in order to allow for optimal overall recommendations for implementation in California.

Ford's understanding is that California's future regulatory environment surrounding fuels (also vehicle compatibility and design) will have a direct link to the conclusions contained within this Full Fuel Cycle Analysis. It is possible that further discussions and a more robust in-depth review of this analysis, the conclusions and assumptions may lead to modifications of our comments or recommendations to better reflect new information. The raw data and assumptions used in the Fuel Cycle Analysis are critical to the entire process and require the utmost scrutiny to ensure correctness to aid in the prevention of potential future confusion or distress throughout the regulatory process. Therefore, it is prudent that the California Energy Commission, University of California-Davis and the Air Resource Board keep in mind the careful consideration for any additional relevant data as they may become available and make every attempt to integrate such information into the final product as appropriate.

Unfortunately, the relatively short notice and comment period precludes a robust review of each fuel contained in each of the three technical documents. The comments contained herein are made with the understanding that a more extensive sort of analysis or comprehensive review may yield additional comments or modifications to the statements found below. One possibility is to provide the opportunity for continued analysis con-current with the actions and tasks assigned to the University of California-Davis. This may allow the possibility for a more in-depth review without jeopardizing the current schedule. Ford comments contained in this document are based on our analysis to date, focusing efforts towards the Well to Wheel report.

As described previously, the Full Fuel Cycle Analysis prepared by TIAX LLC is to be used as the basis by the University of California – Davis to develop roadmaps for passenger car fueling scenarios which show feasibility in achieving the California Governor's objective for fuel-carbon content reduction by 2020. This Full Fuel Cycle Analysis has the potential of redirecting future energy sources and availability which directly impacts future vehicle product offerings. Therefore, taking the necessary time to pour over the intricate and complicated details of the findings and assumptions used to produce fuel-specific GHG values is prudent behavior. California is leading the way into the future in this regard. Supporting good science and technical analysis is beneficial to all stakeholders and ultimately, the public at-large. Good public policy can only be as good as the scientific foundation that is used to create such policy. Ultimately, a complete understanding of the Full Fuel Cycle Analysis is necessary to judge the reasonableness for the final GHG values assigned to each fuel type.

Ford comments contained in this document are based on the analysis to date and considering our available future advanced powertrain designs, technologies and emission control system options. The following section contains specific items of concern addressing:

1. Marginal Analysis
2. Cost Analysis
3. Carbon Sequestration
4. Hydrogen ICE
5. E85 Flexible Fuel Hybrid
6. Electricity Generation
7. Projected Future VOC Increase
8. Diesel Emissions
9. GHG Figure 3-8 Modification

1. Marginal Analysis

There appears a need to more thoroughly define and describe the scenarios for which the "marginal" analysis applies to the fuel types in this report. How would Full Fuel Cycle emissions be accounted if California experiences increased fuel consumption which is beyond the scope of this report? Newer fuels may then become a larger total volume fraction. What happens to emissions created beyond the boundaries of the state? If alternative fuels are delivered to California from out of state, which states are assumed? Are all of the assumed production and delivery processes adequately described in the documents? Are there additional details which can help to explain the scenarios for which the analysis was completed? It is our understanding that each fuel type may have been developed based on different sets of assumptions which then may influence the net final Fuel Cycle Analysis result. Where could changes to the fuel type "marginal analysis" assumptions result in significant changes in the analysis leading to different fuel-specific GHG conclusions with respect to the fuels being displaced?

2. Cost Analysis

Is there a cost element associated with Fuel Cycle Analysis for each fuel type? If not, is it possible to incorporate CO_2 abatement cost estimates for fuel types on a CO_2 basis? For each of the fuel types options made available, there appears to be a need to describe the following: the time to develop adequate distributions and vehicle compatibility, the speed at which specific fuel types can be made available to customers, and the viability for long-term continued uninterrupted supply?

3. Carbon Sequestration

In the hydrogen analysis, as contained in Figure 3-25 and 3-26, what is the fundamental reason for using carbon sequestration for the H_2-coal case and not applying the technique elsewhere? Recognizing that current carbon sequestration methodologies are expensive and consume energy; would it not be beneficial to provide a generic correction which could be applied to other fuel types? For example, NG steam reforming for hydrogen production and NG combined cycle for electricity generation seem to be capable of benefiting from carbon capture and storage options. As shown in the document, the NG WTT CO_2 emissions for hydrogen is around 100 g/MJ (WTT Report, Fig. 7-23, p. 7-38), and for electricity, it is roughly 150 g/km (WTT Report, Fig. 7-20, p. 7-32), and the corresponding WTW CO_2 (or GHG) emissions are all relatively high (See WTW Report, Fig. 3-26 and Fig. 3-20).

