



South Coast Air Quality Management District

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April 17, 2009

Mary Nichols, Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Chair Nichols:

**Support for California Air Resources Board
Proposed Regulation to Implement the Low Carbon Fuel Standard**

The South Coast Air Quality Management District (AQMD) staff appreciates this opportunity to provide comments on the California Air Resources Board (CARB) staff proposed regulation to implement the Low Carbon Fuel Standard (LCFS). Given that the transportation sector contributes about 40 percent to greenhouse gas emissions, it is imperative that CARB examine all mechanisms to reduce greenhouse gas emissions. More importantly, in light of the on-going significant public health challenges associated with the use of high carbon fuels (such as conventional gasoline and diesel), establishing a performance standard governing the carbon intensity (CI) of these fuels is an important statewide priority to reduce criteria, toxic and greenhouse gas (GHG) emissions. The AQMD staff supports the adoption of the proposed regulation and endorses several key aspects of the proposed regulation including the establishment of separate standards applicable to gasoline and diesel and the incorporation of adjustments for direct and indirect land-use changes (LUC) associated with biofuel options.

The AQMD staff believes that there are several key areas that CARB should consider which will enhance the proposed regulation. We urge the CARB Board to consider the AQMD staff's recommendation at its April 23, 2009 Hearing. The four key recommendations are further discussed below.

Prohibition on Renewable Fuel Standard (RFS) Compliance Shuffling

The overlap between the federal RFS program and the LCFS should be structured to avoid double counting as much as possible. The Initial Statement of Reasoning (ISOR) staff report appropriately addresses the possibility that some degree of “reshuffling” of federal “Renewable Fuel Standard” (known as RFS2) credits could occur. The reshuffling of credits from outside California to the state will incrementally diminish the full benefits that are projected in the staff report. As the staff report notes, “*The total RFS2 mandated volumes of ethanol would satisfy the total volumes required by LCFS.*”¹ Some limitation on possible “RFS shuffling” is therefore needed. However, the regulatory language is silent on this issue.

An example of how this effect could occur is a scenario where refiners decided to ship advanced second generation ethanol produced in the mid-west or on the east coast to the California market for the purpose of co-compliance rather than distribute complying fuels proportionally to local markets for the purpose of RFS2 compliance alone. Under this scenario, “advanced biofuel” deployment could serve to meet both the California LCFS and the federal RFS concurrently, resulting in no net added benefit and actually increasing the amount of rail or ship transport for the same amount of complying fuel. The net result would be increased national GHG emissions, due to the unnecessary added fuel transport distances involved. Such a result is clearly not intended under the proposed regulation, as it directly dilutes the benefits of the LCFS.

The AQMD staff therefore endorses the benchmark noted in the ISOR of 11.3% of the nation’s fuel pool as a referent for the appropriate California share of RFS credit. Since federal RFS2 compliance is expected to require refiners to report specific Renewable Identification Numbers (RINs) for each batch of RFS compliance, CARB should build into its rule the requirement that RINs used in California to meet both the federal and CARB rules should be so labeled, and that such RINs be limited to no more than 11.3% of a refiner’s LCFS compliance volume. **Specifically, AQMD staff recommends that CARB amend Section 95484(d)(2) Record Keeping and Auditing, Evidence of Physical Pathway,² to include a specific requirement that regulated parties should be restricted from applying more than 11.3% of their federal RFS2 compliance volume toward compliance with the LCFS. Additionally, regulated parties should be required to identify the volumes and RIN for which co-compliance credit is being applied under the federal RFS2 as well as under the LCFS.**

Prevention of Criteria Pollutant and Air Toxic Emissions Backsliding

The proposed regulation should explicitly ensure that there is no backsliding with respect to criteria pollutant and air toxic emissions. One possible implication of the proposed LCFS regulation is to increase the amount of in-state biofuel production, transport and

¹ CARB, Proposed Regulation to Implement the Low Carbon Fuel Standard, Volume I, Staff Report: Initial Statement of Reasons (ISOR), pg. VIII-38, March 5, 2009.

² ISOR, page A33.

eration, the AQMD staff strongly believes that AB118 funding is best used in support of projects that use commercially available low carbon fuels and not wait until ultra-low carbon fuels become available, while recognizing the value of a balanced program.

