September 25, 2009

VIA ELECTRONIC MAIL

Environmental Protection Agency
Air and Radiation Docket and Information Center
Mailcode 2822T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Submission of Comments
Regulation of Fuels and Fuel Additives:
Changes to Renewable Fuel Standard Program
Docket EPA-HQ-OAR-2005-0161

To Whom It May Concern:

The Brazilian Sugarcane Industry Association (UNICA) is pleased to provide comments on the U.S. Environmental Protection Agency (EPA) proposed rulemaking for the Renewable Fuel Standard program (the "RFS2 Proposed Rule"). *See Proposed Rulemaking, Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 74 Fed. Reg. 24903 (May 26, 2009).*

In short, UNICA supports EPA's proposed RFS2 rulemaking and believes EPA should finalize RFS2 at the earliest opportunity. At the same time, UNICA respectfully raises specific issues and considerations below that we believe improve the implementation of the RFS2 Proposed Rule and achieve the energy security and greenhouse gas reduction goals sought by the Energy Security and Independence Act of 2007 (EISA).

UNICA is the largest organization representing sugar, ethanol, and bioelectricity producers in Brazil. UNICA's members are responsible for more than 50% of all ethanol produced in Brazil and 60% of overall sugar production. UNICA's priorities include serving as a source for credible scientific data about the competitiveness and sustainability of sugarcane biofuels. The association works to encourage the continuous advancement of sustainability throughout the sugarcane industry and to promote ethanol as a clean, reliable alternative to fossil fuels. In fact, gasoline is now the alternative fuel in Brazil, with more ethanol consumption than gasoline. In terms of sustainability, sugarcane ethanol production uses about 1% of Brazil's arable land and reduces greenhouse gases (GHG) by 90% compared to conventional gasoline. Moreover, thanks to our innovative use of ethanol in transportation and biomass for power cogeneration, sugarcane is now the number one source of renewable energy in Brazil, representing 16% of the country's total energy needs. And this industry is expanding existing production of renewable, carbon neutral plastics and, with the help of innovative companies here in the United States and elsewhere, will soon offer bio-based hydrocarbons that can replace carbon-intensive fossil fuels.[1]

Given our extensive experience with and knowledge of sugarcane biofuels production, and given our direct and significant interest in the final RFS2 rule, we request that EPA carefully and thoroughly consider this letter and its various references[2] in finalizing the rule. Based on the conservative results of a Brazil-specific model for calculating "indirect" emissions[3] and the minimum changes required for the "direct" emissions,[4] the revised results for the sugarcane ethanol pathway should be revised to 82 percent and 73 percent for 100 year with a 2% discount rate and 30 years with no discount rate, respectively. In fact, as our comments below as well as other international reports highlight, there is ample reason to believe that GHG reductions may well be even greater in the years ahead.

This letter is structured as follows: *First*, we provide an overview of the Brazilian sugarcane production and its use as a renewable, environmentally sound, and low carbon feedstock, addressing both its benefits and rebutting some erroneous presumptions. *Second*, we address the urgency for EPA to finalize the rule at the earliest opportunity while improving upon a few key issues in a timely way. *Third*, we discuss how EPA's technical lifecycle analysis understates the GHG benefits of sugarcane as a renewable feedstock and suggest specific revisions based on available, creditable scientific data and analysis. *Fourth*, we request reconsideration of various compliance mechanisms that EPA is proposing in order to address possible violations of international trade rules. The letter ends with a brief summary of recommended actions we respectfully request EPA undertake prior to final rule.

I. <u>SUGARCANE IS A CRITICAL FEEDSTOCK TO ADVANCE CLEAN, RENEWABLE ENERGY USE</u>

A. OVERVIEW OF SUGARCANE PRODUCTION

Sugarcane has been used as a feedstock for ethanol fuel production in Brazil for over a century.[5] In Brazil, the process of cultivating, harvesting, and processing sugarcane into ethanol

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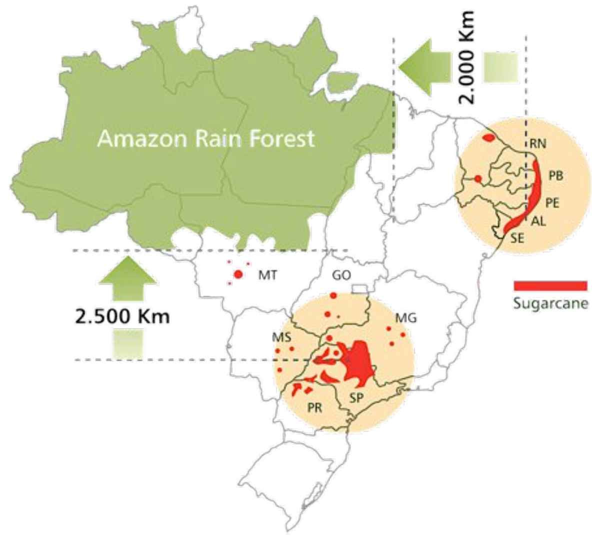
[1] For additional information about UNICA, visit our website at http://english.unica.com.br, which contains up-to-date information, statistics, and technical briefings on the sugarcane industry in Brazil.
[2] We have made every effort to provide English-language references; however, given that significant research on sugarcane has been conducted in Brazil, we have relied on Portuguese literature when English version was not readily available. Wherever possible we have translated relevant documents and/or included web links for original publication. We are standing by to assist EPA in accessing the abundant literature in Portuguese.
[3] See page 30.
[4] See page 28.
[5] For a more detailed discussion of Brazil's experience with sugarcane ethanol as motor vehicle fuel, see "Comment submitted by Joel Velasco, Chief Representative, North America, and Alfred Szwarc, Emissions & Technology Advisor, of the Brazilian Sugarcane Industry Association (UNICA)," submitted to EPA in response to "Notice of Receipt of a Clean Air Act Waiver Application To Increase the Allowable Ethanol Content of Gasoline to 15 Percent," Document ID EPA-HQ-OAR-2009-0211-2580.1

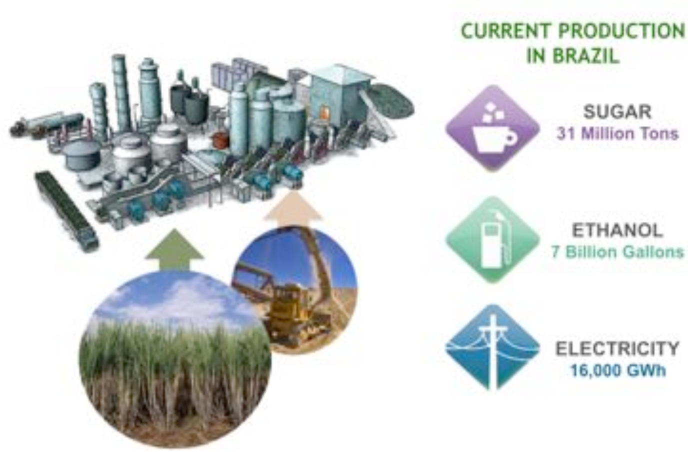
is relatively simple and straightforward, particularly when compared to the processes for starch-derived biofuels and the persistent challenges of cellulosic conversion noted in EPA's Draft Regulatory Impact Analysis (DRIA).[6]



Sugarcane is a semi-perennial crop that stores energy in the form of sucrose in its stalks. Once harvested, the cane stalks are grinded to extract the simple sugars, which are converted into a variety of products, most commonly fuel ethanol and raw sugar for human consumption. [7] The ethanol conversion process generally involves the use of yeast to digest the simple sugars into ethanol.[8]

Sugarcane is grown and processed into ethanol (and other products) in two main areas of Brazil, as the map above shows. The larger of these areas is the South-Central region of Brazil, which primarily includes the states of São Paulo, Paraná, Minas Gerais, Goiás, and Mato Grosso do Sul. Together this region represents about 90% of all sugarcane grown in Brazil today and where nearly all the expansion has taken place.[9] The second and smaller area where sugarcane is grown in Brazil is the Northeast coast, particularly in the states of Alagoas, Pernambuco, Paraíba, Sergipe and Ceará.

Sugarcane production in Brazil continues to increase not only due to heightened demand for fuel ethanol but also most recently due to growing global demand for raw sugar. In the 2008/09 crop year, Brazil harvested nearly 600 million metric tonnes of sugarcane which was used to produce over 31 million metric tonnes of sugar and about 7 billion gallons of ethanol (mostly hydrous for domestic consumption in flex-fuel vehicles). In the 2009/10 crop year, estimates from the Brazilian Ministry of Agriculture suggest that Brazil will harvest approximately 630 million metric tonnes of sugarcane, which will produce 37 million metric tonnes of sugar and 7.5 billion gallons of



[6] Brown, Robert C. *Biorenewable Resources: Engineering new products from agriculture*. Ames, Iowa: Iowa State, 2003.
[7] James, Glyn. *Sugarcane (World Agriculture Series)*. Grand Rapids: Blackwell Limited, 2003.
[8] See page 12-13 of Mastny, Lisa, ed. Biofuels for Transport Global Potential and Implications for Energy and Agriculture. Minneapolis: Earthscan Publications Ltd., 2007.
[9] Zuurbier, Peter, and Jos Van de Vooren, eds. *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment*. Wageningen, The Netherlands: Wageningen Academic, 2008

fuel ethanol.[10] Thus, the Brazilian sugarcane industry can help the world address both food and fuel needs simultaneously, without causing adverse environmental impacts to rainforests and other environmentally sensitive areas.

This year alone, Brazil's crop estimates show that while overall cane harvested volumes are expected to increase by about 10 percent, raw sugar production will increase by over 16 percent while fuel ethanol increases will be around 5 percent. This projection has been corroborated by UNICA's bimonthly crop update reports, which are available in English online.[11] As UNICA noted earlier this year in its own initial harvest estimate, the structural deficit in world sugar production, due to the shortcomings of other major sugar producing countries such as India, has had the effect of encouraging greater sugar – as opposed to ethanol – production in Brazil.[12] However, this effect may be short-lived due to the highly restricted world sugar market, which imposes extraordinary barriers to the free trade of sugar in the world.

Finally, as we demonstrate in greater detail in Section II below, sugarcane mills in Brazil generate their own power from the sugarcane biomass. Official government data indicates that sugarcane mills produced approximately 16,000 GWh of electricity, of which one third was surplus electricity that was fed into the Brazilian grid in 2008.[13] Industry estimates show this surplus cogeneration electricity, commonly known as "bioelectricity" in Brazil, will increase from 3% to 10% of Brazil's electricity demand by 2020 and will obviate the need to increase the number of fossil-based thermal power plants.[14]

B. SUGARCANE AS A RENEWABLE BIOMASS FEEDSTOCK

There is no dispute that Brazilian sugarcane meets the EISA's statutory definition of a renewable biomass feedstock,[15] as it is a "planted crop" that has been "harvested from agricultural land" that was under cultivation prior to December 2007 and remains "actively managed."[16] As the DRIA notes in Table 1.1-3, the planted sugarcane area in Brazil in the 2007 crop year was 19 million acres and overall agricultural land was 661 million hectares.

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[10] See table on page 8 of CONAB crop harvest update, which is available in Portuguese from the Brazilian Ministry of Agriculture, Livestock and Supply. Brazil. Ministério da Agricultura Pecuária e Abastecimento (MAPA). CONAB - Companhia Nacional de Abastecimento*. Acompanhamento de Safra Brasileira: Cana-de-Açúcar, Segundo Levantamento.* MAPA, Sept. 2009. Web. Sept. 2009. <http://www.conab.gov.br/conabweb/>.

[11] See http://english.unica.com.br/releases/ (providing a crop update and statistical breakdown of all mills in South-Central Brazil, which represents 90% of country's sugarcane harvest).

[12] See http://www.unica.com.br/releases/show.asp?rlsCode={6B0A6260-026A-42FB-B4F1-ADE8CAA469F8}

[13] Patusco, Oao Antonio Moreira. "Balanço Energético Nacional – Ano Base 2008 – Dados preliminares – MME." 11 Aug. 2009. E-mail. 2008 data estimates provided by Brazilian Ministry of Mines & Energy (MME).

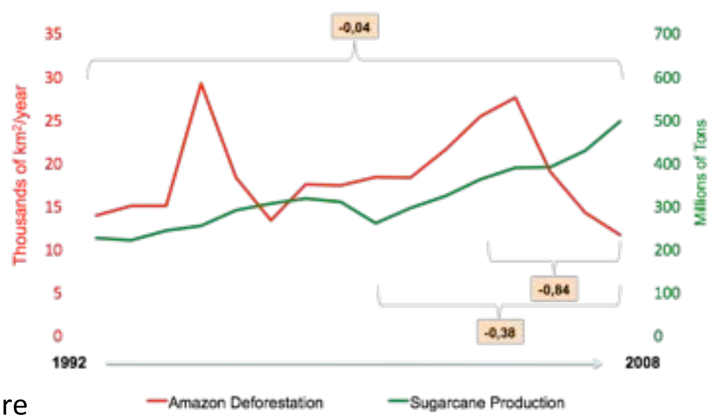
[14] Silvestrin, Carlos Roberto. "Bioeletricidade - Reduzindo Emissões e Agregando Valor ao Sistema Elétrico Nacional." *COGEN/SP*. Presentation made at Ethanol Summit in Sao Paulo, Brazil., 2 June 2009. Web. 1 Sept. 2009. <http://www.cogensp.com.br/workshop/2009/Bioeletricidade_Agregando_Valor_Matriz_Eletrica_03jun2009.pdf>.

[15] See EISA Title II, Subtitle A, Paragraph I and discussion in RFS2 Proposed Rule, page 24994 in 74 Fed. Reg. (May 26, 2009).

[16] See Companhia Nacional de Abastecimento (CONAB), Perfil do Setor do Acucar e do Alcool no Brasil, Situacao Observada em Novembro de 2007/Abril 2008. Ministério da Agricultura, Pecuária e Abastecimento. Brasilia: CONAB, 2008

Increased production of sugarcane is taking place in farming areas that do not displace native or forested vegetation.[17] While we discuss the land use dynamics in Brazil later on this document, it is important to note that scientific data shows that the overwhelming majority of sugarcane areas are located in land that has been converted to agriculture, not native forest.[18] For example, over 50% of the sugarcane production today is located within the southeastern state of São Paulo. An aerial survey of the Atlantic Forest indicated that forests covered about 14% of the state in 1962, over a decade before ethanol fuel became commonly used in Brazil.[19] In 2007, the most recent forestry inventory by the State of São Paulo Environmental Protection Agency shows that about 13.4% of the area is covered by native vegetation.[20] During that period, while total forested area remained stable, sugarcane planted area increased from about 286,713 hectares in 1962[21] to 4,249,922 hectares in 2007 in the state of São Paulo.[22]

More broadly, if we compare the total area used for sugarcane production to historical data of Amazon deforestation (*see chart on the right*), it is quite clear that there is no correlation between the deforestation — or in the words of former Vice President Al Gore, "thoughtless deforestation"[23] — and increased sugarcane production.[24] Nevertheless, the Brazilian sugarcane industry is committed to going one step further and, even before Brazilian President Luiz Inácio Lula da Silva proposed legislation[25] to establish an agro-ecological zoning for sugarcane, UNICA called for an outright prohibition in any future



[17] Nassar, Andre M., Bernardo Rudorff, Laura Barcellos Antoniazzi, Daniel Alves de Aguiar, Miriam Bacchi, and Marcos Adami. "Prospects of the Sugarcane Expansion in Brazil: Impacts on Direct and Indirect Land Use Changes." *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment*. Wageningen, The Netherlands: Wageningen Academic, 2008. 63-94.

