State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

Supplement to the Final Statement of Reasons for Rulemaking,
Including Summary of Public Comments and Agency Responses

PUBLIC HEARING TO CONSIDER ADOPTION OF A PROPOSED REGULATION TO IMPLEMENT THE LOW CARBON FUEL STANDARD

Public Hearing Date: April 23, 2009
Agenda Item No.: 09-4-4

This Supplement to the Final Statement of Reasons (FSOR) for the Regulation to Implement the Low Carbon Fuel Standard addresses comments that were inadvertently not summarized or responded to in the FSOR or were misattributed/unattributed in the FSOR. This Supplement also identifies additional comment letters that were not summarized or responded to in the FSOR and provides the reasons no summary or response are needed. Except as noted below for new comment summaries being added to existing comments in the original FSOR, the numbering of the comments below is continued from the original FSOR document posted to the ARB's website (http://www.arb.ca.gov/regact/2009/lcfs09/lcfsfsor.pdf) and filed with the Office of Administrative Law (OAL) on November 25, 2009. All references to other comments are with respect to this original document. Following the comment summaries, the agency's response is provided to explain how the proposed action was changed to accommodate an objection or recommendation or the reasons for making no change. All of the referenced comments were included in the rulemaking file submitted to OAL on November 25, 2009.

1. Responses to Inadvertently Omitted Comments

The following comments and the agency's responses were inadvertently omitted from the original FSOR.

A. Omitted Recommendations for Resolution 09-31 Language

The first two listed comments are recommendations for provisions to be included in Board Resolution 09-31; we agreed with the recommendations, and the Resolution 09-31 was approved by the Board with provisions addressing the commenters' suggestions. However, acknowledgment of this was unintentionally left out of the FSOR. The numbering of the comments below is continued from the original FSOR.

C-327. **Comment:** We ask CARB to adopt the following language in the Board Resolution. "BE IT FURTHER RESOLVED that the Board directs staff to

continue to work with the CPUC and other stakeholders on the definition of Regulated Party for Electricity in Section 95484 (a)(6), and the appropriate recipient(s) and generator(s) of the LCFS credits, and return to the Board by December 2009 with recommended modifications to the regulation, as appropriate;". The CPUC staff asked CARB staff for additional time to address this issue and recommended the language above, on March 5, 2009. The regulatory framework surrounding the electric sector makes electricity a challenging fuel to address. For example, both CARB and CPUC staff will need to determine how the LCFS definition can conform to (and not be in conflict with) existing regulations governing the electricity market, including those governing the sale and resale of electricity. Regulators and stakeholders will also need to understand how to best develop a framework that will provide benefits to electric transportation (ET) customers and facilitate the use of electricity as a transportation fuel. If given the additional requested time, we believe a cooperative framework can be developed that is superior to the current competitive framework in the proposed regulation. We recommend more time be taken to sort through the many issues to make sure the details are right. (CALETC2, PIA)

Response: The Board agreed and directed staff in Resolution 09-31 to continue working with the California Public Utilities Commission, electric utilities, oil refiners, and other stakeholders to review the provisions applicable to regulated parties for electricity and propose amendments, if appropriate.

D-36. **Comment:** We ask CARB to adopt the following language in the Board Resolution. "BE IT FURTHER RESOLVED that the Board directs staff to: 1) conduct a study to evaluate if displacing petroleum transportation fuels with electricity leads to a cross-sectoral shift in GHG compliance costs and other costs, and the effect of any such shift; and 2) conduct a study and hold one or more public workshops to determine how the Low Carbon Fuel Standard should best work with other programs in the AB 32 Scoping Plan to ensure that the use of electricity as a transportation fuel is not discouraged, and to send the right price signals to consumers; and 3) return to the Board by December 2009 with recommendations, as appropriate;". We are requesting this Board Resolution for staff to work with stakeholders on this issue to ensure that the appropriate price signals are conveyed to consumers, and that the State's regulations, incentives, and programs are coordinated to facilitate electric transportation and the State's carbon reduction goals. Because the LCFS for electricity needs to work with several regulations (most under CARB control) we recommend that a process be set up to address this big picture. We believe the goal should be that (1) any barriers be addressed, and (2) the regulations adopted by the CARB and the CPUC with respect to electricity work together. There are many moving parts to the State's GHG reduction and electrification goals. More time is needed to understand and

remove any barriers, to coordinate the market with existing and proposed programmatic measures, and to send the proper price signals to both electric and gasoline consumers. (CALETC2, PIA)

