COMMUNITIES FOR A
BETTER
ENVIRONMENT

Electronic submittal

April 20, 2009

Mary Nichols, Chairman
James Goldstene, Executive Officer
California Air Resources Board
1001 "I" Street
Sacramento, CA 95812
http://www.arb.ca.gov/lispub/comm/bclist.php

Attention: Clerk of the Board

Re: **Proposed Regulation to Implement the Low Carbon Fuel Standard**

Dear Chairman Nichols and Mr. Goldstene:

This letter and the attached original research supplement the previous comments of Communities for a Better Environment (CBE) to the Air Resources Board (ARB), which are reasserted and incorporated herein, regarding the Proposed Low Carbon Fuel Standard and associated documentation (PLCFS).

Our previous comments showed, among other things, that corn ethanol fuel replacement will not solve and could worsen GHG and ground-level pollution (May, 2008), and that refining higher-sulfur crude is increasing GHG emissions from steam reforming to feed hydroprocessing by California refiners. (Karras et al., 2008) The attached research paper, *Refinery GHG emissions from dirty crude*, provides new evidence that both problems are more extensive and interconnected than previously known—and that the PLCFS, as proposed, will not address these problems.

ARB should amend the PLCFS to:

- Add oil input quality caps for each refinery (an oil input quality cap is a set of limits applied at the point where oil is first introduced to processing after any blending that prevent increased gravity, sulfur, nitrogen, vanadium, nickel, vacuum gas oil yield, residua yield, mercury, selenium or total acid relative to the refinery's current oil input);
- Ban corn ethanol as a fuel; and
- Remove pollution trading as a "compliance" option.

ARB should not adopt the PLCFS without first, at a minimum, making each of these three amendments. The reasons for this are explained below.

1. Increased emissions from refining dirtier oil[1] could increase the lifecycle GHG emission intensity of the oil-energy system substantially.

California is the predominant oil refining center of the Western United States. Yet, although it acknowledges the potential that a switch to different oil sources for California refineries could increase emissions from oil extraction,[2] the PLCFS does not estimate GHG emissions from refining dirtier oil.

The attached research links dirtier oil to its energy-consuming processing mechanism and to observed refinery energy intensity quantitatively, across the U.S. refining industry during 2003 through 2007. Increasing gravity (mass/barrel) and sulfur content (% mass) of oils refined caused a large (+47%) increase in refinery energy and emissions intensity, and could cause a very large (+25% to +230%) further increase in emissions/barrel depending on the extent to which dirtier oil is refined. Even at the current California crude gravity, the emissions increase is large (~123-149%) if sulfur increases to easily foreseeable levels—such as those of Persian Gulf oils. This is consistent with previous evidence for hydroprocessing-related emissions caused by higher-sulfur oil in California refineries. (Karras et al., 2008)

Limiting the worsening quality of oil refined is critical to environmental health and justice.

2. The PLCFS does not measure or address emissions from refining dirtier oil.

At least three fundamental errors in the design of the PLCFS cause it to not measure or address changes in refinery emissions intensity caused by dirtier oil.

Extraction v. refining: The reliance on oil extraction intensity as a measurement of oil quality impacts on refining intensity is an error. Geology and oil viscosity greatly affect extraction. Different oil quality factors, such as distillation yield, which is related to gravity, and contamination by sulfur, nitrogen and metals affect refining. (See Attachment) The PLCFS does not measure or address increased refinery emissions caused by dirtier oil because it ignores the oil quality factors that cause this refining impact. Thus, the PLCFS estimates that emissions intensity for oil *extraction decreased* when the sulfur content and the emission intensity of *refining increased* for hydroprocessing this same oil in the same period. (SR at App. C12; Karras et al., 2008) This is illustrated by the chart at the top of the next page.

Products v. processing: The PLCFS estimates of emissions from refining gasoline, and separately, diesel, rely on product-specific refining efficiency factors which it adjusts for average California conditions. (SR at IV-5; Detailed CA-GREET CARBOB Pathway at 28, note 9.) But these product factors do not account for oil quality impacts on refining. These product efficiency factors are explicitly based on the average crude quality and a single hypothetical refinery configuration. (Wang et al., 2004/8) Thus, they are designed not to measure the changes in processing, energy, and emissions intensity from refining dirtier oil. (Attachment)

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[1] In this letter, "dirtier oil" is lower-quality oil that increases the pollution intensity of oil refining.