[18] *O impacto do mercado mundial de biocombustíveis na expansão da agricultura brasileira e suas consequências para as mudanças climáticas*. WWF-Brasil, 29 Aug. 2009. Web. 10 Sept. 2009. <http://www.wwf.org.br/informacoes/bliblioteca/?21200/O-impacto-do-mercado-mundial-de-biocombustveis-na-expanso-da-agricultura-brasileira-e-suas-consequncias-para-as-mudanas-climticas>.

[19] See page 275. Dean, Warren. With Broadax and Firebrand: The Destruction of the Brazilian Atlantic Forest (Centennial Book). New York: University of California, 1997.

[20] Secretaria do Meio Ambiente de São Paulo. Instituto Florestal do Estado de Sao Paulo. Inventário Florestal da Vegetacão Natural do Estado de São Paulo. Sao Paulo, SP: SMA Governo Estadual de São Paulo, 2007.

[21] IAE

[22] "Área de Cana Safra e Reforma na Região Centro-Sul." *CANASAT*. Instituto Nacional de Pesquisas Espaciais (INPE), Divisão de Sensoriamento Remoto (DSR). Web. 1 Aug. 2009. <http://www.dsr.inpe.br/canasat/tabelas.jsp>.

[23] See http://www.c-spanarchives.org/library/includes/templates/library/flash_popup.php?pID=283696-1&searchphrase=thoughtless.

[24] Amazon deforestation data provided by Brazilian Space Agency (INPE). Deforestation data is calendar year while sugarcane production is based on crop years.

[25] For full text of proposed legislation (*in Portuguese only)* see http://www.planalto.gov.br/ccivil_03/Projetos/PL/2009/msg764-090917.htm. Supporting documentation is available at http://www.planalto.gov.br/ccivil_03/Projetos/EXPMOTIV/EMI/2009/24%20-%20MAPA%20MMA%20MME%20MF%20MDA.htm

sugarcane production in sensitive ecosystems such as the Amazon rainforest.[26] Specifically, President Lula's proposed legislation would "prohibit the construction or expansion of sugarcane farms and production plants in any area of native vegetation, or in the Amazon, Pantanal (Brazilian Wetlands) or Upper Paraguay River Basin regions. Coupled with the areas not suitable for sugarcane farming, the bill would effectively make 92.5% of Brazil's national territory off-limits for sugarcane farming and processing."[27] Conversely, nearly 65 million hectares (7.5% of Brazil's territory) could be used for sugarcane. Moreover, UNICA has led in the creation of the Brazilian Climate Alliance, which advocates binding commitments to curtail deforestation and meaningful targets for GHG emission reduction.[28]

C. CONVENTIONAL BENEFITS OF SUGARCANE AS A RENEWABLE FEEDSTOCK

Brazil's abundant rainfall and warm weather have made sugarcane an ideal renewable feedstock for ethanol production.[29] With an average annual yield during a five-year cycle of 85 metric tonnes of sugarcane per hectare (34.5 metric tonnes per acre) and an average ethanol production of 85 liters (22.5 gallons) of ethanol produced from each ton of sugarcane, Brazilian sugarcane mills have an average ethanol production of 7,225 liters per hectare (765 gallons per acre). This high yield has been growing steadily, particularly in South-Central Brazil where agricultural practices have been evolving quite quickly.[30] In addition to high farm yields, another benefit of sugarcane is a renewable feedstock with a strong energy balance. Currently sugarcane ethanol produced in Brazil yields 9.3 units of renewable energy for each unit of fossil fuel used in its production. According to the latest research, this production may reach 11.6 units of renewable energy for each unit of fossil fuel by 2020 through the use of existing commercial technologies in Brazil, including the increased use of sugarcane bagasse for cogeneration.[31] (Bagasse is the main byproduct from the processing of sugarcane that is high in cellulosic fiber and moisture content. Bagasse's use and benefits are discussed in more detail in Section III.)

Also, while there has been a greater than eight percent increase in Brazilian sugarcane yields observed in this decade so far, the physical yield of the sugarcane *plant* is not the only source of yield gains in the production of sugarcane ethanol. [32] The yield gain in Total Recoverable Sugars

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[26] See government announcement at http://www.cnps.embrapa.br/noticias/banco_noticias/20090917.html and UNICA's comments at http://english.unica.com.br/releases/show.asp?rlsCode={6FF09728-9C40-4291-B419-47050EA5545F}

[27] Brazil. Presidency of the Republic. Secretariat of Communications (SECOM). *Brazil Increases Environmental Preservation Measures With Sugarcane Zoning Proposal*. PR Newswire, 17 Sept. 2009. Web. 17 Sept. 2009. <http://sev.prnewswire.com/agriculture/20090917/SPTH00117092009-1.html>.

[28] See announcement and position paper of the Brazilian Climate Alliance available at http://english.unica.com.br/noticias/show.asp?nwsCode=5E846923-01FA-4099-B54E-D969BC3756A3

[29] Sandalow, David. "Ethanol: Lessons from Brazil." *High Growth Strategy for Ethanol: The Report of an Aspen Institute Policy Dialogue*. Washington, DC: Aspen Institute, 2006. 67-74.

[30] Macedo, Isaias C. "The sugarcane Agro-industry: Its contribution to reducing CO_2 emissions in Brazil." Biomass and Bioenergy 3.2 (1992): 77-80

[31] Macedo, Isaias C., Joaquim Seabra, and Joao Silva. "Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020." Biomass and Bioenergy 32.7 (2008): 582-95.

[32] See table 5 of the following study: Ministério da Agricultura, Pecuária e Abastecimento. 2007. Balanço Nacional da Cana-de-Açúcar e Agroenergia. Edição Especial de Lançamento. Available at

(TRS) should also be considered as that is the target for sugarcane farming. TRS is a measure of the energy content (in sugars, excluding lignocellulosic biomass) of the sugarcane.[33] According to the Ministry of Agriculture, Livestock and Supply (2007)[34], the TRS per ton of sugarcane was 138.7 in 2001 and 149.47 in 2006 — an increase of 8.3 percent. (We note that this result would be even higher if official data for 2007 and 2008 were already available.) Higher TRS are obtained over time due to different improvements in sugarcane production, such as better varieties and harvesting period. In short, when looking at yields, EPA should carefully consider TRS yield (kilograms of sugars per ton of crop) increases as well as traditional yield measures (metric tonnes of crops per acre). Most worrisome, the FAPRI model appears to ignore this essential aspect of sugarcane.

D. GREENHOUSE GAS REDUTION OF SUGARCANE AS A RENEWABLE FEEDSTOCK

Sugarcane ethanol is, by far, the world's most efficient biofuel produced at a commercial scale. The greatest benefit, however, of sugarcane as a feedstock for biofuels production is the ability to reduce GHG emissions when compared to fossil fuels.[35] Traditional lifecycle analysis has shown that sugarcane ethanol, as currently produced in Brazil, reduces GHG emissions by up to 90% when compared to traditional gasoline.[36] In addition, with productivity and efficiency gains in sugarcane production further reduction in emissions will only improve sugarcane ethanol's GHG profile, likely turning carbon negative when considering its byproducts.

Several additional factors explain why sugarcane ethanol can reduce GHG emissions. First, sugarcane absorbs 22-36 metric tonnes of CO_2 per hectare per year.[37] Second, emissions from land use are minimized as the crop is replanted every six years on average, reducing the release of CO_2 following tillage. Because harvesting sugarcane — whether manually or mechanically — does not destroy its complex root system, a new stalk will grow and be harvested for five to seven years before its yields (measured as Total Recoverable Sugars, TRS, as noted earlier) drop and a new planting is made.[38] Third, the use of byproducts such as vinasse, a nutrient rich

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www.feagri.unicamp.br/energia/bal_nac_cana_agroenergia_2007.pdf. (We note that this result would be even higher if official data for 2007 and 2008 were available at this time.)

[33] Technical explanation about TRS can be obtained in the following publication: Macedo, I. C (organizer). 2007. Sugar Cane's Energy: Twelve Studies on Brazilian Sugar Cane Agribusiness and its Sustainability. Berlendis & Vertecchia and UNICA – União da Agroindústria Canavieira do Estado de São Paulo. São Paulo (available at http://english.unica.com.br/multimedia/publicacao/). See also SEABRA, J. E. A. Análise de opções tecnológicas para uso integral da biomassa no setor de cana de-açúcar e suas implicações. Campinas: Universidade Estadual de Campinas, Faculdade de Engenharia Mecânica, 2008.

[34] See table 5 of the following study: Ministério da Agricultura, Pecuária e Abastecimento. 2007. Balanço Nacional da Cana-de-Açúcar e Agroenergia. Edição Especial de Lançamento (available at www.feagri.unicamp.br/energia/bal_nac_cana_agroenergia_2007.pdf).

[35] Wang, Michael, and May Wu. "Life-cycle energy use and greenhouse gas emission implications of Brazilian sugarcane ethanol simulated with the GREET model." International Sugar Journal 110.1317 (2008): 527-45.

[36] Zuurbier, Peter, and Jos Van de Vooren, eds. Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment. Wageningen, The Netherlands: Wageningen Academic, 2008.

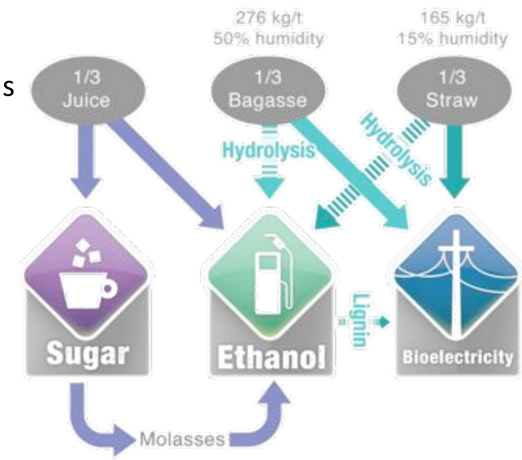
[37] See "Environmental Sustainability of Sugarcane Ethanol in Brazil" by Weber Amaral et al. in *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment*. edited by Peter Zuurbier and Jos van de Vooren. Wageningen, The Netherlands: Wageningen Academic, 2008. Also see Beeharry, Revin Panray. "Carbon balance of sugarcane bioenergy systems." *Biomass and Bioenergy* 20.5 (May 2001): 361-70.

[38] See pages 162-163 of Bakker, H. Sugar Cane Cultivation and Management. New York: Springer, 1999.

liquid resulting from sugarcane ethanol distillation, and other organic pest management techniques are used to offset carbon intensive agricultural inputs.[39]

Of note, a recently published peer-reviewed article shows that the use of sugarcane ethanol in Brazil as a transportation fuel since 1975 has led to a reduction of CO_2 emissions of about 600 million tons, even including estimates for past land use changes. If the use of the bagasse for electricity cogeneration and other efficiency gains had been implemented earlier, the net avoided emissions would increase to over 1 billion tons of CO_2 from 1975 to 2007. Going forward the paper predicts that, based on a reasonable growth rate of 4.3% per year, sugarcane in Brazil would mitigate 836 tons of CO_2 annually in twenty years, or over 10 billion tons of CO_2 in the period.[40]

The future of this renewable feedstock is bright indeed. However, considering that 1 metric ton of sugarcane has the same energy content as 1.2 barrels of oil, there is much more renewable energy to capture from sugarcane. [41] As the chart on the right indicates, the sugarcane juice — the simple sugars that are used to produce sugar and ethanol — represent only one-third of the plant's energy value. The remaining two-thirds is bagasse (the fiber residues remaining after sugarcane processing) and foliage (also referred to as straw or trash) that until recently was burned prior to harvest.



Until a few years ago, sugarcane mills used the sugarcane bagasse to generate vapor and produce electricity for their own consumption. But now, as a result of a number of changes that we detail in Section IV below, mills are generating surplus electricity, which is fed into the grid, substituting other forms of carbon-intense electricity such as those from thermoelectric plants. Through progress in mechanized harvesting and the phase out of open-air burning, estimates are that about 40% of sugarcane straw will be used to generate bioelectricity in the near future. (Cellulosic biofuels, in our experience, are not yet commercially available and would have to be competitive with electricity.) Together with new investments in transmission grids and high-pressure boilers, the bioelectricity potential of the sugarcane sector will increase considerably and is expected to supply over 10% (up from 3% today) of the Brazil's electricity consumption by 2020. Without this renewable energy supply, Brazil would have had to build thermal power plants running on fossil fuels as the country has nearly exhausted its hydroelectric potential.[42]

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[39] *Sustainability Report.* Tech. Sao Paulo, Brazil: UNICA, 2008. This report met the requirements of the Global Reporting Initiative (GRI) and is available online at http://www.unica.com.br/download.asp?mmdCode={D1814075-0E5C-4BFB-BA2C-EF428FF58F33}

[40] Pacca, Sergio, and Jose Roberto Moreira. "Historical Carbon Budget of the Brazilian Ethanol Program." Energy Policy (2009). Article in Press (Corrected Proof Available Online).

[41] Goldemberg, Jose. "The Brazilian Biofuels Industry." *Biotechnology for Biofuels* 1.6 (2008).

[42] McNish, Tyler, Arne Jacobson, Dan Kammen, Anand Gopal, and Ranjit Deshmukh. "Sweet carbon: An Analysis of Sugar Industry Carbon Market Opportunities under the Clean Development Mechanism." *Energy Policy* (2009).

E. CRITICISM OF ADVERSE IMPACTS ARE MERITLESS

There are various myths related to sugarcane ethanol that require rebuttal with facts. The first major myth is that sugarcane ethanol is causing the deforestation of the Amazon Rainforest.[43] As noted above, 90% sugarcane for ethanol production is harvested in South-Central Brazil — about 1,600 miles from the Amazon. The remaining 10% is grown in Northeastern Brazil — about the same distance from the Amazon's easternmost fringe. That is roughly the distance between New York City and Dallas, or between Paris and Moscow.[44]

The second myth is that increased sugarcane production displaces other agricultural activities that in turn move into the rainforest. This too is not accurate. According to the Brazilian National Institute for Spatial Research (INPE), about 65% of recent sugarcane expansion took place on pastures, mostly degraded, in South-Central Brazil. As such, growing sugarcane in these areas does not increase competition for new land or displace other crops, instead leading to cattle intensification (as discussed in Section III.B.) Amazon deforestation, which has been going on for many decades, has been caused by an unfortunate and complex set of social and economic factors completely unrelated to the expansion of Brazil's sugarcane industry.[45] One of the main issues is the absence of clear land titles that leaves the region exposed to rampant land speculation and squatting. Forty-three percent of the Amazon is officially protected, while the rest is divided between areas that are supposed to be public (21%) and private (32%). But the truth is that only 4% of the private areas have legal titles.[46] As a result of the lack of clear property rights and enforcement of the law, illegal logging is the "cash crop" of the rainforest. Finally, over 20 million people currently live in the Amazon region. Tragically, to many of them, the standing forest has no value for their immediate well-being, or economic survival.[47]

The third myth is that Brazil is overrun by sugarcane plantations to the detriment of food production and food prices. As the DRIA correctly notes, in 2007 sugarcane for ethanol production in Brazil occupied 3.4 million hectares, or roughly one percent of the country's 355 million hectares of arable farmland. The area cultivated for sugarcane and used for ethanol is less than one-fourth of Brazil's corn acreage, one-eighth of soybean fields, and one-sixtieth of the land used for cattle ranching. With only 1 percent of its arable land dedicated to sugarcane for ethanol production, Brazil has been able to replace half of its gasoline needs with sugarcane ethanol. In additional, while cane production has increased steadily in recent years, food production in Brazil has grown dramatically. The 2007 harvest for grain and oilseed set a record

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[43] Goettemoeller, Jeffrey, and Adrian Goettemoeller. *Sustainable Ethanol Biofuels, Biorefineries, Cellulosic Biomass, Flex-fuel Vehicles, and Sustainable Farming for Energy Independence*. Grand Rapids: Prairie Oak, 2007.