The Attachment to this letter provides more detailed comments and recommendations related to these and several additional discreet issues. We believe they will help to strengthen the proposed regulation, recognizing in some cases that they may require more time to be fully vetted.

Concluding Comments

The establishment of a new performance standard for gasoline and diesel fuel is exceedingly well justified. California is one of the world's largest transportation fuel markets, and represents a significant portion of the global transportation GHG inventory. The need for urgent reduction in fuel carbon is evidenced by numerous accelerating trends with respect to climate change, as well as the serious and acute near term health effects from criteria and toxic emissions. The proposed regulation to implement the LCFS will make a vital contribution to national and international efforts in addressing these needs. The AQMD staff therefore strongly supports the proposed action as a key stepping stone to sustainable transportation fuel use.

The AQMD staff recognizes that the LCFS is an inherently complex regulation. As such, it will benefit from an on-going effort to improve baseline data and methodologies used to determine LCFS compliance. We therefore agree with the CARB staff recommendation to allow the Executive Officer needed flexibility to update, as appropriate, the input assumptions used in individual pathway compliance determinations. In developing the proposed regulation, CARB staff has addressed many important details which are critical to determining the well-to-wheel life cycle carbon content of specific fuel pathway options. As part of the crucial next phase of implementation, it will be very important for CARB to continue to refine and update its input data, assumptions and methodologies underlying its LCFS pathway analysis. The AQMD staff is committed to working closely with CARB in the implementation and continuing refinement of this important regulation.

Looking beyond the 2020 timeframe, there will be continuing need to develop and deploy increasingly low carbon fuels coupled with advanced and alternative fueled vehicles. The proposal before the CARB Board is the first important step in that direction. The proposed regulation represents the world's first direct control of the carbon content of transportation fuels ever enacted.

We look forward to working closely with CARB staff as it moves forward with the implementation of this important regulation. Please feel free to call me or Dr. Chung Liu,

Deputy Executive Officer, Science and Technology Advancement, at (909) 396-2105, if you have further questions regarding our comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Barry R. Wallerstein". The signature is fluid and cursive, with a large initial "B" and "W".

Barry R. Wallerstein, D.Env
Executive Officer

CSL:HH:PW

Attachment

cc: CARB Board Members
James Goldstene
Mr. Mike Schieble, CARB
Mr. Bob Fletcher, CARB
Mr. Dean Simeroth, CARB

ATTACHMENT

This Attachment provides more detailed AQMD staff recommendations and comments on the LCFS. As noted in our cover letter, there is a significant need to formalize an on-going public process to consider a range of issues associated with the LCFS methodology. In this regard, the AQMD staff has recommendations in the following areas:

I. On-Going Public Process Recommendations

- a) **Commitment to a triennial Life Cycle Analysis methodology review**
- b) **Focused Workshop process to update iLUC assessment in GTAP**
- c) **Annual EER updates to reflect real world fleet FE changes**
- d) **Direction to staff to undertake pathway validation and audits**
- e) **Track impacts on light duty dieselization**
- f) **Nitrogen to N₂O conversion assessment**
- g) **Public tracking of emissions as well as carbon intensity**
- h) **Periodic technology status and cost review**
- i) **Commitment to a rigorous Multimedia Assessment process**

There are also a number of more discreet issues which staff believe should be addressed in the immediate context of the formal content of the regulation and / or its adopting resolution, which are summarized below.

II. Other Specific Recommendations For LCFS or Adoption Resolution Amendment

- a) **Accounting for crude oil API gravity for all refinery batches**
- b) **Prohibition on near term credit trading between LCFS and AB32 markets**
- c) **Provide greater flexibility under the "5 by 10" rule provision under Method 2A**
- d) **Incorporation of full hydrogen production accounting in gasoline pathways**
- e) **Provide incentives for optimization of fuel + vehicle as a system**
- f) **Prohibition on RPS double counting for PHEV credit**

The following provides a brief rationale for each of these recommendations.