[2] The PLCFS does not, however, establish a mechanism—such as a traveling team of experts and a set of treaties—for verifying the emissions intensity of oil extraction and/or pre-refining in the worldwide locations from which California refiners increasing get their oil, and it is not clear that doing so will be feasible for ARB. The PLCFS is not explicit about this verification problem.

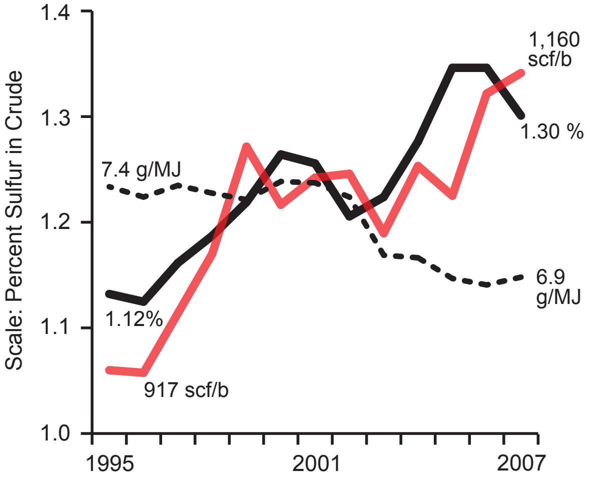
Increasing crude sulfur content and processing intensity at the same time estimated extraction intensity decreased, California average crude input and hydroprocessing, 1995-2007.

- ***Sulfur in crude oil input (% wt.)***[a]
- ***Hydroprocessing intensity (H_2 capacity, scf/barrel crude)***[b]
- ***Crude recovery carbon intensity (estimated, gCO_2e/MJ)***[c]

[a] Data from Karras et al., 2008. *Increasing GHG emissions from dirty crude.* CBE. 12/8/2008. Supplemental comment submitted to ARB.

[b] Data from Karras et al., 2008.

[c] PLCFS Staff Report Appendix C12 estimate.



In fact, based on data for the five U.S. refining districts during 2003-7, these product efficiency factors predict slightly *decreasing* refinery energy intensity when real-world refinery energy intensity, process intensity and oil input gravity and sulfur *increased*. (Id.) The chart below illustrates this for energy v. oil quality.

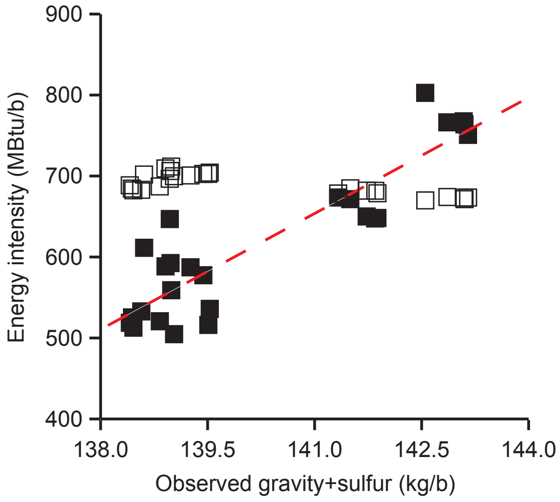
Average v. plant: Compounding the errors above, the PLCFS establishes its oil-based fuel pathway—its real "standard" for fuel emissions intensity—at the average for all California refineries and oil inputs together. (SR at IV-6) This, by definition, allows individual refineries to retool for cheaper, dirtier oils that the PLCFS extraction intensity measurement would not detect. It thereby allows increasing refinery emission intensity.

This failure to detect, measure or address the emissions intensity of dirtier oil transport fuels refining—the central link of the fuel chain which, in the Western US, concentrates predominantly in California—is not excused by the argument that emission reductions from other sources might compensate for refinery pollution, for reasons discussed below.

Product efficiency factors do not explain observed impacts of dirtier oil on refinery energy

- ■ ***Observed from fuels consumed***
- ☐ ***Predicted from refinery products***

Observed gravity+sulfur in crude oil input to refineries is the weighted average for each U.S. refining district and year during 2003-7 from EIA and is shown as the mass of whole crude plus the mass of sulfur in the crude. Observed energy intensities are from fuels consumed in refineries reported by EIA, and Oil & Gas Journal data. Product slate predictions are based on the amounts of each refined product produced in the refining district each year, and typical average product refining efficiencies from Wang et al. (2004/8). See Table 2, Appendix, in Attached Research for details and data.



3. The PLCFS does not analyze or address interactions of dirtier oil infrastructure, corn ethanol dominance of the replacement fuel market, and pollution trading.

The claim that the PLCFS "does not pick winners" among alternative fuels is not correct.