[44] It is true that there is a very small amount of sugarcane production in the Amazon, but it is less than 0.2% of Brazil's total production. It is processed at three mills that were built more than twenty years ago at a time when the government provided fiscal incentives to set up industrial facilities in the Amazon to supply mostly sugar, not ethanol, in the local market. Without subsidies, these mills would not have been economically viable because the Amazon region does not offer favorable conditions for commercial sugarcane production.

[45] Margulis, Sérgio. *Causes of Deforestation of the Brazilian Amazon*. Washington, DC: World Bank, 2004.

[46] Barreto, P., A. Pinto, B. Brito, and S. Hayashi. *Quem é Dono da Amazônia: Uma análise do recadastramento de imóveis rurais*. Belem, PA Brazil: Imazon, 2008. Web. 1 Sept. 2009. <http://www.imazon.org.br/publicacoes/publicacao.asp?id=537>.

[47] For a more recent discussion of the dynamics of Amazon deforestation, see Mark London's *The Last Forest: The Amazon in the Age of Globalization*. New York: Random House, 2007

at 142 million metric tonnes, twice that of ten years ago. Brazil is widely recognized for its diversified and highly efficient agricultural sector – it is the world's leading exporter of beef, coffee, orange juice, poultry, soybeans and sugar, just to name a few of the top commodities. Just this year, despite a booming demand for ethanol in Brazil, sugarcane mills have increased sugar production by 20 percent in response to a global shortfall drive in large part due to a sugar production shortfall in India.

The fourth myth is that ethanol production and use cause more damage to the environment than fossil fuels. Of course, ethanol can be produced from a wide variety of feedstocks, with different environmental impacts depending on how they are processed. Claims that sugarcane ethanol production could actually increases carbon emissions are flawed. Brazilian ethanol produced from sugarcane reduces greenhouse gas emissions by up to 90% compared to gasoline, a reduction unmatched by any other biofuel produced with existing technology and comparable to what is attained with second-generation biofuels. This positive balance is only marginally affected by changes in land use as described later in this document. In fact, when compared to crops such as corn or soybeans, sugarcane captures more carbon because it is a unique semi-perennial crop only replanted every six years. In addition, the use of degraded pastures – the expansion area of choice for sugarcane in Brazil – actually generates a carbon credit, as sugarcane captures significantly larger amounts of carbon than the quantities originally stocked in this type of land. As noted above, the by-products of sugarcane ethanol production (bagasse and in the future straw) are used to produce clean, renewable electricity, currently accounting for 3% of Brazil's electricity needs and expected to surpass 10% by 2015.

II. <u>EPA SHOULD FINALIZE THE RFS2 AT THE EARLIEST OPPORTUNITY</u>

We strongly urge EPA to complete the RFS2 rulemaking at the earliest opportunity, specifically so that the RFS2 mandate may be implemented starting on January 1, 2010. The deadline by which Congress ordered EPA to revise the RFS regulations already has passed. *See* 42 U.S.C. § 7545(o)(2)(A)(i) ("Not later than 1 year after December 19, 2007, the Administrator *shall* revise the regulations . . . .") (emphasis added). Any further delay would undermine public support for the program, negatively impact the investments in the renewable fuel industry globally, and likely exacerbate the detrimental impacts of continued dependency on fossil fuels for transportation fuels in the United States and abroad. While we have some specific concerns that we believe should be addressed in the final rule, it is imperative that EPA avoid any further delays. Further, the thoroughness of the analysis and conclusions in the proposed rule demonstrate the extent to which the RFS2 can be finalized without delay. As described below, EPA correctly has made significant decisions supported by a strong rationale in the proposed rule, which can facilitate a timely finalizing of the rule.

A. EPA HAS A MANDATORY DUTY TO FINALIZE THE RFS2 TO IMPLEMENT THE EISA

Various groups critical of the nation's renewable fuel goals, including those goals Congress directly addressed in the EISA itself, undoubtedly will urge EPA to delay final promulgation of the RFS2 rule. UNICA, however, believes that EPA must ignore those requests and comply with the nondiscretionary mandate specified in the EISA.

UNICA was one of the few, if not the only, organization that asked that EPA not extend the comment period for the RFS2 Proposed Rule.[48] As we noted in our June 23, 2009 letter, the extension of the comment period makes "it more difficult for EPA to begin implementing the RFS2 regulatory program on January 1, 2010, as proposed. The program, which is mandated under the 2007 Energy Independence and Security Act, will help the United States increase its use of renewable fuels and, in turn, reduce its dependence on foreign oil and lower GHG emissions."[49]

Despite the extension of the comment period, EPA has indicated that it seeks to finalize the RFS rule by the end of this year. EPA states that "due to the addition of complex lifecycle assessments to the determination of eligibility of renewable fuels, the extensive analysis of impacts that we are conducting for the higher renewable fuel volumes, the various complex changes to the regulatory program that require close collaboration with stakeholders, and various statutory limitations […] we are proposing that the RFS2 regulatory program go into effect on January 1, 2010."[50] We believe that EPA has a mandatory, non-discretionary duty to finalize the RFS2 this year in order to implement the EISA requirements, which were enacted into law nearly *two* years ago and require EPA to revise the RFS regulations by December 19, 2008. EPA admits as much in the notice of Proposed Rulemaking, which states "under the [Clean Air Act] section 211(o) as modified by EISA, EPA is *required* to revise the RFS1 regulations within one year of enactment, or December 19, 2008." 74 Fed. Reg. at 24913 (emphasis added.)

Indeed, EPA was under a mandatory, non-discretionary duty to revise the RFS regulations by December 19, 2008. *See Natural Resources Defense Council, Inc. v. EPA*, 797 F. Supp. 194, 196 (E.D. N.Y. 1992) (stating that it is "clear and undisputed" that EPA violated a statutory mandate when it failed to publish a guidance that the Clean Air Act required be published "[w]ithin 12 months" and that the Court has the "equitable power to impose a deadline on EPA"); *cf. also Norton v. Southern Utah Wilderness Alliance*, 542 U.S. 55, 64 (2004) (citing 5 U.S.C. § 706(1) (When "an agency fail[s] to take a discrete agency action that it is *required* to take," the Administrative Procedure Act authorizes courts to compel agency action when it is "unreasonably delayed."); *American Canoe Ass'n, Inc. v. EPA*, 30 F. Supp. 2d 908. 921 (E.D. Va.

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[48] See "Comment submitted by Joel Velasco, Chief Representative, North America, and Alfred Szwarc, Emissions & Technology Advisor, of the Brazilian Sugarcane Industry Association (UNICA)," submitted to EPA in response to "Notice of Receipt of a Clean Air Act Waiver Application To Increase the Allowable Ethanol Content of Gasoline to 15 Percent," Document ID EPA-HQ-OAR-2009-0211-2580.1

[49] Available online at http://www.whitehouse.gov/the_press_office/President-Obama-Announces-Steps-to-Support-Sustainable-Energy-Options/

[50] See 74 Fed. Reg. at 24913.

1998) (Clean Water Act's deadline for EPA to approve or disapprove of state's total maximum daily loads and total maximum daily thermal loads of pollutants was "readily-ascertainable" and imposed a mandatory, nondiscretionary duty on EPA, enforceable through a CWA citizen suit).

The agency's new plan to implement the regulations by January 1, 2010, is thus already well past its statutory deadline. Any further delay would be unreasonable and, therefore, a court could compel EPA to act. "When EPA has failed to discharge a nondiscretionary duty under the Clean Air Act, a district court has jurisdiction to compel the Administrator to fulfill it." *Sierra Club v. Johnson*, 444 F. Supp. 2d 46, 52 (D.D.C. 2006) (citations omitted). While a court may under extraordinary circumstances not presented here extend a Congressionally-mandated time limit, it will only do so when it is impossible or infeasible for EPA to meet the deadline. *Id.* at 52-53; *Natural Resources Defense Council*, 797 F. Supp. at 196-97. Here, EPA is already proposing to revise the regulations a full year after the statutory deadline. Given the great importance of finalizing the RFS2 rule and the delay that has already occurred, the agency cannot meet the "especially heavy" burden that would be required to show it is impossible to finalize the rule by the end of the calendar year and justify additional delay. *Natural Resources Defense Council*, 797 F. Supp. at 197.

In short, we believe it is not only "necessary" but also "required" that EPA implement the RFS2 rule by January 1, 2010. We therefore urge EPA to reject the requests it likely will receive to delay this rule further past its statutory deadline.

B. THE PROPOSED RULE THOROUGHLY CONSIDERED AND EVALUATED RELEVANT ISSUES

As UNICA noted during our participation in the EPA-organized workshop on June 9, 2009, as well as in various other public forums, we believe EPA staff deserves recognition for "its trailblazing work in this Proposed Rule, which took too long to be released for public comment — not the fault of the EPA staff but of some special interests who preferred uncertainty and delays over peer-reviews and technological progress."[51] While we believe EPA could continue to strengthen the Proposed Rule is several ways — as indicated in these comments as well as comments from other stakeholders — the proposed text indicates clearly that EPA staff thoroughly considered and evaluated major, relevant issues involved.

EPA has proposed to resolve numerous core issues in a reasonable manner and based on the support of an extraordinarily strong and significant record. Specifically, we believe EPA is well prepared to finalize the RFS2 in a defensible posture in a manner that promotes Congress' intent by deciding the following issues:

- Affirming in the final rule that sugarcane qualifies as an advanced biofuel, either under a revised 40 percent threshold for advanced biofuels or through a more

[51] Remarks at EPA's Renewable Fuel Standard's Public Hearing, EPA/OTAQ Cong. (2009) (testimony of Joel Velasco, Chief Representative, Brazilian Sugarcane Industry Association (UNICA)), June 9, 2009. See Document ID: EPA-HQ-OAR-2005-0161-1017.

accurate lifecycle assessment of sugarcane derived ethanol that accurately establishes the greenhouse gas reductions of sugarcane at more than 50 percent;

- Waiving the cellulosic biofuel requirements at this time to allow advanced biofuels to satisfy the cellulosic mandates;
- Properly weighting different advanced biofuels based on their actual greenhouse gas reduction benefits to further EPA's goals of addressing climate change as expressed in EPA's proposed endangerment finding;
- Affirming that lifecycle analysis should apply fairly across the board to all feedstocks, regardless of whether they originate domestically or internationally; and
- Implementing key components of the RFS2 by the January 1, 2010 deadline, including the affirmance that sugarcane derived biofuels qualify as advanced biofuels.

C. EPA SHOULD ADJUST ADVANCED FUEL LIFECYCLE THRESHOLD TO 40% IN FINAL RULE

EPA requested comments on whether it should adjust the GHG threshold for advanced biofuels "to as low as 40%." While UNICA believes that there is abundant scientific evidence that sugarcane ethanol reduces GHG emissions compared to conventional gasoline by up to 90%, we concur that the threshold should be set at 40% at this time. We base this position on a reasonable interpretation of the EISA as well as on the considerable uncertainties generated by the complex modeling adopted by EPA.

As is clearly stated in the EISA,[52] the Administrator may adjust the 50% threshold for Advanced Biofuels if it is determined "that generally such reduction is not commercially feasible for fuels made using a variety of feedstocks, technologies, and processes to meet the applicable reduction" of 50%. As noted both in the Proposed Rule and the DRIA, other than sugarcane ethanol from Brazil, there is no "renewable fuels that may be available in sufficient volumes over the next several years to allow the statutory volume requirements for advanced biofuels to be met." [53] EPA's lifecycle analysis in the proposed rule "suggests that sugarcane based ethanol only offers an estimated 44% reduction in GHG emissions relative to the gasoline it replaces when assessing 100 years of emission impacts and discounting these emissions 2%, and an estimated 27% reduction when assessing 30 years of emission impacts with no discounting."[54] Therefore, if EPA did not update the lifecycle analysis in the Final Rule, which we urge that it do, sugarcane ethanol would not qualify as an advanced biofuel at the 50% GHG threshold. We believe this result would be unreasonable given the uncertainty in EPA's lifecycle analysis and the clear Congressional intent to include sugarcane ethanol as an eligible advanced biofuel and the clear direction to lower the threshold under the circumstances presented here.

[52] See Title II, Subtitle A, Section 202,(c)(4).
[53] See 74 Fed. Reg. at 25049; DRIA at page 408.
[54] 74 Fed. Reg. at 25049

The DRIA and Proposed Rule, as well as EPA's public presentations, have made clear that EPA's lifecycle analysis contains "varying degrees of uncertainty."[55] Moreover, while Congress expressly excluded "corn starch" from the fuels eligible for consideration as an advanced biofuel category, it explicitly included "ethanol derived from sugar."[56] Given the evolving nature of the relevant science and the clarity of the congressional intent to include sugarcane ethanol among the eligible advanced biofuels, a threshold of 40% "would help ensure that the volume mandate for advanced biofuel" is met.[57]

Thus, in order to realize the goals of the EISA and Congress' direction, EPA should lower the threshold to 40 percent. Failing to do so, without reassessing the appropriate reduction for sugarcane ethanol, would result in a rule that fails to achieve *any* goals set out for advanced biofuels. In the alternative, should EPA reconsider the reduction for sugarcane based ethanol and assess the reduction as it should at above 50 percent, the need to lower the threshold is mitigated. As described above, it is our firm belief that sugarcane ethanol actually offers a much greater reduction in GHG emissions than reflected in EPA's proposed rule. In fact, the abundance of academic research – described in these comments and by other stakeholders – shows that sugarcane ethanol will reduce GHG emissions by up to 90% when compared with traditional gasoline. Such a reduction is much higher than the 50% threshold target necessary to qualify it as an advanced biofuel. Therefore EPA must permit Brazilian sugarcane ethanol to be characterized as an advanced biofuel, whether at a reduction level above 50 percent or by lowering the threshold as intended by Congress to 40 percent.

Finally, further emphasizing the need to properly characterize sugarcane as an advanced biofuel is EPA's own reasonable conclusion that any "advanced biofuel produced above and beyond what is required for the advanced biofuel requirements could reduce the amount of corn ethanol needed to meet the total renewable fuel standard."[58] We fully support this conclusion, which is well supported by the record. On its face, the EISA does not specify any amount of "corn-ethanol" volume that must contribute to the total renewable fuel standard. In addition, allowing advanced biofuels to be used beyond what is required to meet the advanced biofuel requirements will help promote a primary goal of the RFS2 – it will encourage the use of the lowest GHG emitting renewable fuels.

D. WAIVER FOR CELLULOSIC BIOFUELS

As required by EISA, the RFS2 Proposed Rule categorizes renewable fuels based on the results of the lifecycle analyses and addresses possible waivers for cellulosic biofuels. There has been ample discussion in public forums about the likelihood that there will not be enough cellulosic biofuels available to meet the RFS2 volume targets for 2010 and beyond.[59]

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[55] See 74 Fed. Reg. at 25020.
[56] See EISA Title II, Subtitle A, Section 1(B)(ii)(II).
[57] See 74 Fed. Reg. at 24912.
[58] DRIA at page 67
[59] Davis, Ann, and Russell Gold. "Turmoil in Biofuels Threatens Green Energy Revolution; Capacity sits idle amid falling oil prices, recession and delays of government rules." *The Wall Street Journal* [New York, NY] 28 Aug. 2009: 14.