I. Ongoing Public Process Recommendations

As CARB moves to the next phases of LCFS implementation, there are numerous methodological issues which must be navigated. Sustainability criteria will need to be devel-

oped. Sensitivity analysis will be needed on co-product allocations, soil carbon payback assumptions, and possible food grain and water resource tipping points. In addition, there will be increasing need to differentiate averaged impacts with more precise marginal analysis. In the near term, the LCFS program will be enhanced through a public process addressing the following:

a) Commitment to a triennial review of Life Cycle Analysis (LCA) methodologies

Unlike criteria pollutant emissions and their link to the national ambient air quality standards attainment, well-to-wheels greenhouse gas emissions reflect a complex calculation spanning hundreds of airsheds – indeed, multiple continents. While the goal of the LCFS is to create a durable framework of a performance standard, more robust data and methodologies would significantly strengthen the regulation. This will be especially important, as most regulated parties are expected to propose the use of customized lookup table values under Method 2A of Section 95486 (c). As such, AQMD staff recommends that a triennial LCA review focus on four basic questions as CARB moves forward with the implementation of the LCFS:

- What improvements in GREET and GTAP methodologies are possible in order to provide greater carbon accounting credibility of the LCFS for specific fuel pathways?
- What steps can be taken to improve CARB's ability to validate and audit existing assumptions and data to provide an improved basis for regulatory requirements?
- How can uncertainties about sustainability criteria and indirect land use effects be reduced?
- How can CARB better track and reduce the risk of unintended significant consequences from the LCFS, such as possible food or water supply and demand impacts?

b) Focused workshop process to update the iLUC assessment in the GTAP Model

The issue of indirect land use change (iLUC) is clearly one of the key issues under consideration as part of the LCFS. It is widely acknowledged that the iLUC can have negative GHG impacts for certain biofuel pathways which may in certain cases more than offset the direct positive impacts. While AQMD staff recognizes that this is an evolving area of scientific inquiry and modeling, it is clear that the potential magnitude – and indeed the direction of these impacts – may completely reverse a LCFS compliance determination for certain particular pathways. Specific Board direction is needed which commits to an on-going process for updating the Global Trade Analysis Project (GTAP) model used to determine LCFS com-

pliance, to reflect the best available science and judgment, recognizing that this is a rapidly evolving area of research.

There are several reasons for such a specific policy. First, biofuel compliance pathways are expected to predominate in the early years of the program, especially before the full commercial maturation of battery electric and hydrogen fuel cell vehicles occurs.¹ Second, biofuel pathways have unique qualities which present added incremental risk of unintended consequences, such as the increased intensification of agricultural practices to accommodate certain feedstocks. The GTAP model used by CARB to assess land use impacts provides a limited basis on which to fully judge the impact of the LCFS. This model does not take Conservation Resource Program (CRP) land into account, for example. This past summer, the USDA allowed 24 million acres of CRP land – previously held as pasture land – to be converted to crop production to support the growing demand for corn ethanol in light of the floods which occurred during this summer in Iowa and surrounding areas. The conversion of untilled soil (pasture land, fallow land, etc) to corn production can result in a dramatic increase in carbon emissions, as there is twice as much carbon “sequestered” in soil than in the atmosphere. This incremental acreage utilization effect can inevitably lead to some increase in soil carbon emissions which had been “sequestered” for decades if not centuries. Large incremental changes in demand for agricultural land can therefore have real and lasting impacts. Understanding the GHG implications of these changes is essential, given the fuel volumes under consideration under the LCFS. AQMD staff recommend that, as part of future LCFS refinements, these factors be reflected both in the GREET and GTAP modeling done to analyze various compliance path options under the LCFS.

Furthermore, indirect water use is perhaps as relevant as indirect land use changes. AQMD staff recommends that, at a minimum, future GREET and GTAP modeling should be updated to reflect the pumping energy required for irrigation in light of growing drought vulnerabilities.

c) Annual Energy Economy Ratios (EER) updates to reflect real world fleet fuel economy changes

The fuel efficiency assumptions underlying both gasoline and diesel compliance paths are extremely important, as they effectively define the degree of downstream GHG emissions embedded in the LCFS. The downstream portion of the LCFS carbon intensity (CI) metric – that portion from the tank to the wheel (TTW) – represents 75% of the entire well-to-wheels (WTW) CI for both gasoline and diesel, and 85% of the entire natural gas GHG per MJ. In other words, assumptions

