Public Hearing for the 2014, 2015, and 2016 Standards for the Renewable Fuel Standard Program
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Hearing Presenters:

Iris Caldwell, PE	Research Engineer	iriscald@uic.edu
Steffen Mueller, PhD	Principal Research Economist	muellers@uic.edu

University of Illinois at Chicago Energy Resources Center;
1309 South Halsted Street, Chicago, IL 60607

I welcome the opportunity to present at this important hearing regarding the 2014, 2015, and 2016 standards for the Renewable Fuel Standard Program. As you know the Biofuels Research Center at UIC has been extensively informing the scientific discourse in the area of energy and GHG modeling during the RFS development. Our Principal Economist Dr. Steffen Mueller served on the Expert Working Group for the California Low Carbon Fuel Standard development and is the co-author of the CCLUB land use interface model to the Argonne GREET model.

Our peer reviewed research has demonstrated that today's average corn-based ethanol significantly reduces GHG emissions compared to petroleum based gasoline—even when potential indirect land use change (ILUC) emissions are considered for ethanol. It is our belief that the RFS has played an important role in creating a stable market environment that encourages development of, and investment in, new technologies.

Our work has shown that the biofuels industry has a uniquely high rate of innovation and technology adoption, which has resulted in steady reductions in GHG impacts. Specifically, our research shows energy use (and related GHG emissions) by biorefineries has been trending downward over the past decade.[1] Secondly, emerging agricultural practices and technologies have been shown to further reduce land demands and emissions from biofuels production. Most noteworthy are applications of nitrification inhibitors which stabilize nitrogen fertilizer inputs (a market that has seen 20% year over year growth for the last 5 years), advanced hybrid seeds, and precision agriculture.

Finally, recent analyses demonstrate potential ILUC emissions are substantially lower than initially estimated by the U.S. EPA and others. This downward trend in predicted emissions is due to improvements to iLUC land use models including 1) an evolving understanding of the elasticity of land transitions and yield-price relationships, 2) better addressing of ethanol co-product substitutions in

[1] Mueller, S. and John Kwik. Corn Ethanol: Emerging Plant Energy and Environmental Technologies, 2012, available at www.erc.uic.edu

Mueller, S. (2010). 2008 National dry mill corn ethanol survey. *Biotechnology Letters*, *32*, 1261-1264.

animal feed markets, 3) better understanding and data availability of global land types, and 4) carbon adjustments during land transitions.[2]

Argonne GREET life cycle emissions analyses estimate that corn ethanol greenhouse gas emissions are 19-48% (mean=34%) lower than conventional gasoline.[3] In light of the realized GHG reductions that are achieved from using ethanol instead of gasoline we are concerned with the recent Renewable Volume Obligations (RVO) released by EPA. EPA's RVO adjustment from the original RVO to the waivered RVO will likely leave conventional biofuels short by 1.6 billion gallons in 2015 (Original RVO of 15 billion gallons for 2015 to the waivered RVO of 13.4 billion gallons in 2015). The 1.6 billion gallons difference will increase GHG emissions by 4,520,000 tonnes CO_2e for that year (2015). According to the EPA Equivalency calculator this is equivalent to the annual greenhouse gas emissions of 951,600 passenger vehicles.

In closing we believe that the RFS results in substantial GHG savings by stimulating innovation at the feedstock production and biorefinery level. However, the current RVO fails to fully realize these GHG savings. Please do not hesitate to contact me or my co-author if you have any further questions.

[2] Zhangcai Quin, Jennifer B. Dunn, Hoyoung Kown, Steffen Mueller and Michelle Wander. Soil carbon sequestration and land use change associated with biofuel production: empirical evidence; GCB Bioenergy (2015), doi: 10.1111/gcbb.12237

Elliott, J., Sharma, B., Best N., Glotter., M., Dunn, J., Foster, I., Miguez, F., Mueller, S., Wang, M., A Spatial Modeling Framework to Evaluate Domestic Biofuel-Induced Potential Land Use Changes and Emissions, Environ. Sci. Technol., 2014, 48 (4), pp 2488–2496 DOI: 10.1021/es404546r

J. B. Dunn, S. Mueller, H. Kwon, M. Wander, M. Wang. Carbon Calculator for Land Use Change from Biofuels Production (CCLUB) Manual, May 2014.

Ho-Young Kwon, Steffen Mueller, Jennifer B. Dunn, Michelle M. Wander; Modeling state-level soil carbon emission factors under various scenarios for direct land use change associated with United States biofuel feedstock production; Biomass and Bioenergy (2013), http://dx.doi.org/10.1016/j.biombioe.2013.02.021
Jennifer B Dunn, Steffen Mueller, Ho-young Kwon and Michael Q Wang; Land-use change and greenhouse gas emissions from corn and cellulosic ethanol; Biotechnology for Biofuels 2013, 6:51 doi:10.1186/1754-6834-6-51; Published: 10 April 2013

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