Response: The Board agreed in general with this comment and in Resolution 09-31 directed staff, as part of the development of the cap-and-trade regulation identified in ARB's AB 32 Scoping Plan and other AB 32 activities, to: (1) evaluate as part of the cap-and-trade rulemaking whether displacing petroleum transportation fuels with electricity leads to a cross-sector shift in GHG compliance obligations and assesses the effect of any such shift, including the impacts on electricity use as a transportation fuel and attendant price signals on consumers; and (2) consider as part of the ongoing activities associated with AB 32 how the LCFS regulation, a broader cap-and-trade regulation, and other programs established pursuant to the AB 32 Scoping Plan should work together to ensure that the use of electricity as a transportation fuel is appropriately encouraged consistent with the goals of AB 32. Because the Board directed staff to conduct this evaluation as part of the broader, ongoing AB 32 activities, the Board did not believe a separate study and workshops were necessary as suggested by the commenter.

B. Omitted Comments Raising Concerns Already Responded to in the FSOR

The following two listed comments are to be added as part of the comments summarized as F-5 and F-6 in the FSOR because they raise concerns similar or related to the existing comment summaries. The agency responses to existing Comments F-5 and F-6 apply as well to these omitted comments, respectively.

F-5. **Comment:** In addition, some of these fuels may actually increase global warming pollution. (EC)

F-6. **Comment:** Environment California recommends that ARB consider the following: Drive innovation for the long term, building a strong ultra-low carbon fuel strategy into the LCFS and developing fuels with long-term potential. Fuels policy should promote the development of clean, alternative, ultra-low carbon fuels and technologies for the long term, not just blending of marginally beneficial biofuels in the short term. (EC)

C. Omitted Comments Requiring New Responses

The remaining seven comments and the agency's responses were inadvertently left out of the original FSOR filed with OAL. All seven of these comments involve the time accounting of GHG emissions. The numbering of the comments below is continued from the original FSOR.

L-141. **Comment:** ARB should use a time-based accounting method such as the Fuel Warming Potential (FWP) method to account for time varying CO_2 emissions. The annualized method used by ARB treats a unit of emissions occurring far in the future as being the equivalent of a unit of emissions occurring today and therefore underestimates the impact of alternative fuels that cause land use change. The FWP method, however, captures the relative warming impacts of time-varying land use change emissions and provides a more science-based climate modeling approach to calculating the carbon intensities of alternative fuels that cause land use change emissions. (CEERT2, UCS1, UCS3, TESORO1, FOTE2)

Response: The annualized method potentially underestimates the warming impacts of time-varying emissions resulting from land use change. However, as stated in the ISOR (at IV-26), there are advantages to choosing the annualized method. First, annualizing emissions over a chosen time horizon has a long history of use by regulatory agencies for regulations governing pollutant release. Secondly, annualization is the simplest method to apply. Land use change emissions are simply allocated equally over the project horizon time period. All that is required is an estimate of the total emissions attributable to land use change and the total fuel production (on an energy basis) over the assumed project horizon.

In contrast, application of a time-based accounting method requires numerous additional assumptions related to the detailed amount of emissions occurring each year over the project horizon. Many of these assumptions would be difficult if not impossible to support. Finally, at the time the ISOR was released, the fuel warming potential method had not yet been peer-reviewed in the scientific literature, and it would not have been prudent to use a time accounting method that had yet to be rigorously scrutinized by the scientific community. Accordingly, Professor Thomas, one of the peer reviewers for the LCFS regulation, supported the ARB's use of the annualization method as the most sensible of the three methods discussed in the Staff Report, including the FWP method. See response to Comment B-34.

