



WSPA Comments on ARB LCFS Program Review Advisory Panel – June 30/July 1

Topics 6 & 7 – Supply and Availability

1. It is recommended that the Supply and Availability section be combined with the Technology Assessment section (see comments in that section below).
2. The outline¹ for the Supply and Availability section does not, but should, cover all of the questions identified in the Draft Workplan.² In addition, it does not reflect the many comments in this area provided during the Second Panel Meeting. These comments should also be included and addressed.
3. We have provided in the attached the “LCFS Compliance Challenge” charts that were shared during the Advisory Panel meeting. A few minor edits were made subsequent to the meeting to ensure the broadest range of ethanol CI’s was included.

The charts are based on a simple tool developed by ARB (Excel spreadsheet) that calculates the minimum carbon intensity values of biofuels that will be needed to meet LCFS targets in successive years without any carryover credits. For the gasoline & diesel compliance case, the equations from the tool were supplemented by diesel deficit calculations per the regulations. The analysis assumes no change to the current 10 per cent biofuels blend wall and assumes no E85.

The first chart shows the ethanol CI requirements for gasoline complying by itself with the current CaRFG regulations. The second chart shows the ethanol CI requirements with diesel compliance being achieved through overcompliance in the gasoline pool. This situation is relevant due to the uncertainty of a path for blending biodiesel. In both graphs, only fuels that can be consumed in conventional gasoline and diesel vehicles are considered, as these vehicles will constitute a vast majority of the California fleet for the foreseeable future.

E2 Outline – Advanced Biofuel Market Progress Report – Since the information contained in the E2 outline is not complete (e.g., no delineation of what fuels are being projected to be produced from the facilities, nor the CI of the fuels), WSPA was unable to comment on the information provided. Instead we have provided two attached spread sheets based on information taken directly from the Energy Information Administration’s website. The information is a compilation of data from EIA which projects U.S. consumption of ultra low carbon fuels in 2015 and explained in the outline as follows:

¹ See http://www.arb.ca.gov/fuels/lcfs/workgroups/advisorypanel/20110630_SupplyOutline_v2.pdf.

² See http://www.arb.ca.gov/fuels/lcfs/workgroups/advisorypanel/20110421_draftworkplan.pdf.

WSPA Outline - Potential “Ultra-Low Carbon Fuel” Volumes in Calendar Year 2015

During the June 30 - July 1 Advisory Panel meeting, there was some discussion related to the potential availability of “ultra-low carbon fuel” (ULCF) in calendar year 2015. In this context, ULCF was defined as a fuel with a carbon intensity reduction of 50% relative to the gasoline or diesel baselines. It was suggested by one of the Panel members that 4.86 billion gallons of ULCF would be available in calendar year 2015. Because this estimate appears to be based on confidential information that is not publicly available, WSPA sought alternative sources of biofuel projections to serve as a comparison point to this estimate.

One source of biofuel consumption projections in the U.S. is the Energy Information Administration’s (EIA’s) Annual Energy Outlook (AEO) series. EIA publishes its projections of energy use in the U.S. every year, and as part of that effort, estimates of renewable energy consumption are included. The most recent report, the AEO 2011, was published in April of this year (see <http://www.eia.gov/forecasts/aeo/>). For this assessment, WSPA used the AEO 2011 “Reference Case,” which EIA describes as follows:

Under the assumption that current laws and regulations remain unchanged throughout the projections, the AEO2011 Reference case provides the basis for examination and discussion of energy production, consumption, technology, and market trends and the direction they may take in the future. It also serves as a starting point for analysis of potential changes in energy policies.

Based on the above description, it is our understanding that the Reference Case projections account for regulations currently in effect, which would include the biofuel mandates arising from the U.S. Environmental Protection Agency’s Renewable Fuel Standard. Thus, these estimates represent the U.S. government’s projections of the use of various types of biofuels into the future.

In addition to a summary report, EIA publishes over 150 tables containing detailed estimates of energy use throughout the U.S. economy. The tables can be downloaded at http://www.eia.gov/forecasts/aeo/tables_ref.cfm. Of particular interest for biofuels estimates is Summary Table 17, “Renewable Energy Consumption by Sector and Source,” which contains forecasts for ethanol, biodiesel, liquids from biomass, and green liquids. The forecasts for calendar year 2015 are summarized below in Table 1. AEO Table 17 further breaks down ethanol and biodiesel by feedstock source; this is also summarized in Table 1 below.