¹ New York Times, “Royal Dutch Shell said last month that it would freeze its research and investments in wind, solar and hydrogen power, and focus its alternative energy efforts on biofuels.”, “Alternative Fuel Still a Dalli-ance for Oil Companies”, April 8, 2009, pg. B1.

about the vehicle are far more important than assumptions about fuel characteristics in the context of the CI metric chosen for this regulation. The CARB ISOR indicates that several Energy Economy Ratios (EERs) used in the LCFS are based on only two data points per category.² Such a limited data base may not capture important trends in baseline fuel economy occurring in the fleet during the time the regulation is being implemented. Furthermore, in March, 2009, revisions to the 2011 model year Corporate Average Fuel Economy Standards were proposed which relax the standards in the near term for both light duty passenger cars and light trucks. Such diminished fuel economy standards have a direct and adverse effect on the EER trends reflected in the LCFS baseline. Furthermore, a recent Massachusetts Institute of Technology study has found, for example, that the fuel economy disparity between gasoline and diesel engines is expected to shrink appreciably to near-parity levels with the advent of direct injection gasoline technology.³ This declining diesel advantage is not reflected in the LCFS baseline. The following factors contribute to the narrowing disparity in EER of the gasoline pathway compared to the diesel pathway:

- Engine cycle / hybridization optimization (*e.g., hybrid use of Atkinson cycles*)
- Substitution of direct injection for port injection
- Engine downsizing (*e.g., Chevy Volt*)
- Optimized hybrid architecture (*e.g., blended steady state operation*)
- Diesel NOx control strategy effects on fuel consumption (*e.g., EGR + SCR*)

AQMD staff therefore recommends that the EER values used in the LCFS be updated routinely as new data become available.

d) *Direction to staff to undertake pathway validation and audits*

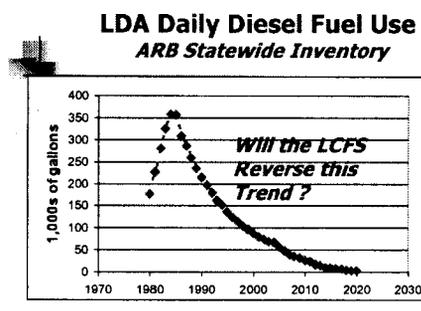
CARB staff has conducted very diligent pathway analysis for 13 individual compliance pathways. While these studies are very well documented, no single pathway has been subjected to independent and complete validation of all the parametric data incorporated in these studies. While such full pathway validation is resource intensive, the credibility of the pathway analyses is crucial to the sustained success of the LCFS. AQMD staff recommend that detailed audits and validation studies of the most likely near term pathways be initiated as soon as possible, so the results of such audits are available for review as part of the first periodic program review.

² "For example, in the case of advanced technology or emerging vehicles such as battery electric vehicles (BEV), plug in hybrid vehicles (PHEV), fuel cell vehicles (FCV), and heavy duty compressed natural gas (CNG) or liquefied natural gas (LNG), the data are limited to one or two vehicles per category.", CARB LCFS ISOR, Volume I., pg. X-9, March 5, 2009.

³ "On The Road in 2035: Reducing Transportation's Petroleum Consumption and GHG Emissions", MIT Lab for Energy and the Environment, July 2008, <http://web.mit.edu/sloan-auto-lab/research/beforeh2/otr2035/>

e) Track impacts of light duty dieselization

The AQMD staff is concerned about the possible increase in light duty dieselization which may occur under certain conditions allowed under the regulation. There are several aspects to this issue. First, as noted in our cover letter, AQMD staff are strongly supportive of the CARB staff's recommendation to keep the gasoline and diesel pathways segregated and distinct for the purpose of calculating the initial CI. However, some flexibility is provided for refiners to modify the default values which underlie the CI calculation, which could be used to increase the relative share of diesel offered above the CARB baseline inventory assumptions. The current CARB light-duty diesel inventory assumes a continuing decline in dieselization, as shown below:



The AQMD staff is concerned that the LCFS may reverse this downward trend and thereby increase fine particulate emissions above the levels reflected in the CARB's emission inventory. Our concern about increased dieselization is premised on several important factors:

- The most recent MATES III study conducted in the South Coast Air Basin indicates that diesel emissions remain the single largest - and by far the predominant - contributor to airborne cancer risk in the Basin with over 80% of the average estimated cancer risk associated with diesel emissions.
- Over 50% of the nation's fine particulate exposure occurs in the South Coast Air Basin.
- Black carbon (BC) is not currently included in CARB's formal list of GHG, although leading researchers have found that it represents the nation's second largest GHG emission source. Diesel exhaust is a primary source of BC emissions.⁴
- Current diesel particulate standards only control mass emissions, and do not limit the number or size of diesel PM emissions to ensure parity with gasoline.

⁴ Mark Jacobson, testimony to Congress, Oct. 18, 2007, House Committee on Oversight and Government Relations, <http://www.stanford.edu/group/efmh/jacobson/0710LetHouseBC1.pdf>

AQMD staff recommends that CARB carefully track any the penetration of light duty diesel in light of the adopted LCFS regulations, and report back to the Board if significant increases become apparent.

f) Nitrogen to N₂O conversion assessment

Nitrogen fertilizer conversion to nitrous oxide (N₂O) emissions has been shown to represent the single largest GHG emission source from agricultural practices.^{5,6} For example, corn fertilizer requirements are 22 times greater than soybean production, which may be diverted to meet growing fuel ethanol demand. While it is virtually certain that N₂O impacts are significant in terms of climate change, the rate of N₂O generation may be sufficient to change the sign of the impact from positive to negative. Looking beyond California, CARB's decisions in this regard will establish important precedent for the design of similar programs at the federal level and internationally. The Roundtable on Sustainable Development of the OECD, for example, has conducted important analysis of this issue.⁷ AQMD staff recommend that the CARB undertake a focused study of its N₂O emission rate assumptions to ensure that they reflect current and expected agricultural practices, including the sensitivity of practices to future potential drought conditions and the need for higher fertilizer use on less productive land.

g) Tracking of mass emissions as well as carbon intensity

The LCFS metric establishes a mass limit on GHG gases per megajoule of energy. This carbon intensity metric, therefore, does not directly require that total GHG emissions be reduced, but merely the intensity of such emissions per unit of energy. In order to track the efficacy of the LCFS over time, it will be constructive for CARB to establish a baseline GHG emission value and to track the actual GHG emissions associated with on-road transportation fuels. AQMD staff recommends that the Board direct staff to include GHG emissions tracking as part of the LCFS implementation process.

⁵ "Land Clearing and the Biofuel Carbon Debt", Fragione, Hill, Tillman, Polasky and Hawthorne, Science, 2-8-2008, pg. 1235.

⁶ "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change", Timothy Searchinger, Ralph Heimlich,² R. A. Houghton, Fengxia Dong, Amani Elobeid, Jacinto Fabiosa, Simla Tokgoz, Dermot Hayes, and Tun-Hsiang Yu, Science, 2-29-2008, pg. 1238.

⁷ "Biofuels: Is the Cure Worse than the Disease", Richard Doornbosch. This study suggests that while the total world surface area is approximately 13.4 giga-hectares (Gha), only 0.44 Gha are available for energy crops. This estimate reflects the need for land suitable for rain irrigation as well as the amount of land needed to accommodate the food and housing requirements of the global population expected in 2050. The principal areas of possible expansion in Africa, Central America and South America. A further complication is that if the entire world to eat a Western diet centered on meat consumption (i.e., an average of 80 kg of meat per year), an additional 2.4 Gha would be needed for additional cultivated land to provide the feed for the requisite livestock production.
<http://www.darwinnet.org/docs/biofuels.pdf>

h) *Periodic technology status and cost review*

A key determinant of a successful LCFS regulation is the expected pace of development of cellulosic biofuels. CARB staff's assumption of a competitive cellulosic ethanol market by 2012 is very optimistic. The central assumption of the proposed regulation is that the Energy Independence and Security Act of 2007 (EISA), specifically its Renewable Fuel Standard (RFS) targets and timetable, will be fully realized without delay.⁸ Significant additional steps beyond the EISA targets alone will be needed, including significant technological and science breakthroughs with respect to C5 sugar conversion to ethanol, enzymes for the production of renewable gasoline and diesel formulations, algae production efficiency, biomass collection and processing, among other challenges.