Although the Board has chosen annualization as the time accounting method because of its simplicity and long history of use by regulatory agencies, it continues to evaluate ongoing developments in the scientific literature involving the FWP method. A peer reviewed article detailing the methodology used in the FWP method was recently published in Environmental Research Letters.[1] Time accounting will likely be a discussion topic for the Expert Workgroup that is being convened at the direction of the Board under Resolution 09-31 to further evaluate the calculation of land-use change

[1] O'Hare, M.; Plevin, R.J.; Martin, J.I.; Jones, A.D.; Kendall, A.; Hopson, E. (**2009**) Proper accounting for time increases crop-based biofuels' greenhouse gas deficit versus petroleum. Environmental Research Letters, 4. This article was identified as Reference 53 in the Staff Report in the form submitted to *Environmental Research Letters* for publication; it has since been published.

carbon intensity. Input from the expert workgroup and the scientific community on this matter will be presented to the Board for its consideration.

L-142. **Comment:** ARB's decision to use the annualized method in the early years of the regulation is appropriate. ARB should further consider the FWP method for time accounting. (CALSTART)

Response: As noted in response to Comment L-141, we are continuing to evaluate other time accounting methods such as the FWP method. As noted in response to Comment L-141, the ARB's use of the annualized method was supported by Professor Thomas as part of the statutorily-required peer review of the LCFS regulation.

L-143. **Comment:** The selection of any annualization period is arbitrary and the resulting land use change penalty is highly sensitive to the length of such period. (NOVOZYM1, TESORO1)

Response: The carbon intensity of crop-based biofuels is highly sensitive to the project horizon chosen to annualize emissions, as detailed in Appendix C of the ISOR (at C-21). However, the choice of thirty years is not arbitrary. As stated in the ISOR (at IV-23), the value chosen for the project horizon is very important as it determines how long a fuel has to "pay back" the land use change emissions that it generates. For a crop-based biofuel, GHG costs and benefits accrue at very different rates through time with large up-front costs and comparatively low annual benefits. The longer the project horizon, the more time the annual benefits are given to catch up with the large up-front costs. A short project horizon (e.g. less than 20 years) favors fuels that have low up-front land use change costs while a long project horizon (e.g. greater than 50 years) deemphasizes up-front land use change emissions and favors fuels that have large annual benefits.

A relatively short project horizon is warranted for two reasons. First, the scientific community is warning that very significant reductions in greenhouse gas emissions are needed in the near term to diminish the potential for large and possibly irreversible damage from climate change. Achieving these reductions requires approaches which promote fuels that provide earlier benefits. Second, it is very difficult to project the mix of fuels and production methods over the next three decades, much less through the remainder of the century. The assumption that the production techniques used for fuels supplied to meet the LCFS will continue for many decades to come is very uncertain. Requiring a shorter "payback" period is far more likely to produce net benefits. For these reasons, a long (e.g. 100 year) project horizon is not appropriate.

The Board adopted 30 years as a well-reasoned compromise for the project horizon. This allows for crop-based biofuels that employ the most efficient production methods to play a role in meeting the goals of the LCFS. At the same time, a 30-year horizon also promotes the transition to truly sustainable fuels that provide substantial near term as well as long term emissions reductions. As structured, the LCFS provides strong

incentive to both improve the greenhouse gas performance of current biofuels as well as encourage investment in 2nd and 3rd generation fuels.

L-144. **Comment:** In calculating land use change impacts, ARB did not account for reversion of land following the end of biofuel production. In future studies, ARB should carefully assess the sensitivity of land use change calculations to the likelihood of land reversion. (NOVOZYM1)

Response: As discussed in the ISOR (at IV-47), ARB acknowledges that for crop-based biofuels some reversion of land may occur after the fuel no longer receives LCFS credits. Moreover, a scenario showing the sensitivity of land use change carbon intensity to the inclusion of land reversion is presented in the ISOR (Appendix C at C-18). We concluded that land reversion is highly speculative, and if it does occur, the extent and duration are impossible to predict. Therefore, ARB took the cautionary approach of assuming that no land reversion occurs.