The forecasts in AEO Table 17 are reported in quadrillion BTUs (i.e., 10^{15} BTUs), and therefore conversion factors are needed to estimate biofuel volumes. Those conversion factors are also tabulated by EIA in Supplemental Table 147, “Conversion Factors.” The conversion factors were applied to the energy-based projections to arrive at the biofuel

volumes summarized below in Table 1. As observed in that table, total ethanol use for transportation in 2015 is projected to be 15.8 billion gallons, biodiesel use is projected to be 1.17 billion gallons, liquids from biomass are projected to be 0.16 billion gallons, and green liquids are projected to be 0.09 billion gallons.

Table 1

Calendar Year 2015 Forecasts from EIA's Annual Energy Outlook 2011 Reference Case Renewable Energy Consumption by Sector and Source - Transportation Sector			
Fuel Type	Energy Consumption^a (10¹⁵ BTUs)	Conversion Factor^b (10⁶ BTU/Barrel)	Biofuel Volume (Billion Gallons)
Transportation Sector			
Ethanol used in E85	0.0057	3.539	0.07
Ethanol used in Gasoline Blending	1.3259	3.539	15.74
Biodiesel used in Distillate Blending	0.1496	5.376	1.17
Liquids from Biomass ^c	0.0206	5.504	0.16
Green Liquids ^c	0.0122	5.504	0.09
Sources of Ethanol			
From Corn and Other Starch	1.2423	3.539	14.74
From Cellulose	0.0144	3.539	0.17
Net Imports	0.0749	3.539	0.89
Total Ethanol			15.80
Sources of Biodiesel			
Soy Based	0.1019	5.376	0.80
Yellow Grease	0.0088	5.376	0.07
White Grease	0.0329	5.376	0.26
Net Imports	0.0060	5.376	0.05
Total Biodiesel			1.17

^a Data extracted from "aeotab_17.xls" available at http://www.eia.gov/forecasts/aeo/tables_ref.cfm.

^b Data extracted from "suptab_147.xls" available at http://www.eia.gov/forecasts/aeo/tables_ref.cfm.

^c Note that a conversion factor for "liquids from biomass" and "green liquids" is not included in "suptab_147.xls". The value used in the calculations was assumed to be the numerical average of ultra low sulfur diesel (5.755) and pure gasoline (5.253), which are included in "suptab_147.xls".

Combining the liquids from biomass and green liquids into a single category and combining the yellow grease and white grease biodiesel into a generic "waste grease" category, the projections in Table 1 can be summarized as follows, in billion gallons per year (BGY):

1. Corn/Starch Ethanol = 14.74 BGY
2. Cellulosic Ethanol = 0.17 BGY

3. Imported Ethanol = 0.89 BGY
4. Soy Biodiesel = 0.80 BGY
5. Waste Grease Biodiesel = 0.33 BGY
6. Imported Biodiesel = 0.05 BGY
7. Biomass to Liquids (BTL) + Green Liquids = 0.25 BGY

Using the carbon intensity values that have been approved for use by ARB and are in Tables 6 or 7 of the regulation (see <http://www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf>), have been approved via the Method 2A/Method 2B procedure, or are one of ARB's priority pathways (see http://www.arb.ca.gov/fuels/lcfs/2a2b/062411lcfs_apps_sum.pdf), or have otherwise been published by ARB, it is possible to estimate how much of the total biofuel volume forecasted by EIA to be used in calendar year 2015 would be considered ULCF. Based on ARB's best-case published carbon intensity estimates, the following pathways are **NOT likely** to be ULCF for the following reasons:

1. Corn/Starch Ethanol: The best-case corn/starch ethanol is at 56.56 gCO₂e/MJ for a sorghum/wheat slurry/corn pathway, which does not meet a 50% reduction vs. gasoline (see pathway ETHGW013 in http://www.arb.ca.gov/fuels/lcfs/2a2b/062411lcfs_apps_sum.pdf).
3. Imported Ethanol : Assuming that the imported ethanol is Brazilian sugarcane (no other imported ethanol has been analyzed by ARB), ARB's best-case estimate is 58.40 gCO₂e/MJ which does not meet a 50% reduction vs. gasoline (see Table 6 of the final regulation).
4. Soy Biodiesel: ARB has estimated the soy biodiesel CI at 83.25 gCO₂e/MJ, which does not meet a 50% reduction vs. diesel (see Table 7 of the final regulation).
6. Imported Biodiesel: A possible feedstock for imported biodiesel is canola. ARB has estimated the CI of that to be 62.99 gCO₂e/MJ, which does not meet a 50% reduction vs. diesel (see pathway BIOD006 in http://www.arb.ca.gov/fuels/lcfs/2a2b/062411lcfs_apps_sum.pdf).

