RFA RENEWABLE FUELS ASSOCIATION

October 24, 2014

Wes Ingram
Manager, Fuels Evaluation Section
California Air Resources Board
1001 “I” Street
Sacramento, CA 95812

RE: RFA Comments on CA-GREET 2.0

Dear Mr. Ingram,

The Renewable Fuels Association (RFA) appreciates the opportunity to provide comment on the California Air Resources Board’s (CARB) draft version of the CA-GREET2.0 model and Tier 1 carbon intensity (CI) calculator.

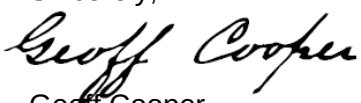
In general, RFA supports CARB’s decision to revise and update its California-specific GREET model based on the Argonne National Laboratory GREET1_2013 and GREET1_2014 models. We believe Argonne’s 2013 and 2014 versions of the GREET model contain important improvements and updated inputs that more accurately reflect the current CI performance of corn ethanol and many other fuel pathways. However, based on our review of the draft CA-GREET2.0 model, we believe several additional revisions should be considered.

As described in the attachment, RFA believes CARB should:

1. Integrate GREET1_2013 default assumptions on ethanol co-product feed displacement;
2. Revise the CA-GREET2.0 model’s treatment of emissions from lime application based on new data from the U.S. Department of Agriculture; and
3. Integrate GREET1_2013 default assumptions on methane emission reductions resulting from feeding of ethanol co-products.

These recommendations are described in more detail in the attached document. We appreciate CARB’s consideration of these comments and welcome further dialog on this subject.

Sincerely,



Geoff Cooper
Senior Vice President

COMMENTS OF THE RENEWABLE FUELS ASSOCIATION (RFA)
IN RESPONSE TO
RELEASE OF (DRAFT) CA-GREET 2.0 MODEL (OCTOBER 10, 2014)

The California Air Resources Board (CARB) released a draft version of the CA-GREET2.0 model and Tier 1 fuels CI calculator on October 10. The CA-GREET2.0 model and Tier 1 calculator will be used for the purposes of assigning direct CI values under the Low Carbon Fuel Standard (LCFS). RFA offers the recommendations below in response to the release of the CA-GREET2.0 model and associated material.

1. **CARB should integrate the Argonne GREET1_2013 default assumptions on ethanol co-product feed (i.e., distillers grains) displacement rates.**

The draft CA-GREET2.0 model maintains the faulty CA-GREET1.8B assumptions regarding ethanol co-product feed displacement rates. When developing the original CA-GREET model in 2008-09, CARB deviated from the accepted Argonne GREET default assumptions on distillers grains (DDGS) displacement rates based on the opinion that "…significant barriers to the widespread adoption of DDGS as livestock feed exist."[1] In the 2009 staff report, CARB staff curiously suggested that increased volumes of distillers grains in the future would not—and could not be utilized—by the livestock and poultry industries. Time has proven that CARB staff's assessment of the distillers grains market in the staff report was incorrect. Distillers grains production has virtually doubled since 2008 and it is *inarguable* that the larger volumes of DDGS produced since publication of the staff report have effectively and economically substituted for traditional feed ingredients.

Further, it is beyond dispute that distillers grains replace both corn *and soybean meal* in livestock and poultry rations and have done so for many years. The CA-GREET2.0 model continues to assume no soybean meal is replaced by DDGS. CARB should *not* maintain this assumption, which has been proven incorrect by the real-world experience with DDGS over the past six years. In the staff report, CARB pledged that "…staff will re-visit this issue and make updates to the co-product credit, as appropriate."[2] As distillers grains displacement ratios have considerable impacts on the overall direct CI score associated with grain-based ethanol, it is imperative that CARB integrates the Argonne GREET1_2013 default assumptions, which are based on a transparent and sound body of nutritional research *and* real-world experience.

In the October 10, 2014 CARB document entitled "DRAFT: Comparison of CA-GREET 1.8B, GREET1 2013, and CA-GREET 2.0," CARB does not explain its rationale for maintaining the CA-GREET1.8B assumptions for DDGS displacement. Rather, Table 10 only refers the reader to notes II and III on page 5, which state that CARB is "…still reviewing specific parameters from GREET1 2013 to confirm data sources and accuracy for inclusion in the model."

[1] CARB. March 5, 2009. Staff Report. Volume II. Proposed Regulation to Implement the Low Carbon Fuel Standard. Appendices. C-54.
[2] *Id.*

While we are encouraged that CARB may still be considering a revision to the DDGS displacement values in CA-GREET2.0, we are concerned that this issue has been open and unresolved for more than five years (i.e., since publication of the 2009 Staff Report). There is ample evidence available to support the use of DDGS displacement rates that include displacement of soybean meal and urea. We strongly encourage CARB staff to contact commercial and academic experts in the field of animal nutrition to gain a better understanding of how DDGS is actually being used today. Further, we again recommend that CARB adopt the displacement factors currently in GREET1_2013. The table below summarizes the weighted average displacement ratio from Argonne's GREET1_2013 compared to CARB's CA-GREET.

