January 18, 2017

Ms. Diana Galperin
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Diana,

National Sorghum Producers (NSP) is pleased to provide the supplemental information you requested via email dated October 28, 2016, on our renewable fuel pathway petition for sorghum oil, which we submitted on July 29, 2016.

For ease of reference, we have reproduced your email in its entirety below in black type and provided our answers in red type. As you will see, portions of this supplemental submission contain confidential business information (CBI). We have marked the CBI-containing sections with red headers and footers and yellow highlighting.

We thank you for your attention to and review of this petition. We stand ready to provide any additional information you may require. Please do not hesitate to call me at (806) 638-5334 or contact me via email at john@sorghumgrowers.com.

Thanks,

John Duff
National Sorghum Producers
(806) 749-3478

Dear Mr. Duff,

We have reviewed your petition and are requesting the following additional information before we can accept your petition as being complete. We understand that some, but not all, of the data requested below is included in the petition you submitted, and we are requesting that the data be provided in the tables/formats specified below to help us complete our evaluation as expeditiously as possible. We ask that all data provided be documented with peer reviewed literature, data from USDA or from other credible sources to the extent possible. If such data are not available, please explain why and include the best information available. Please let us know if you have any questions.

1) In our May 2016 reply to the pathway screening tool (PST) from NSP, we cited section 5.1.2.3 of the RIA to the March 2010 RFS final rule as an example of the type of information needed. For the composition and nutritional value of oiled and de-oiled DGS, the RIA cites Shurson (2006).[1] Please fill in the following data table, based on Table 1 in Shurson (2006). See the attached table completed by Dr. Ryan Mass, feed business manager for ICM, on page 6. Dr. Mass's resume is attached on page 7. Please note Dr. Mass's inclusion of net energy in place of metabolizable energy. According to Dr. Mass, this substitution was made because net energy is the primary parameter used by professional nutritionists to formulate rations. Conversely, metabolizable energy is an intermediate calculation used primarily for research purposes. Net energy also allows for more accurate comparisons between species.

	Common nutrient specifications for oiled and de-oiled SDGS	
Composition/Nutrient	Oiled SDGS	De-Oiled SDGS
Yield (lb DGS/bu grain sorghum) [2]		
Dry matter, %[3]		
Mass As Percent of 100% SDGS on Dry Matter Basis:[4]		
Crude protein, %		
Crude fat, %		
ME[5] (beef cows, kcal/kg)		
ME (dairy cows, kcal/kg)		
ME (swine, kcal/kg)		
ME (poultry, kcal/kg)		
Acid Detergent Fiber (ADF), %		
Neutral Detergent Fiber (NDF), %		
Ash, %		
Calcium, %		
Phosphorous, %		
Lysine, %		
Tryptophan, %		
Methionine, %		
Cystine, %		

[1] http://www.biofuelscoproducts.umn.edu/sites/biodieselfeeds.cfans.umn.edu/files/cfans_asset_416494.pdf
[2] Yield on wet matter basis
[3] Dry mass percent of SDGS = mass of SDGS on dry matter basis / mass of SDGS on wet matter basis
[4] % = dry mass of nutrient listed in first column / mass of SDGS on dry matter basis
[5] ME = Metabolizable energy

Threonine, %		

2) Section 5.1.2.3 of the RIA to the March 2010 RFS final rule cited Arora et al. (2008)[6] as the basis for DGS displacement rates. Please fill in the following data table based on the bottom of Table 14 in Arora et al. (2008). (Only displacement data is needed, as nutritional value will be covered by the data table above.) See the attached table completed by Dr. Mass on page 8. Please note some of the table entries are left blank (for example, soybean meal in beef cattle rations). This is because sorghum DGS does not replace soybean meal in beef cattle rations regardless of the oil content.

	SDGS Displacement rates by animal type (lb/lb SDGS, 100% dry matter basis)							
	Beef cows		Dairy cows		Swine		Poultry	
	Oiled	De-oiled	Oiled	De-oiled	Oiled	De-oiled	Oiled	De-oiled
Corn displacement								
Soybean meal displacement								
Urea displacement								

a) On page 11 of the ICM Consulting report submitted in the petition, it states "Plant A reported that the plant intentionally reduced the BTS oil recovery in order to maintain the fat value in the DDGS for the marketing feed tag requirements." Please provide information on the nutrient requirements to attain marketing feed tags (% lb of dry matter basis oiled and de-oiled SDGS) for beef cows, dairy cows, swine and poultry. This issue relates solely to the feed tag requirements for a specific customer of Plant A. There are no universally-accepted requirements for feed tags. Instead, each facility guarantees a certain nutritional composition based on its own capabilities and the needs of its customers. See the attached letter to this effect from ICM on page 9.