Based on ARB's published carbon intensity estimates, the following pathways are likely to be ULCF:

2. Cellulosic Ethanol (0.17 BGY): For example, ARB has estimated cellulosic ethanol from forest waste to have a CI of 21.4 gCO₂e/MJ, which exceeds a 50% reduction vs. gasoline (see http://www.arb.ca.gov/fuels/lcfs/022709lcfs_forestw.pdf).
5. Waste Grease Biodiesel (0.33 BGY): For example, ARB has estimated biodiesel from used cooking oil to have a CI ranging from 11.76 to 15.84 gCO₂e/MJ and renewable diesel from tallow to have a CI ranging from 19.65 to 39.33

gCO₂e/MJ, all of which exceed a 50% reduction relative to diesel (see Table 7 of the final regulation).

7. Biomass to Liquids (BTL) + Green Liquids (0.25 BGY): Although we are not aware of a specific ARB analysis of pathway #7, an analysis with the CA-GREET model would likely show at least a 50% reduction in carbon intensity relative to the gasoline or diesel baselines.

The above analysis indicates that, based on EIA's biofuel volume consumption estimates and ARB's CI estimates, a total of 0.75 billion gallons of ULCF is projected to be used in 2015 (0.17 + 0.33 + 0.25) in the U.S. This is a substantially lower volume than presented at the Advisory Committee meeting. We are interested in ARB's assessment of the analysis of the EIA data and recommend that ARB verify the 0.75 billion gallon figure independently as well as independently verifying the ULCF availability projections presented to the Advisory Board.

Topics 8 & 12 – Economic Impacts Outline

In the Economic Impacts section,³ ARB staff describes changes proposed to update the economic analysis presented in the 2009 Staff Report. The comments summarized below address both issues with the 2009 analysis that it does not appear ARB is proposing to revisit as part of the update, as well as issues with new assumptions proposed as part of the update.

1. ARB staff is again proposing to analyze scenarios where the costs of bio-refineries and biofuel-related infrastructure are assigned to the federal Renewable Fuels Program (RFS2) rather than the LCFS, while apparently again (as was the case in the 2009 analysis) assigning all of the associated reductions in carbon intensity to the LCFS. ARB staff must perform an incremental analysis of the LCFS relative to the RFS2 program that accurately reflects the additional costs imposed by the LCFS and accounts for the cost and emission impacts of “fuel shuffling” under the LCFS where low CI fuels are drawn to California from other areas of the U.S. where they would have otherwise been used.
2. Similarly, ARB's 2009 analysis attributed the cost of FFV, fuel cell, and various types of battery electric and hybrid vehicles to the ZEV mandate, while claiming credit in the LCFS for the associated reduction in transportation fuel carbon intensity. The updated LCFS analysis needs to clearly attribute costs and benefits of associated programs like the proposed Advanced Clean Car program to one regulatory program or another to avoid double counting of benefits and to ensure a proper accounting of costs.

Another area where programmatic overlap must be considered is with respect to electricity CI and cost—if the staff is going to assume a CI consistent with

³ See http://www.arb.ca.gov/fuels/lcfs/workgroups/advisorypanel/20110630_topic8&12_outline.pdf.

renewable electricity sources, it should also assume electricity costs that are consistent with those sources.

3. ARB staff is proposing to use crude oil prices from the “high price” scenario of CEC’s 2011 Integrated Energy Policy Report (IEPR). As a result, the updated analysis will use crude prices that increase from the maximum of \$88 per barrel in the 2009 analysis to \$121 per barrel. Further, the staff indicates that even higher prices for crude may be considered. No rationale has been provided for considering only a “high price” scenario, and the staff should obviously assess LCFS impacts under a range of crude oil prices.