L-145. **Comment:** ARB should use appropriately conservative assumptions regarding the project horizon for biofuels. Specifically, a 20 rather than 30 year project horizon should be used to recognize uncertainties in future production and use. (UCS3)

Response: As stated in Appendix C of the ISOR (C-22), innovative producers may very well produce crop-based fuels that play a significant role within the LCFS for 20 to 30 years depending on the producer's ability to lower direct emissions and the specific LCFS carbon intensity targets set for 2020 to 2050. As noted in response to Comment L-143, a 30-year project horizon was adopted as a compromise that allows for crop-based biofuels which employ the most efficient production methods to play a role in meeting the goals of the LCFS while also promoting the transition to truly sustainable fuels that provide substantial near term as well as long term emissions reductions. As structured, the LCFS provides strong incentive to both improve the greenhouse gas performance of current biofuels as well as encourage investment in 2nd and 3rd generation fuels.

L-146. **Comment:** Investors need consistency in carbon intensity values in order to make investment decisions. As currently structured the LCFS would allow ARB staff to make changes to fuel pathways without Board approval. Any one change to a relatively significant input to a fuel's pathway could easily remove the fuel's advantage over gasoline or diesel and strand investments. For example, switching time accounting methodology from annualization to the fuel warming potential method would result in significant increases in the land use change carbon intensity for crop-based biofuels and potentially remove the ability for the fuel to receive credit under the LCFS. It is recommended that the ARB Board delay implementation of the LCFS to allow time for a more robust and certain analysis. (CERA1, CERA2)

Response: ARB acknowledges the importance of consistency in carbon intensity values to protect investments and assure investors. Consistency in carbon intensity values may be of particular concern for investment in biofuels whose carbon intensity includes a significant land use change effect. The carbon intensity for these crop-based fuels may vary greatly depending on the choice of time accounting method and project horizon. Because of this, Resolution 09-31 requires a complete rulemaking process be conducted to approve new pathways or revise existing fuel pathways and also requires that any revisions to "Board approved" land use change carbon intensity values be heard and approved by the Board. As such, a change in time accounting method would require Board approval if it resulted in revision of "Board approved" land use change carbon intensity values. These measures should provide sufficient assurance for investors that arbitrary decisions will not result in risk to investments.

L-147. **Comment:** The method used to aggregate emissions across time can have a large impact on the estimated indirect emissions due to land use changes associated with corn-based ethanol. We recommend that CARB staff reject the use of the FWP and the FWPe methods because they reflect an arbitrary truncation effect. Early emissions can receive dramatically more weight than later ones because their impacts in the atmosphere are tracked and accumulated by the method for more years after they are released. The magnitude of this effect depends on the arbitrarily chosen length of an Impact Horizon. Correcting for the truncation effect with the FWP and FWPe makes them equivalent to the simpler Annualized and NPV approaches, respectively, that are based on emissions.

The Annualized and NPV approaches are superior to the FWP and FWPe, respectively, but like those methods they fail to account for the fact that there is a broad consensus that the marginal damages caused by a ton of CO2 emissions will grow over time, so that, for example, it will be worth more in 20 years to reduce emissions by a ton in that year than it is worth to control a ton today. This means that in aggregating emissions that occur in different future years, the weights should reflect those higher relative values, as well as whatever discount rate CARB determines is appropriate for monetized benefits.

The practical effect of accounting for changes over time in the Social Cost of Carbon (SCC) is to reduce the monetary discount rate by the growth rate in marginal damages to arrive at a discount rate appropriate for physical emissions. If one uses either of the two discount rates for benefits highlighted in the ISOR (2 or 3 percent) and the growth rate in the SCC suggested in a recent IPPC report (2.4 percent), this approach yields emission discount rates of between -0.6 percent (with r=2 percent) and +0.4 percent (with r=3 percent), bracketing the emission discount rate of zero implicit in the CARB staff's preferred Annualized or averaging approach. This means that the indirect emissions values for ethanol calculated taking into account increasing marginal damages and the ISOR discount rates of 2 and 3 percent bracket

the value obtained using the CARB staff's preferred Annualized (averaging) approach. (RFA1 Appendix D (NERA Economic Consulting, *Accounting for Differences in the Timing of Emissions in Calculating the Carbon Intensity for the California Low Carbon Fuels Standard*, Prepared for the Renewable Fuels Association, April, 2009))