4. Hydrogen ICE

Hydrogen ICE data and assumptions require some additional review and verification. Since Ford performed in-depth development in the area of H_2–ICE, our experts have found some discrepancies with the following:

- Fuel Economy estimates for H_2ICE appear low.
  In reviewing the information contained in the Tank-to-Wheel analysis and using one of our more popular vehicles as a standard to compare gasoline engine performance to H_2ICE performance; the Ford H_2ICE version of a similar gasoline vehicle improved fuel economy by approximately 20% while the H_2ICE combined with HEV more than doubled this fuel economy gain and Ford's fuel cell version nearly tripled the gain.
- Emission estimates for the H_2ICE appear high.
  The use of advanced aftertreatment devices in the Ford H_2ICE has been shown to be capable of meeting SULEV emission values for NMHC, CO and NOx.

Thus, these two inconsistencies combine in the Tank to Wheel analysis to form an equivalency between the H_2ICE and gasoline ICE which is inconsistent with Ford data. Furthermore, there is also concern with the lack of analysis comparing a H_2ICE-HEV option with H_2 FCEV; Ford data agrees with SCAQMD data showing nearly 90% of the H_2 FCEV fuel economy is achievable via a H_2–ICE-HEV equivalent vehicle.

5. E85 Flexible Fuel Hybrid (FFV-HEV)

WTW Report, Fig. 3-7, p. 3-9 discusses ethanol and various methods to produce E85 for use in flexible fueled applications – why is there not an entry for an FFV-HEV?

6. Electricity Generation

In the case of electricity, it appears inappropriate to arbitrarily expect that the marginal fossil source of electricity is to be natural gas with processes that comply with California's RPS (See the WTT Report, p. 2-2). This assumption likely leads to an optimistic estimate of the marginal emissions, since currently roughly 50% of US electricity is generated from coal. If one further suggests that 20% of the electricity generated is to originate from new renewable energy sources (WTT report, p. 2-3), the question becomes what year is this possible? Then, the question becomes, how realistic is this scenario? There appears to be insurmountable hurdles to achieve this goal in the next 10-20 years.

7. Projected Future VOC Increases

WTW Report Fig. 4-4, p. 4-8 shows increasing emissions. Which types of fuels are being used to displace existing fuel sources? Is this analysis projecting the use of a fuel with higher WTW emissions (such as "Tar Sands") to displace conventional fuels in greater quantity in the future, thus, the increases in VOC's is related to its more extensive use? Explanations for these phenomena are needed, since as older vehicles are replaced by newer, cleaner vehicles an expectation is that emissions will decrease.

8. Diesel Emissions

General concern is the TTW analysis of diesel emissions shows greater VOC than gasoline vehicles. What type of diesel vehicles are being used for reference as a comparison? This analysis seems inconsistent with previous analyses.

9. GHG Figure 3-8 Modification

WTW Fig. 3-8, p.3-10 appears a little confusing since the bar charts extend to both the left (on top of text) and to the right. A potential better option may involve the introduction of a column to the right where net GHG values are listed for each fuel, then shift the text left to allow full viewing of the bar chart to avoid overlap of bar chart and text. At first glance the chart seems to send a confusing message.

Summary

We urge the California Energy Commission to allow ample opportunity for continued additional in-depth analyses of the Full Fuel Cycle Assessments by stakeholders con-current with the next tasks outlined as the process proceeds toward a defined California policy. The final assessment set forth in the Fuel Cycle document may be used by others outside of California to initiate efforts in other States, thus it is necessary to include the most up-to-date information to avoid possible subsequent misdirection to other regions. Ford Motor Company recognizes the importance of implementing Full Fuel Cycle Assessments to guide the future regulatory and policy decisions to reduce the carbon content of fuels. However, prudence must be incorporated into the process.

Ford fully endorses a sustainable sensible approach to achieve California's goal of reducing the carbon content of fuels using Full Fuel Cycle Assessments, but remains firm in the following recommendations and consideration of new information which becomes available.

Ford further recommends that the:

- CEC should include a cost analysis for the fuel types
- CEC should provide WTW analysis on E85 flexible fuel HEV and carbon sequestration applied to fuel types other than H_2 via coal

- CEC should consider revisions to the H_2-ICE WTW analysis based on advanced data and also include a HEV option
- CEC should revisit scenarios for RPS electricity generation, projected future VOC and diesel emissions.

We thank the State of California and the California Energy Commission for giving us this opportunity to send our comments regarding this important topic and look forward to working with you and other stakeholders to achieve our common goals.