Topics 9, 10 & 12 – Environmental Impacts Outline

Two aspects of a complete environmental assessment are missing in the outline. First, this section should include an estimate of the GHG reductions expected from the LCFS. The board has asked for indirect effects to be included and staff has been evaluating the indirect land use changes from biofuel production. There are also very significant unintended consequences of California’s LCFS that should be considered. As the LCFS is currently configured, both crude and biofuels will very likely be relocated (shuffled) so that the increase in low CI fuels in California is more from low CI fuel concentration from existing sources, rather than from increased production. Not only does shuffling result in no net reductions in GHG, but there would be increases due to the extra transport.

It is highly probable that ethanol could be loaded onto vessels in Brazil for delivery to the US and then be backloaded with Midwest ethanol to go back to Brazil as a replacement in Brazil’s fuel supply. The net worldwide effect would be to increase GHG emissions. These increases in carbon emissions outside of California can and should be estimated with economic models to determine the net worldwide GHG effect.

The second type of indirect effect that should be included in the environmental assessment is an indirect effect that results from increased biofuel production on croplands in response to a diversion of crops to biofuel production. This is normally called farming intensity and would result from increased water use, fertilizer use and/or increased numbers of crops per year. ARB staff is undertaking the study of indirect land use GHG effects and has taken credit for this increased crop productivity to reduce the ILUC effect. But there is not yet an effort to quantify the GHG implications of this important effect. Since this route for replacing food probably would replace the majority of the crops diverted to fuel production, this indirect effect should get more careful analysis – especially in this update on environmental effects to the ARB Board.

Topic 14 – HCICO Outline

WSPA continues to advocate for a crude oil treatment that does not differentiate. We hired Wood Mackenzie to study the issues and consequences inherent in a differentiation approach and their Panel presentation can be found on the Advisory Panel’s website.

During the workshop there were questions relating to what WSPA's position is relative to crude oil treatment. We've provided below our position, called Option 6, and ask this be included in the overall options. Option 5 – Worldwide Average approach, which has been characterized as the WSPA approach, is actually a second tier preferred approach after Option 6 (note that WSPA does not support the inclusion of an update to refining emissions in the calculation of the average in Option 5).

Option 6. CA Baseline Approach: In this approach, all gasoline and diesel fuels use the existing CI values in the Look-Up Table. When reporting, refiners will only calculate and be subject to the Base Deficit for all refined products regardless of crude. The Look-Up Table values for gasoline and diesel would not be updated.

This option:

- 1) Focuses the LCFS on what should be its primary objective - driving innovation in alternative fuels.
- 2) Greatly simplifies the regulation.
- 3) Avoids crude shuffling and the additional GHG emissions that go along with it.
- 4) Avoids restricting choices in crude supply and any possible, resulting, unintended adverse consequences to California refiners and the market for petroleum products.

Topic 15 – Credit Trading Outline

Several members of the Advisory Panel brought up the subject of adding provisions for credit purchases into the regulations as a potential “off ramp” should the LCFS requirements prove infeasible. WSPA strongly believes that access to such buy-outs is not an acceptable alternative to reasonable, attainable regulations. We also believe that the availability of credits at a fixed price does more to cap credit value than to support it.

A system would require both sides of each transaction to report and it requires reports to match, significantly improving the accuracy and efficiency of such transactions. It documents the transactions and allows public access via a website to aggregated transaction data. This feature significantly improves the "transparency" of the program.

All available credits would be generated and transacted within one system. This could improve validity of credits and reduce need for due diligence programs to verify integrity of credits when traded. This provides a near real time system to assess program health and perform program analyses. Any credit trading system should be implemented via the LRT.

The input to the LRT is volumes (gallons) and fuel pathway or CI (g/MJ) and it calculates credits/deficits (MT CO₂e). Through the regulated party's submissions in the LRT, CARB would have the data to show credits generated and credits retired for compliance. This information however should only be released in the aggregate to protect confidential business information and interests. This information is helpful in allowing individual

participants to evaluate alternative compliance options (low CI alternative fuels vs. purchased credits) as well as helping to make the credit trading market transparent.

In summary, ARB should adopt a process where the clearing of trades is simple, the LRT needs to receive all official information, and public reports should contain aggregated data.