UNICA concurs with EPA's interpretation of the EISA that "it would be appropriate to allow excess advanced biofuels to make up some or all of the shortfall in cellulosic biofuel."[60] Clearly congressional intent in creating the *advanced* biofuel was to encourage innovation in biofuel technologies that would reduce GHG emissions as compared to the gasoline baseline. Indeed, the stated purposes of the EISA include "increas[ing] the production of clean renewable fuels." *See also* 74 Fed. Reg. at 25021 (explaining that the rule's requirements "are designed to ensure significant GHG emission reductions from the use of renewable fuels and encourage the use of GHG-reducing renewable fuels."). Also, President Obama has called on EPA to increase renewable fuels in order to reduce dependence of foreign oil and reduce greenhouse gas emissions.[61] Therefore, even if the pathways that yield the greatest GHG emission reductions are not "cellulosic" per se, EPA should encourage their use to help meet the RFS2 mandate.

In any given year, if there is an insufficient volume of cellulosic biofuel available but an ample volume of other advanced biofuels available with *GHG emissions equal or better than the cellulosic threshold*, EPA should not lower the required volumes for advanced biofuel but instead shift the requirement from cellulosic to the other advanced biofuel categories. To ignore this option would be to encourage the use of fossil fuels – the very opposite result to congressional intent. In a similar vein, we strongly concur with EPA's assertion that "we do not believe it would be appropriate to lower the advanced biofuel standard but not the total renewable standard, as this would allow conventional biofuels to effectively be used to meet the standards that Congress specifically set for cellulosic and advanced biofuels." [62]

E. PROMOTING LOW CARBON FUELS TO ADDRESS GHG ENDANGERMENT FINDING

EPA has discretion to adjust the required volumes under the RFS2 in favor of lower GHG emission renewable fuels. By exercising this discretion, EPA will establish a program that will help the agency meet other near and long-term goals.

EPA recently proposed findings that GHG emissions from motor vehicles "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare" under the Clean Air Act.[63] *See* Notice of Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Proposed Rule, 74 Fed. Reg. 18886 (April 24, 2009).

Once an endangerment finding is made, EPA must seek to reduce the GHG emissions from motor vehicles and the fuels they consume. In the absence of cellulosic biofuels that reduce GHG by 60% compared with baseline gasoline, EPA would be required to consider whether

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[60] See 74 Fed. Reg. at 24914.
[61] See The White House Office of the Press Secretary, President Obama Announces Steps to Support Sustainable Energy Options, Departments of Agriculture and Energy, Environmental Protection Agency to Lead Efforts (May 5, 2009). , http://www.whitehouse.gov/the_press_office/President-Obama-Announces-Steps-to-Support-Sustainable-Energy-Options/>
[62] 74 Fed. Reg at 24915.
[63] See http://epa.gov/climatechange/endangerment.html

there are other renewable fuels that could reduce GHG by the same *or greater* levels. EPA would also have to consider that, in the absence of an advanced biofuel, greater volume of gasoline would be consumed, generating additional harmful GHG emissions.

We urge the agency not to wait for a final endangerment finding to promote the use of the lowest GHG emitting renewable fuels. We recommend that EPA establish in the final RFS2 rule that the best performing renewable fuel pathway in any given RFS2 category would receive commensurately higher equivalence values based on their relative reduction in greenhouse gas emissions (Code "RR" in 38-digit Renewable Identification Numbers, RIN, codes). In the absence of such a requirement, the renewable fuel with the lowest price — not necessarily the fuel with the lowest GHG emissions — would be consumed in the greatest quantity. In contrast, by including such a requirement, there would likely be greater demand for the fuels with lower GHG emissions as compared to conventional renewable fuels, which in turn would help address the concerns raised in the proposed endangerment finding.

By including such a proportionate mechanism in the Final Rule, EPA would promote the highest density, lowest carbon biofuels in a technology-neutral manner, encourage the use of renewable fuels that are fungible within the existing hydrocarbon fuel infrastructure, and mitigate against climate change.

F. INTERNATIONAL VS. DOMESTIC INDIRECT LAND USE

EPA should apply the same standard for assessing international land use change to both domestic and internationally sourced feedstocks.[64] During the comment period, some members of Congress introduced legislation that would exclude the "international" component of "land use change" emissions calculations in the RFS2.[65] Under the House-approved climate legislation (HR 2454), an amendment was added to direct the Administrator to exclude from the RFS2 "emissions from indirect land use changes outside the renewable fuel's feedstock's country of origin."[66] In the Senate, some Senators are seeking to amend the appropriations bill that authorizes EPA funding to prohibit the EPA from including "international" indirect effects from the RFS2 lifecycle calculations.[67]

Putting aside the technical impossibilities of such requirement, we strenuously caution EPA against applying different standards for calculating emissions for domestically vs. foreign produced fuels. Such an approach would undercut EPA's ability to establish the 2010 RFS2 (see below), increase fuels market uncertainty at a time of economic stress, and likely undermine the ongoing work of EPA and stakeholders aimed at reducing the level of uncertainty associated with these calculations and models.

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[64] See 74 Fed. Reg. at 25020.
[65] See press conference by House Speaker Nancy Pelosi and House Agriculture Chairman Collin Peterson on June 24th. For details and criticism of the proposal, see http://switchboard.nrdc.org/blogs/ngreene/deal_in_the_house_moves_climat.html
[66] See HR 2454, Title 5, Subtitle C, Section 551.
[67] Reeves, Dawn. "EPA Fights Budget Rider Banning Biofuels Indirect Lifecycle GHG Assessment." *InsideEPA*. Inside Washington Publishers, 22 Sept. 2009. Web. 22 Sept. 2009. <http://www.insideepa.com/secure/docnum.asp?docnum=9212009_harkin>.

G. RENEWABLE FUEL STANDARD FOR 2010

EPA needs to finalize the RFS2 at the earliest opportunity to implement the program by January 1, 2010. Given the thoroughness of the proposed rule and EPA's work to date, we believe EPA is well positioned to meet this deadline. However, should this already-extended deadline not be fully met, we urge EPA to implement an in interim RFS2 based on the best available information before the Agency.

We strenuously caution against only increasing the conventional biofuel mandate and presuming that all biofuels will be counted in the conventional pool. Congressional intent was clear – to encourage the use of progressively cleaner, renewable fuels. President Obama reaffirmed as much at the launch of the Biofuels Interagency Working Group earlier this year.[68] In short, EPA has an abundance of information to make a determination that sugarcane ethanol meets the advanced biofuels lifecycle threshold and should implements the RFS2 without delay in 2010 in order to realize the EISA goals and satisfy the mandates specified in the law.

III. EPA'S LIFECYCLE ANALYSIS UNDERSTATES THE GHG BENEFITS OF SUGARCANE

The RFS2 Proposed Rule states, "No single model can capture all of the complex interactions required to conduct a complete lifecycle assessment as required by Congress. As a result, the methodology EPA has currently evaluated uses a number of models and tools to provide a comprehensive estimate of GHG emissions."[69] We recognize that completing the required lifecycle analysis presented a difficult challenge. In general, we believe EPA's lifecycle analysis was carefully done and captured many of the complexities of agriculture, land use, and biofuel production worldwide. At the same time, we believe further refinement is warranted and necessary for the final rule to reflect the true greenhouse gas benefits of sugarcane

Lifecycle analysis, by definition, involves a considerable number of variables with complex relationships, and the addition of indirect land use change emissions only exacerbates these complexities. Various stakeholder groups (e.g. Global Bioenergy Partnership, Roundtable on Sustainable Biofuels, and various others) have recommended that EPA simplify the analyses by eliminating some aspects that clearly have minimal to virtually no impact on the model's output.[70] Reaching a consensus on how to best simplify the analysis with an eye toward the overarching goal of reducing GHG emissions would facilitate analyses and comparisons going forward.

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[68] See The White House Office of the Press Secretary, President Obama Announces Steps to Support Sustainable Energy Options, Departments of Agriculture and Energy, Environmental Protection Agency to Lead Efforts (May 5, 2009). , http://www.whitehouse.gov/the_press_office/President-Obama-Announces-Steps-to-Support-Sustainable-Energy-Options/>
[69] See 74 Fed. Reg. at 24916.
[70] See Sustainable biofuels: Prospects and Challenges, The Royal Society, January 2008, Policy Document 01/08. Available at http://royalsociety.org/document.asp?id=7366

In the following pages, we have highlighted only the discrepancies in EPA's lifecycle calculations that lead to a significant change in model results. Under sub-section A, we identify the necessary changes to EPA's "direct" lifecycle calculations, including the need to incorporate the anticipated changes to the sugarcane ethanol pathway through 2022 as well as to include emissions credits for the surplus bioelectricity that displaces other more carbon-intensive energy sources in Brazil. Under sub-section B we address the "indirect" calculations, with a particular focus on the need to incorporate a Brazil-specific land use model into EPA's calculations.

A. NECESSARY ADJUSTMENTS TO "DIRECT" LIFECYCLE CALCULATIONS[71]

EPA has incorporated some of the unique characteristics of sugarcane production systems and processing into the GREET model.[72] However, industry practices continue to evolve, and we believe it is essential that EPA's analysis reflect not only the current state of the Brazilian sugarcane industry but also the ongoing changes that will be implemented regardless of the RFS2 mandates by 2022. This is particularly important given that EPA is developing its scenarios under a "business-as-usual" approach through 2022. Because there are clear business trends and legal requirements that are changing the way sugarcane is grown, harvested, and processed into a renewable fuel, we believe that EPA should incorporate the following industry trends in its scenarios for sugarcane ethanol.

1. Brazilian Sugarcane Industry Trends Through 2022

Throughout the last few years, there have been significant operational improvements in the Brazilian sugarcane industry.[73] These changes will affect the 2022 baseline of EPA's lifecycle analysis because they are ongoing, structural shifts in industry practices. There are at least three inter-related changes that will significantly impact the direct emissions calculations, namely: (1) *a reduction of pre-harvest field burning*; (2) *an increase in mechanical harvesting*; and, (3) i*ncreased cogeneration efficiency*.

First, a growing share of Brazil's sugarcane harvest (approximately 35%) is not burned *and* is mechanically harvested.[74] Second, this mechanical harvesting without pre-harvest field burning

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[71] For purposes of consistency we are using EPA's definition of "direct emissions as those that are emitted from each stage of the full fuel lifecycle, and indirect emissions as those from second order effects that occur as consequence of the full fuel lifecycle." See 74 Fed. Reg. at 25023.

[72] GREET is the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model that was created by Argonne National Laboratory. Details are available at http://www.transportation.anl.gov/modeling_simulation/GREET/index.html

[73] See World Wildlife Fund's "Analysis of the Expansion of Sugarcane's Agro-industrial Complex in Brazil" [author's translation], available online at http://www.wwf.org.br/index.cfm?uNewsID=13760. An English version of the report is available upon request.

[74] Though the trend is for all sugarcane is to be mechanically harvested and not to be burned, there are mills that still burn the sugarcane in the field but harvest it manually. According to CTC's Annual Report for the 2008 harvest, 47.5% of all harvested cane was mechanically harvested *burned* cane while 35.3% was mechanically harvested from *unburned* (green) cane. See "Relatórios do Controle Mútuo (PAMPA, Agri-Anual e Industrial)." *Centro-Sul Brasil, Safra 2008*. Centro Tecnológico Canaviero (CTC). Web. 1 Aug. 2009. <http://www.ctcanavieira.com.br>.

yields a high amount of additional biomass (commonly referred to as "trash," which includes leaves and tops of cane stalks). Some of this additional biomass is already being recovered and transported to the mill for processing and much more is expected in the very near future.[75] This biomass recovery process increases electricity production through cogeneration (or, in the future, additional ethanol production once cellulosic pathways are commercially viable).[76] Third, as changes in field operations continue, energy efficiency improvements at mills already are adding to the surplus electricity provided to the national grid.[77]

Given that EPA's approach involves establishing business-as-usual baselines for 2022, it is imperative that the Final Rule use the most accurate estimates for reductions of GHG emissions for sugarcane ethanol over a gasoline baseline. As described above, mechanization and cogeneration are common industry practices today that we expect to be rapidly adopted across all plants in the coming years.[78]

These trends are being driven by the following policies and market forces, which do not appear to be accounted for in the Proposed Rule but should be included in the Final Rule.

a) ***Phase Out of Field Burning***. Under current regulations and agreements between the environmental authorities and the sugarcane industry, nearly all of the sugarcane in the State of São Paulo will be mechanically harvested by 2014. (São Paulo accounts for over 50% of all national production and nearly all of the sugarcane ethanol exports to the United States.) São Paulo state law requires that sugarcane field burning be phased-out by 2021 from areas where mechanical harvesting is possible with existing technology (over 85% of existing sugarcane fields) and by 2031 in areas where this may not be possible (e.g., steep slopes, irregular topography, etc).[79] However, UNICA member companies have entered into an agreement with the São Paulo Environmental Agency to move up the deadlines for sugarcane pre-harvest burning to 2014 and 2017, respectively. [80] The agreement also defines other important actions such as conservation programs and restoration projects for riparian corridors as set-aside land policies.[81] Separately, the recently proposed agro-ecological zoning for sugarcane "includes a measure to end the

[75] See Hassuani ibid.
[76] McNish, Tyler, Arne Jacobson, Dan Kammen, Anand Gopal, and Ranjit Deshmukh. "Sweet carbon: An Analysis of Sugar Industry Carbon Market Opportunities under the Clean Development Mechanism." *Energy Policy* (2009).
[77] See page 10 in Angelo Gurgel, John M. Reilly, and Sergey Paltsev. "Potential Land Use Implications of a Global Biofuels Industry" Journal of Agricultural & Food Industrial Organization 5.2 (2007). Available at: http://works.bepress.com/angelo_gurgel/1
[78] See Hassuani op cit. Also see Rabobank's report "Power Struggle: The Future Contribution of the Cane Sector to Brazil's Electricity Supply" by Andy Duff and Rodolf Hirsch (November 2007).
[79] See São Paulo State Law 11.241 enacted on 19 September of 2002, which requires the elimination of sugarcane field burning, is available at http://sigam.ambiente.sp.gov.br/Sigam2/Repositorio/24/Documentos/Lei%20Estadual_11241_2002.pdf
[80] See "Protocolo Agro-Ambiental do Setor Sucroalccoleiro Paulista," available in Portuguese at http://www.ambiente.sp.gov.br/cana/protocolo.pdf
[81] See "Environmental Sustainability of Sugarcane Ethanol in Brazil" by Weber Amaral et al. in Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment edited by Peter Zuurbier and Jos van de Vooren (2008).

practice of crop burning by 2017 in all areas suitable for mechanized harvesting."[82] Should this legislation[83] be approved, the São Paulo state requirement to phase out mechanical harvest by 2017 would become national law.

b) ***Increasing Restrictions on Cane Burning.*** Existing plantations that still use manual harvesting in the state of São Paulo must now obtain state-issued government permits for the pre-harvest sugarcane field burning. Environmental authorities have set strict contingencies upon which these permits can be suddenly revoked (e.g., if air humidity drops below 30%, cane burning restrictions are applied and if air humidity drops below 20%, all cane burning is suspended).[84] This uncertainty has caused many producers to switch to mechanical harvesting to eliminate associated operational risks.

c) ***Sugarcane Expansion only with Mechanization.*** Since 1986 all new sugarcane plantations and mills have been required to submit environmental impact studies prior to construction and operation in order to obtain the required permits.[85] More recently, in order to receive a permit to establish green-field sugarcane mills, as a result of the new laws that phase out pre-harvest sugarcane burning, the São Paulo state environmental authorities now require new licensees to show how they will achieve 100% mechanical harvesting. [86] Other states are in active discussions to follow São Paulo's lead and, as noted above, the federal agro-ecological zoning would require mechanized harvest nationwide. [87]

d) ***Over One-Third of Harvest Mechanization Nationwide*.** The uncertainties caused by the impact of harvest permits, coupled with the aforementioned legislative and regulatory changes, have led to a quicker-than-expected transition to all mechanized, un-burned sugarcane harvest. According to Brazil's Sugarcane Research Center (CTC), which has undertaken benchmarking and data collection in the Brazilian sugarcane industry for decades, about 47.5% of all sugarcane in Brazil is already mechanically harvested, and 35.3% of all sugarcane in Brazil is mechanically

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[82] Brazil. Presidency of the Republic. Secretariat of Communications (SECOM). *Brazil Increases Environmental Preservation Measures With Sugarcane Zoning Proposal*. PR Newswire, 17 Sept. 2009. Web. 17 Sept. 2009. <http://sev.prnewswire.com/agriculture/20090917/SPTH00117092009-1.html>.