Oil energy is more deeply entrenched than the other major sources of GHG emissions. (See e.g., LCFS-1[3]) This predominant oil-based infrastructure stunts non-combustion fuel replacement alternatives—which cannot be blended with gasoline or diesel, carried in their liquid-fuel distribution networks, or burned by internal combustion engine vehicles—by competing for money and land. That forces replacement fuels toward other liquid fuels. (See LCFS-1)

Huge, long-lived capital investments in different equipment are necessary to extract and refine the relatively more available, and cheaper, dirtier oils. (Attachment, refs. 2, 8, 11, 16, 20) Thus, a switch to dirtier oil will further deepen the entrenchment of oil, and extend it for the decades-long operability of the new equipment. Therefore, in addition to its direct emissions from extraction and refining, a switch to dirtier oil would further force fuel replacement toward liquid combustion fuels.

Ethanol refined from corn is the dominant liquid combustion fuel alternative today, and is best positioned to grab the replacement fuel market share that the PLCFS seeks to create. This is a problem. Corn ethanol combustion causes toxic and ground-level pollution, its GHG emissions intensity approaches or exceeds that of gasoline, and it will have impacts in communities near prospective new ethanol refineries.[4]

Pollution trading in the PLCFS makes this worse. Refiners of dirtier oil would buy emission "allowances" for the part of their pollution that the PLCFS detects. Refiners of corn ethanol, because they have the market and infrastructure advantage, would sell most of these emission "credits." Dirtier oil investments get a kind of protection: corn refiners get money to invest. Dirtier oil refining infrastructure and pollution trading thus interact to selectively favor—and finance—the dirtiest of replacement fuels for today's oil. Having missed other impacts of the impending switch to dirtier oil, the PLCFS does not analyze this impact either.

4. The cumulative impact of dirtier oil, corn ethanol and pollution trading would foreclose the achievement of climate protection and environmental justice.

In addition to GHG emissions, refining dirtier oil can increase pollution incidents, toxic emissions, and toxic pollutant discharge.[5] Disparately higher exposures to these pollutants occur in low-income communities of color near oil refineries. Corn ethanol and other biofuel refinery impacts include increased local pollutant exposures as well. (See the Environmental Justice Advisory Committee comments.) Since it is largely avoidable with our recommendations above, this worsening and expansion of environmental health risks that disproportionately impact the mostly low-income communities and communities of color near the existing and prospective refineries would represent a violation of our rights.

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[3] Reference 3 in Volume 1 of the Staff Report: Farrel, Sperling et al., 2007 at pages 22-24.

[4] May, 2008; EJAC Comments; Mauzerall peer review. The PLCFS does not account for all the impacts, and this further exacerbates the corn ethanol-forcing impacts of dirtier oil and pollution trading.

[5] Karras et al., 2008; CBE 1/22/09 Background Paper for President Obama Transition Team.

Moreover, if the worsening quality of refinery oil inputs is not stopped and this along with pollution trading force corn ethanol's dominance as the replacement fuel for gasoline, we will almost certainly fail to achieve the total GHG emission reductions widely believed to be essential for climate stabilization. Emissions/barrel dirtier oil and ethanol emissions/barrel oil replaced could combine to overwhelm all other feasible emission reductions.

In every credible scenario that includes a switch to dirtier oil with corn ethanol as substitute fuel, climate protection appears to be foreclosed. Even in a very hopeful scenario—70% of oil replaced; ethanol is only 25% of the fuel replacing it; with ethanol emission/gallon lower than today, and only a 25% increase in fuel production intensity from dirtier oil—it is barely mathematically possible and is not practically possible to reach the IPCC emission reduction for 2050. (Attachment)

Conclusion

The severe, irreversible impacts described here are foreseeable. They are predictable. They are avoidable if we cap the crude, ban corn ethanol, stop pollution trading and make room for proven emission controls and alternatives that can work. Accordingly, CBE urges ARB to accept these recommendations.

In Health,

Bill Gallegos

Bill Gallegos, Executive Director

Greg Karras, Senior Scientist

Copy: Interested organizations and individuals

Attachment: CBE, 2009. *Refinery GHG emissions from dirty crude*. Communities for a Better Environment. April 20, 2009.

Previous comments:

May et al., 2008. *California's proposed AB32 Scoping Plan unfortunately has fatal flaws—revise or reject the Plan*. December 8, 2008.

Karras et al., 2008. *Increasing GHG emissions from dirty crude. Analysis of publicly available data for one of the oil refining processes expanding for more contaminated oil in California: Hydrogen steam reforming*. December 8, 2008.