The advanced biofuel targets established under EISA have never been subjected to independent verification as to their fundamental feasibility and sustainability. The first cellulosic ethanol targets, upon which the schedule is fundamentally predicated, are scheduled to take effect after the CARB's planned adoption date for the LCFS. As a result, the LCFS fundamentally assumes that the targets will be met, and that the advanced biofuels emanating from the EISA requirements will be readily available to help drive compliance with the CARB's LCFS.

However, recent events strongly suggest that the U.S. Environmental Protection Agency (EPA) is likely to delay and significantly weaken the near-term mandates for such fuels. Specifically, there is growing recognition that the costs of cellulosic ethanol production in high volume is far beyond the reach of the commercial marketplace in the foreseeable future. One prominent indication of this is the recent review by the Congressional Research Service, which has found that the November, 2009 start date for the EISA mandate is already viewed as impossible.⁹ As noted by the report, "It's clear a breakthrough is needed." Other reports point to the difficulty of collecting energy crops.¹⁰ At the same time, biofuel developments are receiving growing attention in terms of possible unintended consequences.^{11, 12} The U.S. Department of Agriculture projects that cellulosic biofuels

⁸ The AQMD staff believe that premising this regulation on the full realization of the RFS timetable and targets is fundamentally premature.

⁹ Congressional Research Service, Cellulosic Biofuels: Analysis of Policy Issues for Congress, November 7, 2008, http://assets.opencrs.com/rpts/RL34738_20081107.pdf

¹⁰ "Harvesting Cellulosic Ethanol Peter Hemken, head of DuPont Bio-Based Materials, discusses the difficulty of collecting crops for the fuel", GreenTechMedia, September 2007. <http://www.greentechmedia.com/articles/harvesting-cellulosic-ethanol-097.html>

¹¹ Oxfam, "Another Inconvenient Truth: How biofuel policies are deepening poverty and accelerating climate change.", June 25, 2008.

http://www.oxfam.org.uk/resources/policy/climate_change/downloads/bp114_inconvenient_truth.pdf

¹² International Harold Tribune, "Studies Conclude That Biofuels are Not So Green", Feb. 7, 2008. For example, Joseph Fargione of the Nature Conservancy states: "We fully believe that if biofuels are to be part of the solution

are not expected to be commercially viable on a large scale until at least 2015.¹³ As a result, U.S. EPA is expected to be in the process of relaxing the cellulosic ethanol time table due to pragmatic realities on the ground. In contrast to the RFS however, no such flexibility for delay or revision is provided for nor contemplated by the proposed LCFS regulation. The AQMD staff therefore recommends that CARB staff undertake a technology readiness and cost review of the federal EISA targets in the context of the LCFS requirements.

i) *Commitment to a rigorous Multimedia Assessment process*

The LCFS is likely to result in one or more new fuel formulations as a means of compliance. For example, butanol (*a C4 alcohol*) has been identified as one means of enhancing the value chain of corn-to-ethanol production by utilizing the corn stover as feedstock in its production. Other fuel formulations are also being considered. As compliance pathways become clearer over time, it will be essential that CARB conduct a rigorous Multimedia Assessment process to avoid a repetition of the events which surrounded the use of MTBE. As part of the adopting resolution, AQMD staff therefore recommends that the Board commit to a rigorous Multimedia Assessment for any new fuel formulation before it is introduced in significant commercial quantities.

II. Other Specific Recommendations for LCFS or Adoption Resolution Amendments:

a) *Accounting for crude oil API gravity for all refinery batches*

The AQMD staff strongly recommends that CARB staff track the quality of crude oil, rather than simply assume that all conventional crude quality will remain constant through the duration of the regulation. Trends in declining quality and resulting carbon intensification of conventional crude oil feedstocks should not be overlooked in the regulation. Some refiners assert that any effort to differentiate conventional crude quality will be ineffectual due to global "reshuffling". However, important economic and market signals will result by including within the LCFS an adjustment for the API gravity of individual crude shipments. By placing a direct market signal on the carbon content of all feedstocks, the CARB carbon intensity (CI) regulation will go a long way in helping rationalize the market to supply finished products with net lower carbon intensity. This principle will have particular importance as a precedent once a federal CI standard is promulgated. While the differences in upstream crude quality may be relatively small (at least in the short term), the key lesson of the GREET model and other well-to-wheel

rather than part of the problem, there urgently needs to be better sustainability criterion."
<http://www.iht.com/articles/2008/02/07/healthscience/biofuel.php>

