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November 10, 2008

The Honorable Stephen Johnson
Administrator
United States Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

The Honorable Ed Schafer
Secretary
United States Department of Agriculture
1400 Independence Ave., SW
Washington, DC 20250

Dear Administrator Johnson and Secretary Schafer:

We write to you in response to a series of letters and statements that argue for excluding indirect land use effects in the EPA's rulemaking for the Renewable Fuel Standard (RFS). As we explain below, it is essential to include the best available scientific estimate of the full greenhouse gas consequences of biofuel production—including indirect land use change—as required by the Energy Independence and Security Act of 2007 (EISA).

EPA is required by EISA to ensure that different classes of biofuels achieve designated reductions in life cycle GHG emissions relative to those of gasoline in order to be counted under EISA's renewable fuel mandate. The Act specifically requires including significant GHG emissions resulting from land use change. The salience of this requirement lies in the size of current estimates of these indirect emissions: added to typical direct emissions values, they indicate that substituting certain biofuels, especially corn ethanol, for gasoline will actually increase the global warming (GW) intensity of motor fuel, or decrease it so little (depending on how it is calculated) that these biofuels would fail to meet EISA required GHG reductions.

Recent letters to EPA Administrator Johnson have raised a series of arguments against incorporating the best estimates of greenhouse gas (GHG) releases from land use change (LUC) into the life cycle assessment of renewable fuels. These arguments are refuted below.

1. *Claim: Estimates of LUC are too uncertain to use in policy decisions.*

The estimates do indeed come with substantial uncertainty. However, EPA has long regulated vehicle and stationary source emissions on the basis of air transport and chemical transformation models whose uncertainty regarding (i) the concentrations in a particular place of (ii) a given quantity of released pollutants, (iii) the health effects of these releases, and (iv) the economic costs of the effects have very wide error bands owing to data sampling error, meteorological variability, and public health models. Engineered product systems such as biofuels produced on arable land carry risks to human health and Earth's climate; those risks are uncertain, but a variety of methods are available for their estimation. Understanding the boundaries and limitations of those methods is critical to informing policy. Excluding use of these methods because of alleged "severe data and technical shortcomings" would result in open-ended comparisons that ignore the principle of "compared to what" and imply no action.

Estimates of direct GHG emissions from biofuels production also include some very uncertain factors, most notably the nitrous oxide emissions related to fertilizer application [1]. Indeed, LCA results are generally uncertain, owing to data gaps, aggregation, arbitrarily constructed system boundaries, handling of co-products, and more [2-4]. If "uncertain" means "we have to ignore it", then all these elements of direct emission also need to be omitted, greatly (and absurdly) reducing the calculated GW intensity for ethanol, but to include one and not the other would be completely inconsistent.

2. *Claim: There are no generally accepted methods for determining indirect effects; no published papers in the life cycle literature use indirect effects; and the ISO standards for life cycle assessment (LCA) has not published standards for estimating indirect effects.*

In fact, the leading two major peer-reviewed life cycle assessment journals (International Journal of Life Cycle Assessment and Journal of Cleaner Production) have published numerous articles on indirect effects within the emerging framework of consequential LCA, including papers describing the use of a computable general equilibrium (economic) model and satellite-based data to assess land use change [5-14]. It is true that no consensus exists yet on how to treat indirect effects generally in LCA, but the LCA community clearly recognizes this type of analysis as legitimate.

The ISO's LCA standards were last updated in 2006 [15, 16]. That these standards do not include methodologies that are only now coming to the fore is inadequate justification for ignoring the more current science. LCA must evolve when gaps in methodological procedures are identified, it is the job of researchers to find ways to address them. The best methods currently available for estimating market-mediated effects are economic models such as partial and general equilibrium models. Several groups are currently employing these models to estimate indirect LUC, and despite considerable uncertainty, none has concluded that zero grams of CO_2 per megajoule is the best estimate of the effect. Ignoring an effect that may be large simply because it is uncertain is unjustifiable.

3. *Claim: There is no way to apply even current methods in any meaningful way to the choices a farmer makes*.

This is true but irrelevant. We see no basis in EISA or LCA methodology for limiting the life cycle assessment to include only GHG emissions affected by farmer choices. As the articles cited above indicate, a consequential LCA measures the results of an action or policy, such as a biofuels mandate. Individual farmers are not the focus of such an analysis.

4. *Claim: Owing to the existence of large quantities of unused land, expanding biofuels production would not necessarily lead to land use conversion.*

We agree that this is one possible outcome. However, the likelihood of this scenario is actually *reduced* by ignoring indirect LUC, because ignoring the effect removes incentives to avoid the effect. In any case, as it is impossible to predict the future, we believe EPA should estimate the LUC effect under existing regulations and behaviors, and update these when the situation warrants it. When land is categorized as "unused", it may still support vegetation and have higher soil carbon levels than a cultivated system. Indeed, land that really is desert, and would not release carbon if converted to agriculture, is most unlikely to be used for food production.

5. *Claim: Feedstocks such as switchgrass and miscanthus can be produced on "marginal" or "degraded" land not suitable for food production, so EPA should not cast doubt on these 2nd-generation biofuels.*

We agree that EPA should assign a lower GHG rating to biofuels produced in any manner that avoids indirect LUC. However, rather than casting doubt on 2nd-generation biofuels, inclusion of the indirect LUC emissions provides precisely the right incentives to ensure that truly low-carbon biofuels will be produced, and CGE/LCA analysis will capture this advantage.

6. *Claim: Assigning a value to crop-based biofuels in EISA would be catastrophic for advanced biofuels development.*

This is claimed without evidence, and indeed it seems most unlikely. The infrastructure required to increase the ethanol content of vehicle fuel is not especially complicated or even expensive, and could be provided rapidly if a biofuel with lower GW than gasoline is offered to the market. Little experience remains to be gained from handling corn ethanol that is needed for managing other kinds. Moreover, bio-based hydrocarbons currently under development by several companies will be compatible with existing petroleum fuel infrastructure. If these fuels obtain a low GW rating and can be produced economically, there would be no barriers to their widespread use.

The idea that because we don't know everything about a complicated process means that it has negligible negative impact, or that it can or should be treated as having negligible negative impact, contradicts years of regulatory experience.

In sum, and more generally, the idea that because we don't know everything about a complicated process means we know nothing about it, or cannot make useful predictions for regulation or investment, verges on the bizarre. The influences on human behavior are as complicated and as imperfectly understood as the social influences on land use change; friends, entertainment, employment, financial incentives, religion, appetites, and more. Nevertheless we uncontroversially regulate behavior with rules that have less than perfect consequential certainty: if some drivers are cited and fined for speeding, we are quite sure that there will be less speeding by most or all drivers, and we think the regulatory program will have its own effect, whether or not the state is simultaneously investing in public education of drivers, and whether gasoline prices are high or low.

That some land will be brought from natural conditions into cultivation, with accompanying rapid carbon emissions from the existing vegetation, when ethanol demand is added to whatever other corn the world market would otherwise use, is an inference from absolutely foundational and uncontroverted elementary principles of human behavior, such as the law of demand. Exactly how large the effect is requires sophisticated predictive models and will never be as precise as measuring the specific gravity of ethanol, but to act as though the effect is nil is simply obscurantist and unscientific. No principle of law or regulatory practice or common sense dictates that the state must regard any uncertain value as zero.

This is not something on which a political compromise makes any sense; it's not about benefits to this or that group, nor redistribution, but about our best estimate of carbon discharges.

Sincerely,

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