[83] For a copy of the proposed legislation (in Portuguese), see http://www.planalto.gov.br/ccivil_03/Projetos/PL/2009/msg764-090917.htm

[84] See São Paulo State Environmental Agency's Resolution SMA 38/08 of May 16, 2008, available online at http://sigam.ambiente.sp.gov.br/sigam2/default.aspx?idPagina=123.

[85] See CONAMA (Brazilian National Council on Environment) first resolution in January 1986, available at http://www.antt.gov.br/legislacao/Regulacao/suerg/Res001-86.pdf. For more info on CONAMA's action regarding sugarcane, see http://www.mma.gov.br/port/conama/index.cfm

[86] See São Paulo State Environmental Agency's resolution SMA-088 of 19 December 2008 as well as resolution SMA-SAA 004, of 18 September 2008, available at http://www.ambiente.sp.gov.br/contAmbientalLegislacaoAmbiental.ph[- 2009 and http://sigam.ambiente.sp.gov.br/sigam2/default.aspx?idPagina=123

[87] See statements by Environment Minister Carlos Minc on this as well as the environmental and economic zoning being prepared by an inter-ministerial group of the Brazilian government and expected to be publicly announced shortly. Available online at http://www.mma.gov.br

harvest without being burned in the field. [88] In 2008, well over half of the sugarcane fields in the state of Sao Paulo were mechanically harvested and not burned (green cane). And other states such as Goiás, Mato Grosso do Sul, and Paraná are also implementing mechanical harvest with green cane. In fact, the robust pace of mechanization was recently highlighted in a John Deere earnings release that states, "sales are being helped by […] rising demand for sugarcane harvesting equipment."[89]

As an aside, and perhaps not relevant for the RFS2, but nevertheless of great importance to our industry and other stakeholders, there is a clear ongoing trend to improve the sustainability – not just environmental but also social and economic – of the sugarcane industry in Brazil. For instance, UNICA has launched an aggressive effort to address the implications, particularly in the labor force, of the rapid change caused by the aforementioned industry trends. For instance, UNICA has joined forces with the Inter-American Development Bank and other organizations[90] to launch a large-scale training and requalification program, known as RenovAção. Every year, 7,000 workers and members of the local communities will be trained in various sugarcane-producing regions of the State of São Paulo. In addition to ensuring workers are prepared for the new opportunities in the evolving sugarcane industry, UNICA has been active in multi-stakeholder efforts, including the Better Sugarcane Initiative, the Roundtable on Sustainable Biofuels, the Global Bioenergy Partnership, and many others. The results of these efforts are highlighted in the UNICA's Annual Sustainability Report, which met the requirements of the Global Reporting Initiative and is available on UNICA's website. [91]

In summary, any realistic evaluation of carbon emissions from sugarcane farming in Brazil must reflect that the above policies have caused (and will likely continue to cause) a phase-out of sugarcane burning, and an increase in mechanical harvest and, as explained below, an increasingly large surplus of cogeneration electricity output. In an effort to ensure that the Final Rule would represents a robust and scientifically credible approach, we believe EPA should consider and account for these factors in its scenarios for the sugarcane ethanol pathway. In the next section we will show how these trends impact the "direct" lifecycle of sugarcane ethanol.

2. Emission Credits from Cogeneration Surplus

According to the Proposed Rule, EPA "factors in credits from [sugarcane bagasse] excess electricity based on offsetting the Brazilian electricity grid." However, the Proposed Rule has to be adjusted given the fact that cogeneration in Brazil displaces the marginal power supplier (i.e., thermoelectric power plants, running on natural gas or heavy fuel oil) not the average grid

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[88] "Relatórios do Controle Mútuo (PAMPA, Agri-Anual e Industrial)." *Centro-Sul Brasil, Safra 2008*. Centro Tecnologico Canaviero (CTC). Web. 1 Aug. 2009. <http://www.ctcanavieira.com.br>. CTC has a sample of 167 mills and, therefore, has been accepted as the preeminent benchmark for the sugarcane industry in Brazil.
[89] See Deere & Company's second and third quarter of 2008 earnings reports, available online at http://www.deere.com/en_US/ir/financialdata/2008/thirdqtr08.html
[90] Those include Case IH, Deere & Co., Syngenta Federation of Rural Workers of the State of São Paulo (FERAESP).
[91] *Sustainability Report.* Tech. Sao Paulo, Brazil: UNICA, 2008. http://www.unica.com.br/download.asp?mmdCode={D1814075-0E5C-4BFB-BA2C-EF428FF58F33}

electricity (i.e., predominantly hydroelectric). This is a fundamental flaw, which if not addressed may result in an arbitrary and capricious rulemaking. The faulty current analysis significantly alters the direct emissions of sugarcane ethanol, particularly as EPA projects out to 2022, as well as undermines the scientific integrity of the Agency's work in combating climate change. For EPA's lifecycle analysis to be credible, thorough, and accurate, it must take into account the nature of the power generation being displaced; in this case, fossil fuel generation with higher greenhouse gas emissions. Recognizing that cogeneration of electricity from sugarcane bagasse effectively displaces the *marginal*, not the average grid, electricity in Brazil —*ceteris paribus*— the results of EPA's lifecycle analysis would change from 44 percent to 57 percent GHG reduction compared to baseline gasoline in the 100 year, 2% discount scenario.[92] Depending on the assumptions made on the increases of sugarcane mechanization in Brazil (i.e., increased biomass energy utilization described below), these results could show an even greater emissions reduction.

The benefits of bioelectricity have been analyzed from the standpoint of lifecycle analysis in various studies, which generally all concur that sale of surplus electricity form cogeneration of sugarcane bagasse can significantly contribute to carbon mitigation.[93, 94, 95] Generally, scientists have established that emissions can be assigned to by-products of the bioenergy chain and to the energy product in many ways; the choice of method for allocation depends on the specific by-product in case.[96] The emission assignment may consider: use of the displacement method, the energy content, the mass, the market value, and a specific reference scenario for the biomass/ processes under consideration. When bioenergy is the main product, the *displacement method* is usually selected. Basically, the *displacement method* takes into account the service offered by the by-product and how (and with what amount of net CO_2 emissions) that service would have been delivered in the absence of the by-product. (This, in fact, is quite similar to the indirect land use argument.) These net CO_2 emissions are credited to the biomass fuel chain for providing the by-product.

Cogeneration in Brazil should be given emission reduction credits relative to the marginal power supply in the context of EPA's lifecycle analysis. The United Nations Framework Convention on Climate Change (UNFCCC), under the Clean Development Mechanism (CDM), establishes methodology for electricity generation from biomass residues.[97] The CDM

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[92] Calculation is done by changing (a) electricity at the margin with GREET natural gas methodology, (b) yield of 27 gallons per ton of cane; and (c) 1.78kWh/Gal in EPA-HQ-OAR-2005-0161-0956 spreadsheet.

[93] McNish, Tyler, Arne Jacobson, Dan Kammen, Anand Gopal, and Ranjit Deshmukh. "Sweet carbon: An Analysis of Sugar Industry Carbon Market Opportunities under the Clean Development Mechanism." *Energy Policy* (2009).

[94] Barroso, Luiz Augusto, Priscila Lino, Sergio Granville, Leonardo Soares, and Mario Pereira Veiga. "Cheap and clean energy: Can Brazil get away with that?" *Power and Energy Society General Meeting - Conversion and Delivery of Electrical Energy in the 21st Century, 2008 IEEE* (July 2008): 1-8.

[95] Nguyen, Thu Lan, John Hermansena, and Masayuki Sagisaka. "Fossil energy savings potential of sugar cane bio-energy systems." *Applied Energy* 86.1 (Nov 2009): S132-139.

[96] Campbell, J., D. Lobell, and C. Field. "Greater Transportation Energy and GHG Offsets from Bioelectricity Than Ethanol." *Science Science* 324 (22 May 2009): 1055-057.

[97] "CDM: Consolidated Methodology for Electricity Generation from Biomass Residues - Version 9." CDM: CDM-Home. Web. 1 Sept. 2009. <http://cdm.unfccc.int/methodologies/DB/XFJ41S3J17TLQCW904D26WJK7ST8TL/view.html>.

methodology clearly establishes that in the case of sugarcane bagasse, the emissions should be compared with the combined margin, not the grid average.[98] The World Bank has echoed this view saying, "Bagasse cogeneration projects reduce CO_2 emissions by substituting for electricity produced by thermal plants."[99]

The question then – much like the *indirect* land use change question – is what amount of additional net CO_2 emissions would be produced by the Brazilian power system to provide the same energy, absence the surplus of electricity supplied as a by-product of sugarcane ethanol and sugar production. The next three sub-sections will address (a) the growth of cogeneration in Brazil, (b) the characteristics of the Brazilian electricity system, and (c) the emissions savings resulting from bioelectricity use that EPA should consider for the Final Rule.

a) Cogeneration in Brazil

The sale of excess cogeneration electricity from sugarcane mills to the national grid is a relatively new phenomenon in Brazil, due mostly to previous regulatory restrictions on the sale of surplus cogeneration electricity.[100] It was not until 2002 that sugarcane mills began to sell meaningful volumes of electricity. Despite the novelty of this activity, a large number of mills have already begun to supply local power distribution companies with significant volumes of electricity. [101] In 2007, mills produced about 11,095 GWh, which corresponds to about 22.5 kWh per ton of raw sugarcane crushed.[102] In 2008, the Brazilian Ministry of Mines & Energy calculated that sugarcane power cogeneration increased to 15,768 GWh, netting 4,409GWh.[103]

This increase is a result of not only increased sugarcane production but, more importantly, new mills upgrading to high-pressure steam cycle generators that produce at least 70 kWh per ton of cane with bagasse alone.[104] Moreover, more efficient mills are entering into long-term

[98] See UNFCCC/CCNUCC's CDM Executive Board, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002). <http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDAOV5K382HW0JR14GS7XYQUMCP>.

[99] The World Bank. Development Committee. *Clean Energy for Development Investment Framework: The World Bank Group Action Plan*. The World Bank, Clean Energy for Development Investment Framework (CEIF), 28 Mar. 2007. Web. 1 Aug. 2009. <http://siteresources.worldbank.org/DEVCOMMINT/Documentation/21289621/DC2007-0002(E)-CleanEnergy.pdf.>

[100] Granville, Sergio, Priscila Lino, Leonardo Soares, Luiz Augusto Barroso, and Mario Pereira. "Sweet Dreams are Made of This: Bioelectricity in Brazil." IEEE Xplore: Guest Home Page. June 2007. Web. 1 Aug. 2009. <http://www.psr-inc.com/psr/download/papers/IEEE_GM2007_Barroso_This_Bioelectricity_Brazil.pdf>.

[101] Duff, Andy, and Rodolfo Hirsch. *Power Struggle: The Future Contribution of the Cane Sector to Brazil's Electricity Supply*. Sao Paulo, Brazil: Rabobank, F&A Research and Advisory, November 2007.

[102] Sugarcane harvest was 493 million metric tonnes of sugarcane according to actual production data compiled by UNICA and available at http://www.unica.com.br/dadosCotacao/estatistica/. Data for current power sales is provided by the Brazilian government's Ministry of Mines & Energy and National Electricity Agency, the autonomous regulator, and compiled by the São Paulo Cogeneration Association (COGEN-SP). While all the data is in Portuguese, it is easily accessible online at http://www.aneel.gov.br and http://www.cogensp.com.br.

[103] Patusco, Oao Antonio Moreira. "Balanço Energético Nacional – Ano Base 2008 – Dados preliminares – MME." 11 Aug. 2009. E-mail. 2008 data estimates provided by Brazilian Ministry of Mines & Energy (MME).

[104] See "Mitigation of GHG emissions using sugarcane bioethanol" by Isaias C. Macedo and Joaquim E.A. Seabra in Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment edited by Peter Zuurbier and Jos van de Vooren (2008).

supply contracts with power distribution companies.[105] Based on expert estimates, a reasonable approximation is that cogeneration surplus for 2022 will be in excess of 115,000 GWh.[106] These are based not only on the fact that there will be additional electricity incorporated into the grid every year through 2022, either through the scheduled government auctions or via open market sales,[107] but also, when the additional sugarcane biomass (i.e., "trash") is used for power production, the power generation values will increase to above 100 kWh per ton of cane within the decade (including bagasse and 40% of the straw previously burned in the field).[108]

In order to provide a full picture of how large the electricity surplus is already, and in hopes of corroborating the national data provided by the Ministry of Energy, UNICA surveyed every mill that is a member of the trade association and obtained data for electricity surplus fed into the grid in 2008. Of the 124 mills that are UNICA members, 39 mills reported exporting a total of 3,062 GWh electricity surpluses into the grid in 2008.[109] Based on the considerable sample (about two-third of all sugarcane produced in Brazil in 2008), the average cogeneration surplus for <u>all</u> sugarcane mills in Brazil was estimated at 10.5 kWh/t in 2008. And, if we only include the 39 mills that reported providing surplus electricity to the grid, the average for the exporting mills was approximately 25 kWh/t in 2008, which is nearly equal to the values proposed by Michael Wang in GREET.[110] Finally, as proof that improvements are ongoing, about 20% of the mills are already producing 40 kWh/t and the overwhelming evidence is that this growth trend will continue, both in scope and scale.