Feed Ingredients Replaced by 1.00 lb. of Distillers Grain CA-GREET2.0 vs. GREET1_2013		
	CA-GREET2.0	**GREET1_2013**
Corn (lbs.)	1.00	0.781
Soybean Meal (lbs.)	**0.00**	**0.307**
Urea (lbs.)	**0.00**	**0.023**
TOTAL (lbs.)	**1.00**	**1.111**

In addition, CARB should carry revised treatment of DDGS into the indirect emissions analysis associated with corn ethanol. This should include reconsideration of 1) GTAP distillers grains substitution rates, 2) effects of feeding DDGS on emissions from enteric fermentation (as recommended by the CARB Expert Work Group), and 3) displacement of synthetic urea/non-protein nitrogen compounds in beef cattle diets.

2. **CARB should revise the CA-GREET2.0 model's treatment of emissions from agricultural lime application based on new data from the U.S. Department of Agriculture (USDA).**

The GREET1_2013 model uses an emissions factor of 0.44 g CO_2/g $CaCO_3$ applied to the soil for corn ethanol (cell F379 on the EtOH sheet). With the default lime application rate in the model, this results in about 2.25 g CO_2eq/MJ of ethanol after allocation. The 0.44 g CO_2/g $CaCO_3$ is the IPCC Tier 1 default emission factor for limestone. While the GREET1_2014 model makes a small improvement on the treatment of emissions from lime application, it does not go far enough in correcting the problem. CARB has proposed to adopt the GREET1_2014 lime emissions value for use in the CA-GREET2.0 model. While this is an improvement over the CA-GREET1.8B treatment of lime emissions, we strongly encourage CARB to further revise its lime emissions factor based on new data and information from USDA.

In July 2014, the USDA released a report on the methods to quantify the GHG emissions of agricultural and forestry activities.[3] The report lays out methods for estimating changes in GHG emissions and carbon storage at a local scale. Many of the methods laid out in the report are

[3] USDA. 2014. Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory. http://www.usda.gov/oce/climate_change/Quantifying_GHG/USDATB1939_07072014.pdf

those that are used by the USDA and the EPA to develop the U.S. National GHG Inventory report that is prepared each year for the UNFCCC program. According to the USDA report:

> *Addition of lime to soils is typically thought to generate CO_2 emissions to the atmosphere (de Klein et al., 2006). However, prevailing conditions in U.S. agricultural lands lead to CO_2 uptake because the majority of lime is dissolved in the presence of carbonic acid (H_2CO_3).* ***Therefore, the addition of lime leads to a carbon sink in the majority of U.S. cropland and grazing land systems****. Whether liming contributes to a sink or source depends on the pathways of dissolution and rates of bicarbonate leaching. The emissions factor provided in this guidance has been estimated from a review of existing models and mass balance analyses conducted for the application of lime in the United States and is a Tier 2 method as defined by the IPCC.*
>
> *Since crushed limestone ($CaCO_3$) contains 12 percent C, an application of 1,000 kg $CaCO_3$ places 120 kg C on the soil surface. It is assumed that two-thirds of this (80 kg) is acidified to HCO3- and leached to the ocean where it will be sequestered for decades to centuries (Oh and Raymond, 2006). Because this transfer represents a movement from one long-term pool (geologic formations) to another (ocean), this carbon transfer does not represent a net uptake of CO_2 from the atmosphere. However, with this transfer, there is 80 kg C of atmospheric CO_2 uptake into soils. The uptake of CO_2 from the atmosphere, after subtracting the one-third of carbon in the lime that is acidified directly to CO_2 (40 kg C), yields a total net CO_2 uptake of 40 kg C per 1,000 kg $CaCO_3$ applied. This results in a carbon coefficient or emission factor of 40/1000 = -0.04 kg C per kg $CaCO_3$. This equates to a carbon sink (40 kg C sequestered/120 kg C × 100). Dolomite contains only slightly more carbon than does $CaCO_3$ (13 percent vs. 12 percent) so the factors are essentially the same.*[4]

The reaction of calcium carbonate, water and carbon dioxide to produce carbonic acid is:

$$CaCO_3 + H_2O + CO_2 \rightarrow Ca^{2+} + 2HCO_3^-$$

This shows the carbon uptake resulting from the limestone reaction.

