RENEWABLE FUELS ASSOCIATION

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RESPONSE TO
"CARBON BALANCE EFFECTS OF U.S. BIOFUEL PRODUCTION AND USE"
BY PROF. JOHN DECICCO ET AL.

A new study funded by the American Petroleum Institute (API) and conducted by University of Michigan Professor John DeCicco suggests biofuels like ethanol are worse for the climate than petroleum. As with his previous studies, DeCicco's conclusion is based on a flawed methodology that misunderstands the critical differences between the carbon cycles of bioenergy and fossil fuels.

In essence, DeCicco's methodology only examines carbon emissions at the tailpipe without accounting for the distinctive origins of the carbon embedded in the fuel. In the case of ethanol, the CO_2 released at the tailpipe was recently in the atmosphere and is simply returning to that origin.

Biomass crops (like corn) that are used to produce energy act as temporary carbon sinks. During growth, they quickly absorb CO_2 from the atmosphere. The same amount of CO_2 is then returned to the atmosphere when the carbon in the crop is converted into fuel and combusted for energy. In this way, the use of biomass for energy recycles atmospheric carbon as part of a relatively rapid process.

Thus, carbon emitted from burning biofuels does not introduce "new" carbon into the atmosphere. Rather, burning biofuels emits the same carbon that was recently removed from the atmosphere and sequestered in the plants utilized to create the biofuel. This carbon was already present in the global atmospheric system, moving periodically from the atmosphere into the oceans, into plants, into soils, etc., and then back into the atmosphere.

In contrast, the use of fossil fuels adds to atmospheric CO_2 by emitting carbon that was previously sequestered deep underground for millions of years. When coal, oil, natural gas or other fossil fuels are burned, "new" carbon is introduced into the atmosphere. It is this new carbon that is contributing to climate change.

Of course, there are CO_2 emissions associated with the *production* of biofuels. Energy inputs are used to plant, grow, harvest, and transport biomass, as well as to convert the biomass into liquid fuel and transport it to the user. The supply-chain emissions associated with this energy use are the subject of "lifecycle analysis." When considered on a full lifecycle basis, scientists generally agree that first-generation ethanol reduces GHG emissions by 30-60% compared to petroleum, while second-generation ethanol offers reductions of 80% or more.[1] But these

[1] See, for example, Wang et al. (2012). "Well-to-wheels energy use and greenhouse gas emissions of ethanol from corn, sugarcane and cellulosic biomass for US use." *Environ. Res. Lett.* 7 045905

"lifecycle" emissions, which are the result of energy input during biofuels production and use, do not change the fact that biomass itself is fundamentally carbon neutral.

This critical difference between biomass and fossil fuels is broadly understood within the global scientific community and it is included in accepted bioenergy accounting methods. Researchers at Duke University, the University of Minnesota, and Oak Ridge National Laboratory describe the difference between biofuel and petroleum carbon cycles this way:

> *A critical temporal distinction exists when comparing ethanol and gasoline life-cycles. Oil deposits were established millions of years in the past. The use of oil transfers into today's atmosphere GHGs that had been sequestered and secured for millennia and would have remained out of Earth's atmosphere if not for human intervention. While the production and use of bioenergy also releases GHGs, there is an intrinsic difference between the two fuels, for GHG emissions associated with biofuels occur at temporal scales that would occur naturally, with or without human intervention. …Hence, a bioenergy cycle can be managed while maintaining atmospheric conditions similar to those that allowed humans to evolve and thrive on Earth. In contrast, massive release of fossil fuel carbon alters this balance, and the resulting changes to atmospheric concentrations of GHGs will impact Earth's climate for eons.*[2]

DeCicco's methodology entirely fails to account for this key distinction between biomass and fossil fuels. He attempts to justify this fatal omission by suggesting that only carbon sequestration that is *"additional"* to the existing sequestration performed by bioenergy crops should be counted. Scientists from Purdue University, Argonne National Laboratory, and the Federal Aviation Administration (FAA) have called DeCicco's "additionality" approach "erroneous."[3]

In response to a similar paper published by DeCicco in 2015, the Purdue, Argonne, and FAA researchers highlight the fact that his "additionality" approach completely ignores the fundamental differences between fossil fuels and bioenergy and incorrectly omits carbon uptake by biomass:

> *Fossil fuel carbon comes from the underground fossil carbon stock created a few million years ago. In his proposed analytic framework,* ***DeCicco did not take into account the avoided CO2 emissions from the fossil energy displaced by bioenergy****, even though he casually*

(http://iopscience.iop.org/1748-9326/7/4/045905)

[2] Parish et al. (2012). "Comparing Scales of Environmental Effects from Gasoline and Ethanol Production." *Environmental Management*, 50 (6): 979-1246

[3] Wang et al. (2015). "Comments on and Discussion of 'The Liquid Carbon Challenge: Evolving Views on Transportation Fuels and Climate.'" Available at: https://greet.es.anl.gov/publication-comments-liquid-carbon

> *pointed out the avoided fossil CO2 emissions in his discussion. Biofuels from additional biomass are introduced to displace fossil fuels. Thus, biomass additionality for biofuels should be examined* ***together*** *with the fossil energy* ***subtractionality*** *that is caused by biofuels.*
>
> *On the other hand, biomass carbon derives from biogenic carbon stock and carbon flow via biomass growth. If biogenic carbon stock (both above- and below-ground) is tapped for bioenergy production, the time required for re-establishment of biomass carbon stock by biomass growth can affect bioenergy's carbon reduction significantly. But if bioenergy carbon comes from the annual carbon flow of biomass growth, bioenergy should offer GHG reductions.*[4]

In sum, it is simply not credible to analyze the climate impacts of biofuels without taking into account the fundamental differences between the origin of carbon in fossil fuels and biomass. Studies that attempt to omit this crucial factor serve only to obfuscate and confuse the debate over the climate impacts of our energy policies. While DeCicco's latest paper is being promoted as "new research," it simply repeats arguments and methods that have already been soundly rejected by climate scientists, government researchers, and policymakers.

[4] *Id*.