As we detailed in our earlier comments to the State of California's Air Resources Board during the Low Carbon Fuel Standard (LCFS) proceedings, which UNICA submitted to the EPA Docket for the RFS2 on September 2,[111] sugarcane mills in Brazil will soon produce averages of 75kWh/t by using all bagasse in high-pressure steam systems.[112] However, since the trend towards mechanization (i.e., no cane burning) is well underway (i.e., roughly half of harvested area),[113] experts point out that it is reasonable to expect that by 2022 average mills will have

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[105] See "Brazil to invest $21.2 billion in cogeneration" in The Economist Intelligence Unit (1 December 2008).
[106] See COGEN-SP for additional data and information, http://www.cogensp.com.br/cogensp/workshop/2008/Bioeletricidade_ENASE_01102008.pdf
[107] Silvestrin, Carlos Roberto. "Bioeletricidade - Reduzindo Emissões e Agregando Valor ao Sistema Elétrico Nacional." *COGEN/SP*. Presentation made at Ethanol Summit in Sao Paulo, Brazil., 2 June 2009. Web. 1 Sept. 2009.
[108] For further details, please review Technical-Economic Evaluation for the Full Use Sugarcane Biomass in Brazil, [author's translation from Portuguese], Joaquim Seabra, Universidade Estadual de Campinas, July 2008.
[109] More detailed supporting information was provided to CARB on a "Confidential Business Information" basis in June 2009.
[110] See "Life-Cycle Energy Use and Greenhouse Gas Emission Implications of Brazilian Sugarcane Ethanol Simulated with the GREET Model," by Michael Wang et al. in International Sugar Journal (2008), available online at http://www.transportation.anl.gov/pdfs/AF/529.pdf.
[111] See "Comment submitted by Brazilian Sugarcane Industry Association (UNICA), Document ID EPA-HQ-OAR-2005-0161-1761.1." Letter to Environmental Protection Agency, Docket EPA-HQ-OAR-2005-0161. 2 Sept. 2009. MS. EPA/OTAQ, Washington, DC.
[112] See pages 5-10 of our April 16 letter to CARB.
[113] These estimates are made by the Brazilian Space Agency (INPE) and are beyond any dispute today. The resulting percentages are from remote sensing analysis and made public on the Internet (see http://www.dsr.inpe.br/canasat/ but only in Portuguese). The INPE figures corroborate CTC's own statistical analysis know as the "CTC Mutual Controls (Pampa and Agro-Industrial), again only available in Portuguese.

performance reaching 130 kWh/t given the mills will be bringing about 40% extra cane straw (i.e., trash) that was previously burnt in the field.[114]

b) Understanding Brazilian Electricity Grid

In order to determine appropriate emission credits for sugarcane cogeneration surplus provided to the electricity grid, it is important to understand the basic characteristics of the Brazilian electricity grid.[115]

The current electricity matrix in Brazil is dominated by hydroelectric power, which accounts for about 80% (in normal hydrology) of the country's total electricity supply, making it the world's most hydro-dependent large-scale electricity grid in the world.[116] Due to this unique characteristic, Brazil has developed a national, centrally dispatched interconnected electricity grid, which according to official government data generated 496TWh of electricity in 2008.[117] The national system operator (known as ONS in Portuguese) controls the dispatch of electricity by hydroelectric and other power generators to ensure that the system as a whole is operating at its peek efficiency and given particular consideration to the amount of hydroelectricity being used (i.e. the hydrological risk of future power shortages by depleting water reservoirs). As a result of this unique system, thermal power plants are dispatched in order to allow for hydroelectric power sources to store water in reservoirs. In other instances, localized transmission restrictions require thermoelectric power generators to meet temporary demand instead of hydroelectric plants.[118] For instance, in 2008, while 80% of total electricity consumed was from hydroelectric sources, thermal power production from biomass represented 5.3% while thermal from fossil fuels represented 11.6% (mostly natural gas but also heavy fuel oil, coal and derivatives).[119]

According to all experts in the Brazilian power generation market, including the U.S. Energy Information Agency,[120] hydroelectricity's share in the electricity matrix will reduce as the

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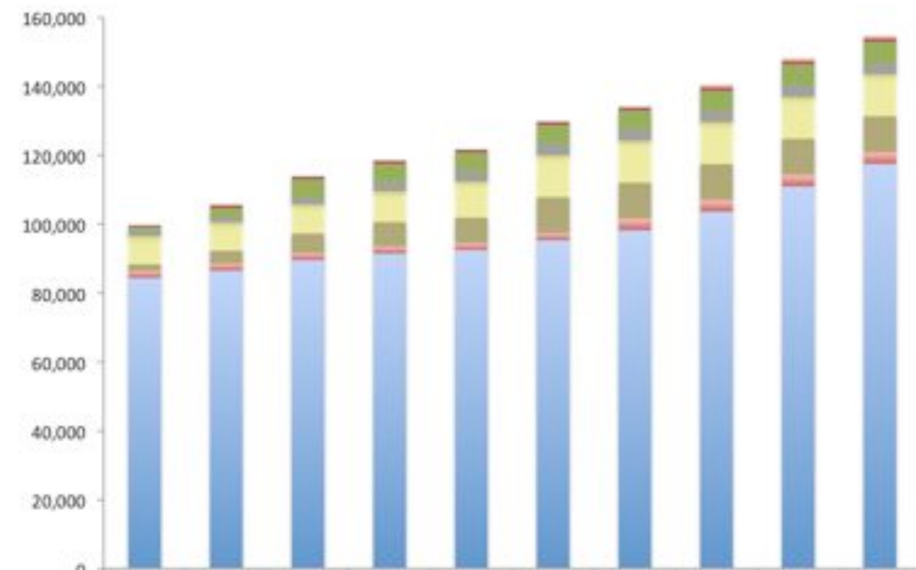
[114] Macedo, Isaias C., Joaquim Seabra, and Joao Silva. "Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020." Biomass and Bioenergy 32.7 (2008): 582-95.
[115] For general background on Brazil's electricity sector, see "Brazil: Country Analysis Brief." *U.S. Energy Information Administration (EIA)*. U.S. Department of Energy (DOE), Oct. 2008. Web. 1 Sept. 2009. http://www.eia.doe.gov/cabs/Brazil/Full.html. For a review of the recent regulatory changes, see Chapter 3 of Jose Jaime Millan. *Market or state?: Three decades of reforms in the Latin American electric power industry*. Washington, DC: Inter-American Development Bank, June 2007. Sustainable Development Department, June 2007. Web. 1 Sept. 2009. <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1585746 >.
[116] "Brazil: Country Analysis Brief." *U.S. Energy Information Administration (EIA)*. U.S. Department of Energy (DOE), Oct. 2008. Web. 22 Sept. 2009. <http://www.eia.doe.gov/cabs/Brazil/Full.html>.
[117] Brazil. Ministry of Mines & Energy (MME). Energy Research Company (EPE). *Balanço Energético Nacional - 2009*. EPE/MME, July-Aug. 2009. Web. 10 Sept. 2009. <https://ben.epe.gov.br/>.
[118] For a detailed discussion of this, see (a) Marques, T. C., M. A. Cicogna, and S. Soares. "Benefits of Coordination in the Operation of Hydroelectric Power Systems: The Brazilian Case." *IEEE's Power Engineering Society General Meeting* (2006). *IEEE Xplore*. 16 Oct. 2006. Web. 15 Sept. 2009. http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=1709574 (b) Street, Alexandre, L. A. Barroso, B. Flach, M. Pereira, and S. Granville. "Risk Constrained Portfolio Selection of Renewable Sources in Hydrothermal Electricity Markets." *IEEE Transaction on Power Systems* 24.3 (2009): 1136-144.
[119] Brazil. Ministry of Mines & Energy (MME). Energy Research Company (EPE). *Balanço Energético Nacional - 2009*. EPE/MME, July-Aug. 2009. Web. 10 Sept. 2009. <https://ben.epe.gov.br/>.
[120] IBID.

country's electricity demand increases.[121] This shift is due not only due to a significant increase in electricity demand (which is estimated to have between 3.5% and 5% annual growth through 2030) but also due to a significant slow down in the construction of new hydroelectric plants in last decades. Construction new hydroelectric plants are now only possible in very remote (and environmentally sensitive) areas, such as the Amazon.[122] In fact, the Brazilian government's official projections for the expansion of the generation system indicates that from 2008 to 2017 the installed capacity for hydroelectricity will decrease from 82% to nearly 70%. Moreover, the same analysis indicates that there will be a substantial increase in the use of fuel oil at thermal power plants (from less than 1% to near to 6%).[123]

Brazilian Electricity Expansion by Sources (2008-2017)



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Misc								900	900	900
Process Gas & Steam	469	959	959	959	959	959	959	959	959	959
Renewable Biomass & Wind	1,256	2,682	5,420	5,479	5,479	5,593	5,593	5,913	6,233	6,233
Charcoal	1,415	1,415	1,765	2,465	2,815	3,175	3,175	3,175	3,175	3,175
Natural Gas	8,237	8,237	8,453	8,948	10,527	12,204	12,204	12,204	12,204	12,204
Fuel Oil & Diesel	1,984	3,807	5,713	7,153	7,397	10,463	10,463	10,463	10,463	10,463
Nuclear	2,007	2,007	2,007	2,007	2,007	2,007	3,357	3,357	3,357	3,357
Hydroelectric	84,374	86,504	89,592	91,480	92,495	95,370	98,231	103,628	110,970	117,506

Source: *Plano Decenal de Expansão de Energia (PDE)*.

The trend toward greater use of fossil fuels in power generation is exacerbated by the smaller water reservoirs in new hydroelectric sources, according to a recent presentation by the ONS at

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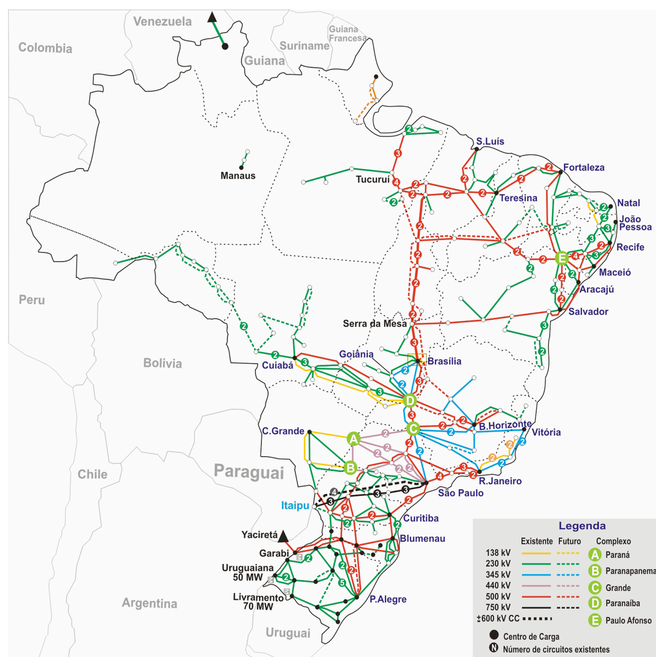
[121] *Energy and Electricity Report Brazil*. Publication. London, UK: Economist Intelligence Unit, Aug 2009. *EIU Industry Reports*. Web. 1 Sept. 2009. <http://portal.eiu.com/>.
[122] Even when considering additional hydroelectric power expansion, emissions calculations should include transmission impacts, direct and indirect land use changes. For a recent account of this, see "Doubt, Anger Over Brazil Dams; As Work Begins Along Amazon Tributary, Many Question Human, Environmental Costs" in *The Washington Post* on October 14, 2008.
[123] Brazil. Ministry of Mines & Energy (MME). Energy Research Company (EPE). *Plano Decenal de Expansão de Energia (PDE)*. Spring 2008. Web. 15 Sept. 2009. <http://www.epe.gov.br/PDEE/Forms/EPEEstudo.aspx>.

an industry conference in Brazil.[124] According to one recent report from the Brazilian Association of Thermal Power Generators (ABRAGET), the water reservoirs in 1970 corresponded to 28 months of operation but in 2008 the reservoirs corresponded to only 6 months. More interestingly, ABRAGET's report indicates that in the absence of thermoelectric power, the level of water in the reservoirs would be would be one third less.[125]

These constraints on the hydroelectric supply have significantly limited the capacity for multi-annual regulation of the large reservoirs by the system operator, forcing the increasing installation and dispatch of thermal power to help the supply system in dry (critical hydrology) season. Thermal power systems have been dispatched three to four times more often than initially planned, ABRAGET analysis shows. The new thermal based units, due to high fuel costs, are dispatched only when the hydrology requires it.

The question then arises over how the operational plans for the grid are developed and what is their dispatch order vis-à-vis bioelectricity.[126] The ONS evaluates projected energy demand in various sources of demand in the four main sub-systems of the interconnected Brazilian electricity grid (i.e., South, Southwest, North, and Northeast) for the next ten years. (See ONS map of Brazilian grid on the right.[127]) As part of this operational planning, the ONS takes into consideration the limitations on the transmission of power between regional subsystems and hydrological scenarios to determine the best dispatch policy for stable energy supply, within the five percent limit for the risk of energy shortage. The ONS then dispatches power generation unit for each sub-system while considering both the specific costs and varying technical restrictions of each generator. As a safety precaution,[128] particularly after the 2001 energy rationing, the ONS will displace thermal power plants beyond specific cost considerations in order to store water in the reservoirs.[129]



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[124] Chipp, Hermes. "Desafios para a operação em um sistema com maior participação térmica." Proc. of Segurança para o Sistema: Operando uma Matriz Hidrotérmica, Fórum Matriz Hidrotérmica e a Segurança do Sistema Elétrico Nacional, Rio de Janeiro, Brazil. 20 Aug. 2009. Web. 15 Sept. 2009. <http://www.ctee.com.br/termica/programacao.asp>.
[125] Ponchmann da Silva, Edmundo. *Analise dos Leiloes de Energia Eletrica*. Tech. Sao Paulo, Brazil: ABRAGET, Aug 2009
[126] Street, Alexandre, L. A. Barroso, B. Flach, M. Pereira, and S. Granville. "Risk Constrained Portfolio Selection of Renewable Sources in Hydrothermal Electricity Markets." *IEEE Transaction on Power Systems* 24.3 (2009): 1136-144.
[127] See http://www.ons.org.br/conheca_sistema/mapas_sin.aspx
[128] See updated graphic of the hydrological variations in Brazil at http://www.grupocanalenergia.com.br/reservatorios/reserv.asp?regiao=Sudeste
[129] For a detailed discussion of the energy rationing and implications for Brazil's power sector, see Chapter 3 of Jose Jaime Millan. *Market or state?: Three decades of reforms in the Latin American electric power industry*. Washington, DC: Inter-

As a rule, the ONS dispatch order in Brazil is: Hydroelectric, Wind, Nuclear, Imports from other Sub-Systems (ordered by increasing costs) and, finally, thermal power (ordered by increasing cost).[130] Sugarcane bagasse-based power generation units are classified as "inflexible thermal based systems" given they are always dispatched when the mill is operating. Consequently, they are in the lowest range in terms of "variable unit cost (CVU, in Portuguese) for the thermal systems.[131] It is also important to note that the ONS considers that the energy sugarcane mills supply to the grid allows for the reduction of the use of other thermal power plants, with higher costs, which would have been dispatched for hydrological safety reasons.

c) Emissions Credits from Bioelectricity

The emissions avoided by the bagasse generated energy surplus today are well represented by the emission factor for the electricity grid's operating margin. All bagasse-derived energy supplied to the grid is accounted in the operational procedures as saving water in the hydro reservoirs, therefore reducing the need to dispatch *at the margin* power generators fueled by natural gas or other fossil fuels. Under the IPCC auspices, some methodologies have been used for its evaluation, such as simple or adjusted margin, dispatch data analysis, or average operating margin. However, the use of the dispatch data is the most recommended by IPCC.[132]

The emission factor can be calculated as the weighted average of the emission factors for the power generation units supplying the 10% (of total dispatched energy) at the lowest priority dispatch (calculated each hour). As an example, the table below presents the average fuel mix for electricity generation in the grid's operating margin in December 2008, based on dispatch data provided by ONS for each hour of the day during that month, the latest available.[133] (It is expected that the government will make additional data available in the coming months.)

Average Fuel Mix for Electricity Generation in Brazilian Grid's Operating Margin (December 2008)

Hydro	1.11%
Wind	0.24%
Nuclear	18.99%
Natural gas	60.24%
Coal	14.37%
Diesel or Fuel oil	3.63%
Coke-oven gas	1.41%

Source: MCT (2009), based on from ONS data for Dec 2008.

American Development Bank, June 2007. Sustainable Development Department, June 2007. Web. 1 Sept. 2009. <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1585746>.

[130] Ibid.

[131] Bagasse power has a CVU less than R$100 per MWh, while some fuel oil, diesel and LNG have CVU over R$300 per MWh according to ONS.

[132] "CDM: Consolidated Methodology for Electricity Generation from Biomass Residues - Version 9." CDM: CDM-Home. Web. 1 Sept. 2009. <http://cdm.unfccc.int/methodologies/DB/XFJ41S3J17TLQCW904D26WJK7ST8TL/view.html>.