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[4] *Id*. (Emphasis Added) See also: Oh, N.-H., and P. A. Raymond (2006), Contribution of agricultural liming to riverine bicarbonate export and CO_2 sequestration in the Ohio River basin, Global Biogeochem. Cycles, 20, GB3012, doi:10.1029/2005GB002565.
http://onlinelibrary.wiley.com/doi/10.1029/2005GB002565/pdf

CARB should be using the best available science and data for its CI modeling. In this case, that means the adoption of the Tier 2 methodology developed by the USDA for estimating the impact of liming US agricultural soils on carbon emissions for use in the CA-GREET2.0 model.

Thus, in the GREET model, Cell F379 should be changed to:

=G332*-0.04*44/12

Or =-G332*0.147

This makes a difference of approximately 3 g CO_2/MJ ethanol after allocation. We note that this emission factor is dependent on the specific soil conditions and the change should only apply to U.S.-produced crops at this time. If other regions that lime soils have data or Tier 2 methods for determining the emission factors for their regions they should be considered, but in the absence of such data the IPCC Tier 1 approach should be used outside of the United States.

3. **CARB should adopt the GREET1_2013 methodology for accounting for methane emissions reductions resulting from feeding of DDGS to livestock.**

For the CA-GREET2.0 model, CARB is proposing to exclude the GREET1_2013 credit for methane emissions reduction resulting from feeding DDGS. We strongly disagree with this proposal and CARB's rationale for the exclusion. We recommend CARB adopt the GREET1_2013 methane emissions reduction credit for use in CA-GREET2.0.

In the October 10 document accompanying the release of the draft CA-GREET2.0 model, CARB states that the methane emissions reduction credit is excluded:

> "…due to the feeding of animals not being considered in the LCFS fuel pathway LCA system boundary. Including the feeding of animals in the LCA would require significant analysis and would not only include the enteric emissions or change thereof from business as usual, e.g. other emissions would need to be considered and feed markets would need to be analyzed and updated. The LCFS LCA boundary stops at displacing the feed that would have to be produced if DGS were not available."

This line of reasoning by CARB is highly questionable for at least three reasons:

- CARB states that the "feeding of animals [is] not being considered in the LCFS fuel pathway LCA system boundary." This argument is wholly contradictory to CARB's reasoning for maintaining the faulty 1:1 DDGS:Corn displacement ratio (i.e., assuming DDGS does not replace soybean meal or urea). In the 2009 Staff Report, CARB stated that it "…conducted an extensive review of the literature…" regarding the feeding of DDGS to animals. This "review" led CARB to conclude that "DDGS appears to face significant barriers to widespread adoption as a replacement for corn and soybean meal." Thus, CARB staff's DDGS displacement rates are based on staff's analysis and

consideration of feeding DDGS to animals. Yet, for the issue of methane emissions reductions, CARB staff claims "feeding of animals" is outside the analytical boundaries. This is entirely inconsistent and raises important questions about the amorphous boundary conditions of CARB's analysis.

- CARB states that an "expanded system boundary" would be required for inclusion of methane emission reductions resulting from feeding DDGS to livestock. This implies that CARB views methane emissions reductions as a potential indirect or consequential effect. It could be argued that reduced methane emissions from livestock are a direct effect of corn ethanol expansion (via increased DDGS feeding). Nonetheless, even if we accept the argument that methane emission reductions are an *indirect* effect, CARB has no defensible reason for excluding these emission reductions. That is because CARB *already has expanded the boundary conditions for its corn ethanol pathways to include consequential/indirect effects such as purported land use changes*. CARB is also proposing to include indirect emissions associated with irrigation constraints, and at one point CARB was considering inclusion of hypothetical emissions that would indirectly result from "holding food consumption constant." Thus, CARB is proposing to include a number of potential indirect/consequential emissions sources in the corn ethanol lifecycle, but plans to selectively exclude potential emissions reductions (i.e., credits). This reflects inconsistent and asymmetrical boundary conditions (and possible bias) in CARB's analysis of corn ethanol emissions.

- In attempting to justify exclusion of the GREET1_2013 methane reduction credit, CARB states that:

> "It is important to consider that the reduced enteric emissions are primarily due to the shortened lifespan of the animals, e.g. cattle, being fed DGS because they grow faster and spend less time in feedlots when fed DGS compared to alternative feed. This requires examining livestock feeding, feed markets, and assuming that the animals are not replaced more quickly because of spending less time in the feedlot (livestock markets). Certainly, if feeding DGS increases cattle throughput, then overall lifecycle enteric emission could actually increase."

This statement demonstrates that CARB may be confusing basic LCA allocation principles and misunderstands how the methane emissions reduction credit applies to the corn ethanol lifecycle in GREET1_2013. That is, a certain amount of methane is emitted ***per unit of feed*** used to produce a ***fixed quantity of meat***. If substituting some DDGS for conventional feed leads to lower methane emissions for the same fixed quantity of meat, then credit for the reduced emissions should be allocated to the DDGS. Whether total cattle throughput increases or not is irrelevant to corn ethanol lifecycle emissions because allocation is on a *per unit* basis.