Draft Report Chapter 4 – Technology Assessment

The “technology assessment”⁴ purports to address the technology available for near-term LCFS compliance that is expected to “come on-line in the next several years,” as well as “hurdles and market barriers to market penetration of these technologies.” As summarized below, however, there a number of serious issues that must be resolved to make the assessment meaningful in the context of LCFS compliance.

- It is not clear why the technology assessment plans to address gasoline and diesel fuel in section A.1.a, unless ARB expects that the carbon intensity (CI) values associated with these fuels are going to be changing over time, given that the impacts of high-intensity crudes are to be addressed separately.
- The discussion on biodiesel seems to imply that there are very large quantities of waste oils in the state. A casual reader may infer there are 70 million gallons of low CI waste biodiesel available in California. However, this pathway is limited by the availability of waste oils. As with all fuels, ARB should evaluate the expected production volumes of these fuels to enable a full assessment of overall compliance feasibility. Moreover, this evaluation should reflect the perspective that waste oil feedstock would otherwise be sent as waste to landfills without the motor fuel option. If a bio-oil could be burned in a boiler, for example, it would not qualify as a waste oil.
- The following gasoline and diesel substitutes are currently addressed in the technology assessment:
 1. Ethanol from grains and sugars;
 2. Ethanol from biomass;
 3. Biobutanol;
 4. Electricity;
 5. Hydrogen;
 6. Biodiesel from crops and waste fats and oils;
 7. Biogas;
 8. Natural gas; and
 9. Algal biofuels.

Although ARB staff does indicate that other fuels will be added, conspicuously absent from this list is renewable diesel fuel. It should also be noted that the manner in which substitute fuels are treated in this section appears to be at odds

⁴ See http://www.arb.ca.gov/fuels/lcfs/workgroups/advisorypanel/20110630_chapter4_technology_draft.pdf.

with how the same subject is dealt with in the Supply and Availability section, which, for example, currently lumps ethanol from all sources into two categories—E10 and E85.

- The draft includes specific estimates of the availability and estimated use of selected substitute fuels, as well as estimates of alternative technology vehicle populations; the sources for most of the information presented, however, are not indicated. References should be provided to allow for independent review and verification of that information.
- The draft is disorganized and does not cover different substitute fuel technologies at the same level of detail. It also fails to address key questions, noted below, regarding these fuel technologies.
 1. Current and forecast (~2015) substitute fuel production facilities, facility locations and volumes likely to be available to the California market.
 2. Current and forecast CI values and costs that may be associated with substitute fuels based on the technology assessment.
 3. Distribution and dispensing infrastructure requirements.
 4. The LCFS “compliance increment” (e.g., the portion of overall LCFS compliance) that could be realized through fuel utilization of the available volume of different substitutes.
 5. The LCFS “compliance increment” that is estimated to be realized for each potential substitute given its cost, infrastructure issues, and market penetration of special technology vehicles (e.g., battery electric or fuel cell vehicles or FFVs) required for use of the fuel.

The technology assessment must address these questions in order to allow for the assessment of fuel technology “feasibility and cost-effectiveness” as required by Section 95489(a) of the LCFS regulation. In addition, because the topics they address are inextricably linked, it would likely be better to combine the current Technology Assessment section and Supply and Availability section into a single section.

- At present, barriers to market penetration are addressed only superficially in the report for biogas and hydrogen and are ignored for other substitute fuels. Clearly, there are major potential market barriers facing other substitute fuels, e.g. the cost of electric vehicles and recharging infrastructure is one example, and another is the need for biobutanol-gasoline blends to receive a waiver of federal Clean Air Act preemption under Section 211(f) in order to be used as transportation fuels in the U.S. as well as a successful completion of a multimedia analysis and CBG rulemaking in order to be used in California. The assessment needs to include a

- The issue of current and potential investments in fuel production needs to be addressed separately for each substitute fuel, as it will likely have a significant relationship to the current and forecast volumes and costs of those fuels.
- The discussion of “incentives for ultra-low carbon fuels” is strikingly reminiscent of ARB staff’s attempt to deal with the economic and technological infeasibility of compliance with the electric vehicle sales mandates under the Zero Emission Vehicle Regulation. Revisions to the actual LCFS requirements themselves to account for the realities of the market must also be addressed in any discussion of “incentives” to promote the use of ultra-low carbon fuels.