[133] Brazil. Ministry of Science & Technology (MCT). Secretariat of Policy and Research & Development (SEPED), Climate Change Coordination. *Identificacao do perfil de fontes de energia e consumo de combustivel da margem de operacao do Sistema Interligado Nacional*. By Ana Carolina Avzaradel. Brasilia, DF: MCT/SEPED, 2009.

In conclusion, considering the predominant use of natural gas thermal plants in the Brazilian operating margin generation mix, and recognizing that the margin would grow with fossil fuels in Brazil, we suggest the adoption of natural gas emission factors for electricity credits evaluation within the displacement method, which would result in an emissions credit sugarcane cogeneration electricity surplus. *Ceteris paribus*, EPA's lifecycle analysis should be adjusted from 44% to 57% GHG reduction compared to baseline gasoline in the 100 year, 2% discount scenario.

3. Clarifications Requested

In the course of our review of EPA's lifecycle analysis a number of questions have been raised with EPA staff that remain unanswered. In order to ensure the most accurate full lifecycle analysis of the sugarcane ethanol pathway, we believe that EPA should provide answers given its stated goal of transparency and scientific-integrity prior to finalizing the lifecycle analysis.[134] Questions for which UNICA requests clarification:

a) ***Cane Burning.*** How was sugarcane straw burning calculated in the lifecycle? As noted in our letter to CARB's LCFS as well as in GREET methodology, the average trash (leaves and tops) is 0.14 t (dry mass)/t cane stalks.

b) ***Straw Yield.*** What volumes of straw harvested and percentages of that straw process at mill has EPA assumed for today as well as for 2022 scenarios? As noted earlier in this section, the rapid increases in mechanization suggest that 2022 estimates could be understated. EPA should carefully review its estimates and, hopefully, make the information transparent to stakeholders.

c) ***Transportation in U.S.*** Is EPA not double-counting transport emissions in the United States for sugarcane ethanol? In EPA's spreadsheet EPA-HQ-OAR-2005-0161-0950.3, emissions related to the item "Fuel Production" are calculated from a table entitled "Sugarcane Ethanol Production & Transport in the U.S. per mmBtu Fuel." Apparently, the values were taken from GREET and are said to include ethanol distribution in the United States. If this is the case, the item "Other (fuel and feedstock transport)," which also includes ethanol transport inside the U.S., represents a double counting of the same emissions and should be corrected in the Final Rule.

d) ***Ocean Transport.*** How is the "haul back" shipping emissions calculated in the EPA model? When using GREET for calculating the fuel oil needed for ethanol transport from Brazil to the United States, some have mistakenly assumed that ocean tankers

[134] EPA Office of the Science Advisory, Guidance on the Development, Evaluation, and Application of Environmental Models, EPA/100/K-09/003, at 48 (Mar. 2009). Available online at http://www.epa.gov/fedrgstr/EPA-RESEARCH/2009/March/Day-31/r7183.htm

would return to Brazil empty (almost doubling the fuel consumption). We have found that GREET would not allow setting the "haul back" value to zero, so would recommend it setting it to close zero so as not to artificially inflate transportations emissions.

e) *Choice of IPCC Data.* Apparently EPA has chosen to use IPCC's Global Warming Potential (GWP) factors from the second assessment report instead of the more recent 2007 updated values. Is that the case? If so, what is EPA basis for choosing the older GWP values for RFS2?

B. IMPROVING "INDIRECT" LIFECYCLE CALCULATIONS

The inclusion of emissions associated with indirect land use changes (ILUC) in lifecycle modeling has been controversial[135] and the source of various academic analysis,[136] critiques,[137] and policy recommendations.[138] We believe the science of indirect effects is evolving and may not be ready for regulatory action. Putting aside the ILUC debate, in this section, we will focus on eight key areas of EPA's indirect lifecycle calculations that require improvements prior to the Final Rule.

1. Land Allocation Models do not Provide the Answers EPA Needs

Although different methodological alternatives can be established for measuring GHG emissions associated to ILUC, there is a broad consensus among experts that the methodologies rely on the combination of geospatial analysis, for defining the past and the current land use changes, and economic-based models that should use information from geospatial analysis as inputs for projecting supply, demand, land use and land competition for agricultural products.

Partial equilibrium worldwide models, as FAPRI's world models, were developed to measure land allocation and need additional improvements to project land use changes. Those improvements imply the development of detailed national models that are able to capture change in land use within the countries and not only on the country. Likewise a detailed model has been used for United States (e.g., FASOM), similar models should also have been used for other countries.

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[135] Power, Stephen. "If a Tree Falls in the Forest, Are Biofuels To Blame? It's Not Easy Being Green." *The Wall Street Journal* [New York, NY] 11 Nov. 2008. Web. 1 Sept. 2009. <http://online.wsj.com/article/SB122636711059015989.html>.
[136] Rathmann, Regis, Alexandre Szklo, and Roberto Schaeffer. "Land use competition for production of food and liquid biofuels: An analysis of the arguments in the current debate." *Renewable Energy* 35.1 (2009): 14-22.
[137] Liska, Adam, and Richard Perry. "Indirect land use emissions in the life cycle of biofuels: regulations vs science." *Biofuels, Bioproducts and Biorefining* 3.3 (17 Apr 2009): 318-28.
[138]G. Phillip Robertson et al. "Sustainable Biofuels Redux: Science-based policy is essential for guiding an environmentally sustainable approach to cellulosic biofuels." *Science* 5898th ser. 322 (2008): 49-50

The unavailability of country specific models, as well as lack of detailed geospatial information to define country-based patterns of land use changes, lead EPA to establish a methodology that does not reflect the best science available at this time. Some methodological choices made, such as the assumption that pastures and savannas displaced should necessarily be compensated over other landscapes displacing forest and shrubland, reveal the scientific uncertainty of the analysis in the Proposed Rule.

We recognize the Administrator's public statement that, prior to the Final Rule, EPA will "quantify the uncertainty associated with specifically the international indirect land use change emissions."[139] Given the Proposed Rule's shortcomings in terms of geospatial analysis and economic modeling, EPA should adopt a wider range of assumptions with respect the values of CO_2 emissions released.

2. Use Regional Models when Available

EPA has relied of the FAPRI[140] model as the primary tool for calculating indirect land use changes outside the United States. We believe that while the FAPRI model can be used on a global level, EPA should defer to regional or sub-national models whenever these are available.[141] For the Final Rule, UNICA respectfully submits that EPA use the Brazil Land Use Model (BLUM), which has been developed by researchers in Brazil in coordination with FAPRI modelers at Iowa State University. As the authors indicate, BLUM "represents at a *regional* level the dynamics of the Brazilian agricultural sectors, capturing cause-effect relations that are not available by international or nationwide models." [142]

Using conservative assumptions, BLUM indicated that under the RFS2 scenarios, sugarcane ethanol GHG reductions compared to gasoline would be 69 percent and 60 percent for 100 year with a 2% discount rate and 30 years with no discount rate, respectively. In their submittal to EPA, BLUM modelers recognized the conservative nature of their results by stating:

> "First, we have used an overestimated total area available for agriculture though it is quite reasonable to expect that competition effect would have been stronger than scale effect, thus diminishing expansion over natural vegetation. Second, we are incorporating significant amounts of "International farm inputs and Fert N2O" (as estimated by the original RFS-2 DRIA), which is also associated with international LUC. This, in turn, is, by hypothesis, not considered here, since we hold the Brazilian net exports to avoid international leakage."[143]

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[139] Jackson, Lisa P. "EPA Administrator's Letter." Letter to U.S. Senator Tom Harkin (D-Iowa). 23 Sept. 2009. MS. Environmental Protection Agency, Washington, DC.

[140] FAPRI standard for the Food & Agriculture Policy Research Institute . The FAPRI model is a joint effort of Iowa State University's Center for Agricultural and Rural Development (CARD) and the University of Missouri-Columbia. For more information, see http://www.fapri.iastate.edu/

[141] *Workshop on Lifecycle Greenhouse Gas Analysis for the Proposed Revisions to the National Renewable Fuels Standard Program*, EPA/OTAQ Cong. (2009) (testimony of Andre Nassar). All presentations, as well as audio transcript, are available online at http://client-ross.com/lifecycle-workshop/

[142] Nassar, Andre M. "Comment submitted by Andre M. Nassar, Institute for International Trade Negotiations, The Brazilian Institute for International Negotiations (ICONE)." Letter to Environmental Protection Agency, Docket EPA-HQ-OAR-2005-0161. 11 Sept. 2009. *Regulations.gov*. EPA Docket, 14 Sept. 2009. Web. 14 Sept. 2009. <http://www.regulations.gov/>.

[143] Ibid.

3. Capture Cattle Dynamics

Lack of pasture as a class of land use in FAPRI's world models and the presumption of no pasture intensification in the Winrock International methodology to calculate GHG emission is the central weakness of EPA analysis. This is a fundamental flaw not only because pasture occupies more than 200 hundred million hectares (76 percent of the current agricultural land, or roughly one head of cattle per hectare) but mainly because a large share of the pastureland is under low slope areas. In other words, pasture is a well suited "land releaser" for crops. Combining the previous low levels of intensification, which is measured by stocking rate indexes (number or animals per hectare), and large convertibility of pastures to crops, would allow EPA's modeling for the RFS2 to capture the pasture intensification in the projections of land use change.

Not surprisingly, BLUM has undertaken such phenomena and was able to develop methodologies to more accurately capture the dynamics of Brazilian agriculture, thereby assessing pasture intensification, and, consequently, having land availability and suitability as inputs for the model, estimated indirect land use changes. "One of the most important advantages of BLUM for the RFS-2 regulations is that the model measures not only land allocation but also land use changes. Having the results on land use change estimated through an economic model, carbon emissions can be more accurately calculated by multiplying the land use changes for specific sub-national region by corresponding CO_2-e emissions factors. […] This is an important differential since it makes the calculation simpler and more accurate than the two-step approach developed by Winrock International for the RFS-2 DRIA."[144]

4. Use Geospatial Information Available in the Countries

As EPA admits, while "FAPRI model does predict how much crop land will change in other countries but does not predict what type of land such as forest or pasture will be affected."[145] Consequently, EPA chose to use remote sensing imagery for a limited period of time (2001-2004) to estimate how recent changes in land use have affected forest, grassland, savanna and scrubland. This methodology has a number of shortcomings. First, it was based in the gathering of primary satellite imagery, without any validation, and not in geospatial maps available in Brazil. Since 2001 INPE has been assessing Amazon deforestation using geospatial information, making available for external consultations annual LANDSAT shape files with maps interpreting land use changes promoted by the deforestation. Those satellite imageries are more detailed and accurate than the ones collected and interpreted by Winrock International. Second, as four of the five EPA reviewers[146] suggested, by looking at remote sensing data for period when sugarcane production in Brazil was flat (Note: Brazil was expanding the production of soybean, a completely unrelated crops), it is likely that the methodology is not accurately capturing the

[144] Ibid.
[145] See 74 Fed. Reg. at 25026
[146] See http://www.epa.gov/otaq/renewablefuels/rfs2-peer-review-land-use.pdf

dynamics of Brazilian agriculture.[147] Third, while remote sensing data can be useful, it must be accompanied by ground truthing. In fact, EPA's peer reviewer, Dr. Brian Wardlow, concisely said "any supporting evidence whether it is ground truth observations, reports, and/or high resolution imagery to highlight potential errors either regionally or thematically would be helpful in understanding the possible uncertainty they could introduce into the GHG emission estimates and change projections."[148]

5. <u>Cumulative Demand Shocks Overestimates ILUC</u>

Based on our review of the modeling employed for the Proposed Rule, CARD used six shocks analyses according to CARD's Technical Report.[149] All the analyzed scenarios do not isolate the biofuels shocks, considering the shock on domestic production (for both biodiesel and ethanol) combined with a shock on the imported ethanol. This analysis leads to significant distortions on national and international land use changes impacts by overestimating the ILUC outside the United States. The first "international" ILUC effect is due to the increasing demand on corn-based ethanol and/or biodiesel from soybeans in the U.S.. This, in turn, leads to lower U.S. international supply of these products, which are compensated by increasing production in other countries (e.g., Brazil). This effect precedes any higher levels of U.S. imported ethanol demand and, thus, exacerbating the individual ILUC of foreign produced biofuel feedstock.

For the Brazilian specific case, since the country is an important international player in all analyzed feedstocks (i.e., corn, soybeans and sugarcane), and as evidenced by the model results responding to the demand shocks in producing all of these feedstocks, the cumulative impact of the demand shocks exponentially penalized Brazilian produced feedstocks.

In the Final Rule, we suggest the shocks be isolated in two aspects: First, in terms of U.S. production and imported shocks; and, also isolating the shock for each type of biofuels (ethanol and biodiesel). Only by analyzing this independent manner would it be possible to isolate the ILUC effects of a specific biofuel pathway in the RFS2.

6. <u>Price Responses from Supplier Countries</u>

Basic economic theory shows that an increase on the price of a commodity will induce an increase in the production of that commodity. However, countries respond differently to these price signals due to the combination of two basic factors: (a) a country's international competitiveness and (b) its land availability. In analyzing response to price signals, these factors should be combined in order to have coherence with the analysis of each country prices responses. For example, it is known that Argentina is highly competitive in some agricultural products in terms of costs, yields and so on, but it does not have enough land availability to support demand shocks. On the other hand, Brazil is also highly competitive *and* has

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[147] Remarks at EPA's Renewable Fuel Standard's Public Hearing, EPA/OTAQ. (2009) (Testimony of Steffen Mueller and Ken Copenhaver, University of Illinois), June 11, 2009. See Document ID: EPA-HQ-OAR-2005-0161-1017.
[148] See page 87 (G6) at http://www.epa.gov/otaq/renewablefuels/rfs2-peer-review-land-use.pdf
[149] See ID: EPA-HQ-OAR-2005-0161.

considerable land available for agricultural expansion, from both the legal conversion of natural vegetation and the intensification of cattle production. With this in mind, any expansion in Brazilian agriculture should not have any significant leakage effect. A simple review what happened in the past years in Brazilian agriculture would illustrate the multidimensional dynamics of agricultural expansion in Brazil: expansion of second crops production, intensification of pasture areas and displacement of natural vegetation. Given that the models used in the EPA ILUC analysis do not consider land availability for each country, the results may not be consistent in terms of ILUC and of leakage effects among countries. We urge EPA to evaluate this issue prior to the Final Rule.

7. Shift of Land Use Patterns in Brazil due to Public Policies

EPA requested comments on the extent to which different government policies that shift land use patterns should be incorporated into the future land use change calculations and the best methodology for taking into account these changes.[150] We strongly urge EPA to incorporate these policy changes into its modeling. Brazil is at a critical juncture in terms of environmental public policies and their enforcement. Both governmental actions and private sector initiatives – agreements with governments and NGOs – are flourishing and are likely to be even more powerful in the future. Some significant legislations and agreements have already been mentioned earlier in our comments, such as the drop in Amazon deforestation, the sugarcane agro-ecological zoning, the sugarcane burning phase-out and the Brazilian Climate Alliance. It is also worth to mention the on-going discussions regarding the proposal of law for environmental crimes, which will set more severe penalties for those not complying with environmental legislations. All these policy changes and initiatives will change the pattern of land use change in Brazil. Considering that economic models reproduce the pattern observed in the past, it is imperative that the Final Rule seeks to address these likely future changes in various policy scenarios for land use change in Brazil.