Response: As noted in response to Comments L-141 through L-143, the Board approved the annualized method, accepted that the Net Present Value (NPV) method is not appropriate for the accounting of time-varying GHG emissions, and agreed that the Fuel Warming Potential (FWP) method warrants further study. First, as outlined in the ISOR (at IV-26), the NPV method was deemed inappropriate for the accounting of time-varying GHG emissions because establishing a link between physical emissions and economic impacts is highly uncertain and may not be possible. While the Board did not accept the FWP method, an article based on this method was recently published in a peer reviewed journal, and therefore the method has received some scrutiny by the scientific community.[2] The FWP method will also likely be a topic of discussion for the Expert Workgroup, which is being convened at the Boards request to further evaluate the estimation of land use change emissions. The FWP method will continue to be considered based on input from the scientific community and the Expert Workgroup on this matter.

[2] *Ibid*

2. Unattributed or Misattributed Commenters

The following table identifies instances in which the commenter (as indicated by its abbreviation indicated in the FSOR) was inadvertently not attributed to a comment that person made (i.e., the commenters' list shown for a comment was incomplete) or the commenter's abbreviation was misspelled. For these unattributed or misattributed commenters, the table below identifies the appropriate attribution by specific comment number.

	Commenter Abbreviation	**Add Commenter Abbreviation to the Following FSOR Comments**
1	111SCIENTIST	C-64, L-7
2	BURR	C-205, J-2, J-3
3	CALUMET	C-158, F-16, F-18, F-42, G-1, G-6, L-94
4	CAP2	F-24, F-28, F-30, I-80
5	CEVC	L-1, L-7, L-75
6	CLF1	G-8
7	DALE	C-252, L-1, L-3, L-4, L-5, L-10, L-11, L-45, L-47, L-89, L-94
8	EC	C-251, C-310, E-1 to E-12, F-5, F-6, F-24, F-61 to F-70, H-1, L-94
9	ECOMETRICA	Misspelling of abbreviation in L-84 and L-88
10	EMA	C-81, J-30, V-63, V-64, V-67
11	GE1	L-1, L-2, L-40, L-66, L-75
12	GE2	L-75
13	GE5	IV-9, IV-13, IV-15
14	GOVTCANADA1	C-235, C-237, C-238, C-239
15	GOVTCANADA2	C-237, C-238, C-239
16	HOFF	F-47
17	KORC2	C-118, C-135, K-127, K-128
18	KORC3	K-128
19	MALECHIKOS	K-29
20	NEB	K-143
21	NFA2	K-9
22	NRDC1	L-17, L-94, L-95, L-96, L-97
23	OEC	C-64, C-220 through C-262, K-156, L-75, L-97, IV-175, IV-182
24	PMPBRAZIL	G-10, G-12
25	REPLLC	C-145
26	SIERRARRES	Misspelling of abbreviation in D-24 and F-13
27	WASTESCT1	Misspelling of abbreviation in K-101
28	WASTESCT2	K-101
29	YOKAYO	C-145

3. Comments Not Summarized and Responded

The following table identifies comments that were not summarized and responded to for the reasons specified. "Not LCFS related" means the comment was on a topic other than the topics covered by the applicable Notice (i.e., the comment did not address the proposed regulatory action, supporting documentation, or the rulemaking process).

	Comment Abbreviation	**Letter Number**	**Reason**
1	MAURIELLO	144	Not LCFS related
2	WINNSON1		Duplicate letter
3	YULEX	122	Duplicate letter
4	SPT3	22	Letter submitted additional data table only to SPT2
5	179SCIENTIST	200	Duplicate letter
6	BAAQMD	OT39	Not LCFS related
7	EESI2	56	Duplicate letter
8	FORMLETTER1	2	Deleted from rulemaking record (not LCFS related or a duplicate)
9	SBLLC	179	Not LCFS related
10	USNAVY2	1035	Not LCFS related
11	OLSEN	40	Not LCFS related
12	YANG	7	Not LCFS related
13	DABBR	33	Not LCFS related