¹³ U.S. Biobased Products, Market Potential and Projections Through 2025, Office of the Chief Economist, Office of Energy Policy and New Uses, USDA., <http://www.usda.gov/oce/reports/energy/BiobasedReport2008.pdf>

analyses is that small differences, when multiplied through the entire fuel pathway reflecting billions of gallons annually, can have very disproportionate carbon implications.

Anything short of addressing the carbon density of all crude sources would not be a “gold” standard; a bifurcated system which assumes constant conventional crude quality, in contrast, is more akin to a “brass” standard. The decline in crude oil quality was acknowledged several years ago by Jean-Luc Guiziou, President of Canadian Operations for France’s major oil company, Total:

“We have to accept the reality of geoscience, which is that the next generation of oil resources will be heavier.”¹⁴

For this reason, the AQMD staff agrees with CARB’s intent to breakout tar sands based crude feedstocks. At the same time, it is essential that all crude sources be treated equitably by tracking and accounting for the specific API gravity or carbon content of all fossil feedstocks used by refineries to produce transportation fuels sold in California.

- b) Prohibition on near term credit trading between LCFS and AB32 markets
A “LCFS market” for credit trading is authorized in the LCFS regulation. However, there are no oversight mechanisms specifically designed to address the unique issues surrounding the trading of GHG emission credits for carbon intensity credits. No such market exists in the world at present. Given the complex scope of the well-to-wheels calculations, which will determine the magnitude and valuation of these credits, adequate oversight of carbon intensity credit market alone will present major resource issues to CARB. AQMD staff recommends that the LCFS CI market be carefully tracked before allowing its expansion into the domain of AB32 emission offset trading, and that future LCFS CI credit trading should be prohibited with the broader AB32 program until after at least the first five years of LCFS implementation.
- c) Provide greater flexibility under the “5 by 10 rule” provision under Method 2A
Under Method 2A of the regulation, the LCFS allows for the substitution of data other than the default values to be provided by CARB in the Carbon Intensity Lookup Table. (The values for the Lookup Table have not been published as of April 8, 2009). It is assumed that the basis of this set of default values will be the 13 separate pathway assessments issued by CARB. Under the CARB proposal, substitution of a default value is only allowed in which a 20% change in well to tank GHG carbon intensity is achieved (i.e., 5 grams or greater well-to-tank

¹⁴ Wall St. Journal, , Russell Gold, 3-27-06, pg. 1. <http://royaldutchshellplc.com/2006/03/28/the-wall-street-journal-as-prices-surge-oil-giants-turn-sludge-into-gold/>

(WTT) impact per MJ out of a total gasoline WTT value of 24.2). In addition, default value substitution is only allowed on fuel volumes which exceed a minimum of 10 million gasoline gallon equivalents (gge) annually. AQMD staff believes that both the 5 gram threshold (i.e., essentially 20% of the WTT value) and the 10 million gallon annual threshold are too restrictive, especially in the short term. Some alternative fuel pathways may not start out at such high volume. Also, reducing the WTT from a baseline of 24 grams down to at least 19 represents the equivalent to a 20% increase in upstream production efficiency. Only the largest regulated parties are likely to be able to accomplish such large incremental upstream efficiency improvements. In contrast, even a 2-5% improvement would be meaningful, and result in real carbon intensity reductions, as well as mass GHG reductions. AQMD staff therefore recommends that under the Method 2A Sustainability Review, that improvements of greater than 1 to 2% be allowed, with minimum incremental volumes of 1 million gallons, for at least the first 5 years of the regulation.