8. Sugarcane Carbon Uptake is Underestimated

EPA's analysis uses the IPCC default value for annual cropland C stock, which is 5 Mt C/ha. However, as previously explained in Section I.A., sugarcane is a semi-perennial tropical crop that accumulates significant higher amounts of biomass above ground than other annual crops. Considering that IPCC recommends using its default values *only when* there is no other local estimate, we strongly suggest that the lifecycle analysis adopts the value of 17 Mg C/ha for sugarcane carbon uptake, as suggested in the BLUM. This value more accurately reflects the sugarcane biomass, which in turn can represent a carbon uptake when converting grassland to sugarcane.[151]

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[150] See 74 Fed. Reg. at 25032.
[151] See "Environmental Sustainability of Sugarcane Ethanol in Brazil" by Weber Amaral et al. in *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment* edited by Peter Zuurbier and Jos van de Vooren (2008).

IV. COMPLIANCE MECHANISMS REQUIRE REVIEW & RECONSIDERATION

A. PROPOSED RULE APPEARS TO BE WTO-INCONSISTENT

We believe that EPA's proposed approach to implementing the new RIN system, implicates several World Trade Organization (WTO) violations. We urge EPA to reconsider the proposed system to avoid such concerns. Specifically, the proposed RIN system described in the proposed RFS2 are inconsistent with the United States' international legal obligations under the WTO Agreement in six distinct ways. These six measures can be grouped in three categories of measures:

- Additional "enforcement-related" requirements that are levied *exclusively* on foreign renewable fuel producers (RFPs) and renewable fuel importers (RFIs), specifically the requirements to: (1) physically segregate fuel; (2) ensure third-party certification and comparison; (3) comply with an up-front bond-posting requirement; and (4) satisfy additional annual attest engagement requirements;[152]
- (5) The exemption of domestic small-batch RFPs from all recordkeeping, reporting and attest engagement requirements; and,[153]
- (6) The differential treatment of domestic and foreign RFPs in connection with documentation requirements for implementing the land use restrictions.[154]

Each single one of these six measures independently constitutes an unjustified discrimination of foreign renewable fuel and is thus in violation of Articles 2.1 and 2.2 of the Agreement on Technical Barriers to Trade (*TBT Agreement*), as well as Article III:4 of the General Agreement on Tariffs and Trade (*GATT*). In addition, all measures identified, except measure (5), the small-batch waiver for domestic RFPs, are in contravention of Article XI:1 *GATT*.

Under WTO precedent, a violation arises when *any* of these measures fulfills *one of three* conditions: (i) that it affords "less favorable" treatment to foreign renewable fuel than to "like" domestic renewable fuel (violation of Article 2.1 *TBT* and III:4 *GATT*); (ii) that it is a measure "more trade-restrictive than necessary to fulfill a legitimate objective" and thus creates an "unnecessary obstacle to international trade" (violation of Article 2.2 *TBT*); or (iii) that it constitutes a "restriction" "on the importation" of foreign renewable fuel.

Measures (1) through (4), the allegedly "enforcement-related" provisions, each constitute an unjustified discrimination of foreign renewable fuel in violation of Articles 2.1 and 2.2 of the *TBT*, and Articles III:4, and XI:1 of the *GATT*. Individually or in combination, these proposed requirements will effectively block exports of renewable fuel from Brazil and elsewhere by imposing substantial administrative impediments and prohibitive costs on foreign RFPs. By

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[152] § 80.1466 (74 FR 25138-25141).
[153] *See* § 80.1454 (74 FR, 25132).
[154] *See* 74 FR, 24941 ("We seek comment on whether and to what extent the approaches for ensuring compliance with the EISA's land restrictions by foreign renewable fuel producers could or should differ from the proposed approach for domestic renewable fuel producers … we believe it may be appropriate to require foreign renewable fuel producers to use an alternative method of demonstrating compliance with these requirements.").

contrast, less trade-restrictive alternatives such as certified statements coupled with certain civil prosecution, liability and sovereign immunity commitments by foreign RFPs could equally achieve EPA's goal of ensuring that foreign RFPs meet RIN requirements. At the very least, EPA should grant equal treatment to foreign RFPs originating in countries where comparable standards to the RFS2 prevail.

Measure (5), the proposed exemption of small-batch U.S. RFPs discriminates against foreign RFPs in general, and against similarly positioned small foreign producers in particular, thus violating *TBT* Articles 2.1 and 2.2, as well as Article III:4 of the *GATT*. EPA could eliminate this WTO-inconsistency by extending the waiver to similar-sized small-batch foreign producers.

Finally, any less favorable treatment of foreign RFPs in connection with documentation requirements concerning land use restrictions and handling of feedstocks (measure (6)) is in contravention of *TBT* Articles 2.1 and 2.2, as well as Articles III:4, and XI:1 of the *GATT*. A WTO-consistent alternative would involve applying the same set of requirements for domestic and international producers of renewable fuel. Alternatively, verification on land use and feedstock origin by government officials of the exporting country would suffice to achieve the same objective.

These measures, taken individually or in combination, are apt to completely block exports of renewable fuel, because they impose substantial administrative impediments and prohibitive costs on foreign RFPs, while affording an advantage to domestic producers. As is well known, and as two Panels in the *US – Upland Cotton* case stated,[155] in a highly commoditized market such as that for transportation fuel, small differences in costs (and thus prices) can have substantial volume effects. As EPA's Proposed Rule recognizes,[156] the ethanol market is already highly distorted due to various subsidies and trade protections.[157] Clearly EPA should seek to minimize, not exacerbate these trade barriers.

UNICA respectfully urges EPA to address these issues in finalizing the RFS2 to avoid any WTO violations. Further, beyond mere WTO ramifications, these unfair restrictions against foreign producers risk EPA's ability to achieve the ambitious volume goals mandated EISA due to the significant obstruction of foreign renewable fuel imports. Billions of gallons of imported renewable fuel, which would otherwise help obligated parties comply with EISA's ambitious renewable volume obligations, may be foregone unless these issues are addressed.

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[155] Panel Report, *U.S. – Upland Cotton*, para. 7.1330; Panel Report, *U.S. – Upland Cotton (21.5)*, para. 10.50.
[156] 74 Fed. Reg. at 24917, 24997-8, 25079-80, and 25086.
[157] D. Koplow, Biofuels—At What Cost? Government Support for Ethanol and Biodiesel in the United States: 2007 Update (International Institute of Sustainable Development, Geneva, 2007); www.globalsubsidies.org/files/assets/Brochure_-_US_Update.pdf.

B. TECHNICAL COMPLIANCE CONCERNS

1. Renewable Biomass Verification

EISA's definition of "renewable biomass" creates a requirement for biofuel producers to verify that the source of their feedstock meets the requirements. Recognizing the logistical and pragmatic challenges in requiring verification of numerous requirements for widely divergent feedstocks and practices, the Proposed Rule requests comments on alternative methods to verify that this requirement has been satisfied.[158]

As noted earlier, in the case of sugarcane, we believe that the nature in which the feedstock must be produced facilitates compliance. Sugarcane must be grown in the vicinity of the mill where the feedstock will be processed. Because the sugars in cane stalks naturally begin to ferment into acids and alcohols as soon as the crop is harvested, sugarcane farming is by definition located next to the sugarcane processing. Once harvested, sugarcane is processed on average within less than 12 hours in Brazil. A sugarcane mill in Brazil receives its feedstock from an average distance of 15 miles away.[159] Also, this requirement by "Mother Nature" means that sugarcane mills tend to have long-term, exclusive sugarcane suppliers.[160] Most mills grow their own sugarcane or harvest it from leased lands, meaning that only about one quarter of all sugarcane in Brazil arrives at any given mill from an established third-party supplier.[161] In sum, to identify the origin of the feedstock, one needs only to identify the mill, as its feedstock must come from nearby areas.

UNICA would be pleased to work on established agreed-upon protocols for verification, similar to what was done with the Sustainable Ethanol Initiative with Sweden.[162] As noted earlier, this verification process in Brazil can be simplified by the use of remote sensing tools such as the public satellite imagery database for sugarcane areas available at the Brazilian Space Agency's website, http://www.dsr.inpe.br/canasat/. We also note here the proposal advocated by POET on July 21 concerning the establishment of a Renewable Biomass Allowance for biofuel producers[163] and believe that it may present a reasonable solution. Alternatively, given that nearly every mill in Brazil today must renew its operating license every two years with state authorities, we recommend EPA consider using this regulatory process, which requires mills to identify the source of their feedstock, with not only via traditional environmental impact

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[158] 74 Fed. Reg. at 24939-41

[159] See Chapter 4 in Zuurbier, Peter, and Jos Van de Vooren, eds. *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment*. Wageningen, The Netherlands: Wageningen Academic, 2008

[160] See ORPLANA (Organização dos Plantadores de Cana da Região Centro-Sul do Brasil), available at http://www.orplana.com.br/

[161] *Manual de Instruções*. Tech. CONSECANA (Conselho dos Produtores de Cana-de-Açúcar, Açúcar e Álcool do Estado de São Paulo), 2006. Web. 1 Sept. 2009. <http://www.orplana.com.br/manual_2006.pdf>

[162] http://www.sustainableethanolinitiative.com/default.asp?id=1062

[163] Whiteman, Bob. "Comment submitted by Bob Whiteman, Chief Financial Officers, POET Ethanol Products LLC." Letter to Environmental Protection Agency, Docket EPA-HQ-OAR-2005-0161. 21 July 2009. *Regulations.gov*. EPA Docket, Web. 1 Sept. 2009. <http://www.regulations.gov/>.

assessments but also thought the use of independent engineering audits, as part of its compliance mechanisms.

For the reasons stated above, and given the clear WTO-inconsistency of some of the aspects of the Proposed Rule, there is no need to establish additional requirements for the enforcement of the renewable biomass provision in EISA.

2. Registration of Facilities

The Proposed Rule establishes an "expanded" facility registration process for all renewable fuel producers, including those producing abroad.[164] While the requirements, which may include providing information about feedstocks, facilities, and products, as well as submitting an on-site independent engineering review of their facilities, appear reasonable two areas require greater clarification in the Final Rule. First, EPA should permit the required independent engineering review to be conducted by an independent third party who is based in — and licensed by — foreign countries. In the case of Brazil, there is an active and highly respected professional engineering community that undoubtedly meets comparable U.S. standards.[165] In fact, Brazil hosted the "World Engineers Convention" annual meeting in December 2008.[166] Second, EPA should facilitate facility registration by allowing the registration of mills by holding companies or cooperatives. In Brazil, one entity may oversee various mills either via a holding company or through a cooperative. A streamlined registration process that allows for one entity to register all of its mills together would greatly facilitate compliance and lower transactional costs.

3. Segregation & Dehydration

The Proposed Rule prohibits the commingling of similar foreign-produced renewable fuel until such time it enters the U.S. market.[167] In addition to the trade law concerns listed above, this burdensome requirement would generate additional costs for exports and, ultimately, consumers.

Brazil has nearly 400 mills producing hydrous and anhydrous ethanol, all of it un-denatured, which is distributed domestically and internationally via a complex network of truck, rail, pipelines and ships. To segregate the product at the level proposed by EPA, while technically feasible, would be prohibitively expensive. In addition, the Proposed Rule's requirements for segregation appear also to penalize renewable fuel processed in the Caribbean, as permitted (if not, encouraged) under U.S. trade laws. EPA recognizes that the "most likely route is through the Caribbean Basin Initiative [since] Brazilian [sugarcane] ethanol entering the U.S. through the

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[164] See 74 Fed. Reg. at 24943
[165] Brazil is a founding member World Federation of Engineering Organizations (WFEO) at http://wfeo.org/ as well as Pan American Federation of Engineering Associations (UPADI) at http://www.upadi.org.br/. At the national level, see Brazilian Federation of Engineering Organizations (FEBRAE) at http://www.febrae.org.br/ and Federal Council of Engineering (CONFEA) at http://www.confea.org.br/ for more information.
[166] See "Brasil vai sediar convenção mundial de engenheiros." *Valor Economico* [Sao Paulo, SP, Brazil] 11 Dec. 2006.
[167] See 74 Fed. Reg. at 24941.

CBI countries is not currently subject to the 54 cent imported ethanol tariff."[168] Yet, despite this obvious fact, the Proposed Rule's RIN system may prohibit the processing of Brazilian ethanol in the Caribbean by requiring an unwarranted and burdensome level of fuel segregation.

We recommend that EPA reconsider its approach on segregation and follow the example set by the European Union in the Renewable Energy Sources Directive[169] by considering a mass balance approach, whereby it would compare volumes of ethanol produced at registered mills in Brazil with volumes of ethanol exported to volumes of ethanol imported into the United States. Such accounting method is easily achieved with readily available data from the U.S. and Brazilian trade authorities.[170] In fact, we understand the U.S. Internal Revenue Service (IRS) is working with various U.S. agencies to harmonize import, production, and distribution codes in order to better track fuels (including ethanol) to enforce excise taxes. Perhaps EPA should explore how this IRS effort could serve EPA's compliance requirements under EISA.

4. Denaturant & Point of RIN Generation

Given that EPA takes the view that renewable fuel ethanol requires the addition of a denaturant,[171] and that in case of the sugarcane ethanol pathway the denaturant is nearly always added at the U.S. port of entry,[172] the Final Rule should clarify that importers, not foreign producers, should generate the RINs under RFS2 as has been the case in RFS1. The requirement for adding denaturant, which ironically requires the addition of a *non*-renewable fuel such as gasoline, is unique to the United States[173] and, consequently, one that shifts the point of RIN generation to the port of entry in the case of imported ethanol.[174]

V. CONCLUSIONS

UNICA supports EPA's proposed RFS2 rulemaking and believes EPA should finalize RFS2 at the earliest opportunity but, as evidenced by our detailed comments, respectfully requests careful review and reconsideration on various aspects that would improve the implementation of the RFS2 Proposed Rule and achieve the energy security and greenhouse gas reduction goals sought by the Energy Security and Independence Act of 2007 (EISA).

In the final analysis, we believe that EPA must take in consideration the abundance of scientifically-credible evidence that supports the determination that Brazilian sugarcane

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[168] See 74 Fed. Reg. at 24997
[169] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Official Journal L 140 of 5 June 2009, page 16
[170] See U.S. International Trade Commissions (ITC) and Brazilian Ministry of Trade (MDIC).
[171] See 74 Feg. Reg. 25114 and 27 CFR parts 20-21.
[172] According to the U.S. International Trade Commission (ITC), which provided UNICA with data from 1996-2009, only about eight percent of all imported ethanol arrived at the U.S. port of entry "denatured." Of those, nearly all of it came from Canada and Trinidad & Tobago. For further information, contact Mr. Douglas Newman, International Trade Analyst, at the U.S. ITC.
[173] Ethanol in Brazil, either hydrous or anhydrous, does not contain *any* denaturant.
[174] See http://www.ttb.gov/industrial/alcoholfuel_bg.shtml

ethanol surpasses the advanced bioufel thresholds in the Proposed Rule. Moreover, EPA should finalize the rule at the earliest opportunity while improving upon a few key issues in a timely way. Among these issues, EPA should revise its technical lifecycle analysis, which understates the GHG benefits of sugarcane as a renewable feedstock, as well as ensure that its compliance mechanisms are consistent with U.S. international trade obligations, particularly including those related to the WTO.

As produced in Brazil, sugarcane is an environmentally sound, low carbon, renewable feedstock that meets the stated goals of the RFS2. Based on the conservative results of the BLUM for the "indirect" emissions[175] and the required emission credits from bioelectricity,[176] the revised results for the sugarcane ethanol pathway should be revised to 82 percent and 73 percent for 100 year with a 2% discount rate and 30 years with no discount rate, respectively.

We remain at your disposal to answer any questions or concerns EPA may have and look forward to helping meet the energy security and greenhouse gas reduction targets set by the Energy Security and Independence Act of 2007.

Respectfully Submitted,

Joel Velasco
Chief Representative - North America

[175] See page 30.
[176] See page 28.