- d) *Incorporation of full hydrogen production accounting in gasoline pathways*
The increasing rate of hydrogen utilization at refiners (using either merchant hydrogen or in-situ production) is a clear sign of overall continuing degradation in base crude feedstock quality.¹⁵ At a minimum, AQMD staff recommends that CARB update the LCFS to ensure that 100% of such hydrogen-related GHG emissions are fully reflected in the baseline calculations for conventional fuel processing. In effect, if CARB desires to control carbon intensity, it should require that regulated parties track the carbon properties of crucial gasoline building blocks such as hydrogen from which commercial fuels derive.
- e) *Provide incentives for optimization of the fuel and vehicle as a system*
Since 1990, CARB's Low Emission Vehicle and Clean Fuel regulations have taken full advantage of the synergies which exist between the vehicle and the fuel to optimize efficiency, performance and emissions from a systems perspective. The LCFS, since it is structured solely as a carbon intensity metric per MJ of energy, does not provide a direct linkage to such synergies. Opportunities for the optimization of plug-in electric vehicles (PHEVs) for GHG and criteria emissions levels may be greater with alternative fuels than solely with conventional gasoline. The LCFS should provide some mechanism to leverage these synergies.

Table 5 in Section 95485 of the proposed regulation provides key data inputs regarding the Energy Economy Ratio (EER) for various fuel/vehicle combinations.¹⁶ There is significant technology evolution occurring with respect to alternative fuel and electric drive vehicles. The values in Table 5 do not currently provide esti-

¹⁵ See "Increasing GHG Emissions From Dirty Crude", Communities for a Better Environment, December 8, 2008 submittal on AB32 Scoping Plan, <http://www.arb.ca.gov/lists/scopingpln08/1474-cbe-arb120808supplement.pdf>

¹⁶ Proposed Regulation Order, Section 95485, (a) (3), LCFS ISOR, Volume I, pg. A-39

mates of optimized vehicles in some of these categories, as they imply that PHEVs are optimized to run solely on gasoline. However, optimization for natural gas and biofuels is also possible, including flexible fuel vehicle optimization to the lowest carbon intensity fuel rather than baseline gasoline. The architecture of PHEVs is inherently complex and provides opportunities for various means of optimization, including engine downsizing and alternative engine cycles such the Atkinson cycle.

Given the growing national interest in such integrative and agile technology, AQMD staff recommends that CARB provide a default case for alternative fuel PHEVs, including an optimized FFV EER value. Such additional vehicle default values would reflect the optimization of downsized steady state engine which also takes advantage of fuel properties such as the latent heat of vaporization, which is three times higher for E85 compared to gasoline.¹⁷ Increased compression ratios, for example, have been demonstrated on E85 FFVs which approach the fuel economy parity of gasoline engines.¹⁸ Hybridized natural gas vehicles could also be further enhanced to bias the use of natural gas rather than gasoline in setting engine parameters such as compression ratio.

f) *Prohibition on RPS double counting for PHEVs*

Plug-in hybrid vehicle (PHEV) and Electric Vehicle (EV) credits should not be doublecounted as both LCFS credits and as offset credits for compliance with the Renewable Portfolio Standard (RPS) established by the California Public Utilities Commission. Full compliance with the 20% RPS standard in 2010 is somewhat uncertain at this time. The full benefits of both the LCFS and the RPS program are essential to meet the goals of AB32, as well as the Scoping Plan adopted by the CARB. Accordingly, before PHEV LCFS credit is provided for trading purposes, full compliance with the 2010 standard, as well as the Governor's goal of 33% RPS in 2020, should be required distinct from LCFS compliance. The integrity of both the LCFS and the RPS standards is essential and should not be compromised by LCFS credit trading. Furthermore, worse case and best case PHEV recharging scenarios should be examined. AQMD staff recommends that double counting of PHEV or EV credits be prohibited under the LCFS.

¹⁷ This allows for the cooling of the inlet air, which increases the air density and resulting efficiency of the engine.

¹⁸ Lotus Engineering, "Flex Fuel Vehicle Development to Promote Synthetic Alcohols as the Basis of a Potential Negative CO₂-Energy Economy", Turner, Pearson, Holland and Peck, SAE paper 2007-01-3618; see also "Exploitation of Energy Resources and Future Automotive Fuels, Pearson and Turner, Lotus Engineering, SAE paper 2007-01-0034