   a. Please also provide background information on how de-oiled SDGS are treated in order to be sold on the livestock market. No additional non-mechanical treatments are used in the production and marketing of in de-oiled SDGS. See the attached letter to this effect from Conestoga Energy Partners on page 10.

   b. On page 3 of the appendix with Dr. Kimberly C. McCuistion's analysis of the nutritional value of sorghum DDGS with and without oil extraction, she notes, "With the removal of the oil, additional sources of fat may be included in the diet through other ingredients to insure adequate energy availability; however, any additional fat sources needed when feeding de-oiled sorghum DDGS should be similar in quantity to those needed when feeding de-oiled corn DDGS." Please provide quantities in lbs of additional fat that need to be added to the de-oiled sorghum DDGS and the most common sources of this fat. Please also provide similar information for corn DDGS. Dr. Mass outlines these minor

[6] http://www.anl.gov/energy-systems/publication/update-distillers-grains-displacement-ratios-corn-ethanol-life-cycle-0

additional requirements on page 8. Also attached on pages 11-12 are two rations (one for sorghum and one for corn) balanced by Dr. Mass using de-oiled distillers grains.

c. Please provide the following information on the market value of SDGS with and without oil extraction:
    a. Monthly historical prices (in nominal terms) for past 5 years of SDGS with and without oil extraction $/lb See this information attached on pages 13-14. Please note data for the three White Energy plants are only available beginning in 2014. This is due to an ownership change that has made gathering accurate accounting information difficult. Also note these data are marked as CONFIDENTIAL BUSINESS INFORMATION.
    b. Please also provide values for corn DDGS oiled and de-oiled. Prices for corn and sorghum distillers grains are not separated in public datasets as prices received do not differ based on the feedstock. See the attached letter to this effect from the USDA Agricultural Marketing Service on page 15.

4) Please fill out "Tab 2. Process" on the spreadsheet titled *Data Submission Template for New Pathway Petitions Version 2.0* and located at https://www.epa.gov/sites/production/files/2015-08/420b14071.xlsx.
    a. In this spreadsheet please provide the mass and energy balance of a representative dry mill grain sorghum ethanol facility with both sorghum oil and no sorghum oil extraction. If you wish to provide data for multiple dry mill facility configurations, please fill out separate spreadsheets for each one and submit all of them with clear labelling explaining the differences. See the attached spreadsheets completed by ICM detailing mass and energy balances for dry mill ethanol production facilities using grain sorghum as a feedstock. One includes oil extraction, and one does not. These sheets are attached as PDFs on pages 16-17 along with a letter from ICM on the process of completing the sheets on page 18. Please note they are marked as CONFIDENTIAL BUSINESS INFORMATION.
    b. Please also fill provide separate spreadsheets with the mass and energy balance of representative fuel production processes for the conversion of extracted grain sorghum oil to finished fuel. This should include the following fuel production processes:
        i. Biodiesel produced via transesterification See the attached spreadsheet completed by engineering consulting firm Saola Energy LLC on page 19. We have also attached at page 20 a letter from Saola on the process of completing the sheet. Please note the sheets are marked as CONFIDENTIAL BUSINESS INFORMATION.
        ii. Renewable diesel, jet fuel, naphtha and LPG produced via hydrotreating (with and without co-processing). (Note that on the cover sheet of your petition you listed the production process as "hydroheating" but we assume you meant "hydrotreating" as currently listed in Table 1 to 40 CFR 80.1426, if that is incorrect please clarify.) You are correct. We indeed mean "hydrotreating." Thank you for catching this typo. The separate spreadsheets you requested were completed by Saola Energy and attached on page 21. Please note it details the mass and energy balance of renewable

diesel only. Also note these are marked as CONFIDENTIAL BUSINESS INFORMATION.

iii. Heating oil produced via transesterification and/or hydrotreating. At this time, NSP cannot provide the requested supplemental information for jet fuel, naphtha, LPG and heating oil. As of this writing, there is no market for sorghum oil-derived jet fuel, naphtha, LPG or heating oil, and to our knowledge, no facilities are considering producing these fuels. We respectfully reserve the right to supplement this pathway petition in the future with jet fuel, naphtha, LPG and heating oil data, should they become relevant. In the meantime, we respectfully request EPA proceed with processing our pathway petition on the sorghum oil to renewable diesel and biodiesel pathways.

5) Please explain all of the units for the data in the table found on page 52, in the PDF version of your petition which lists production and sorghum use figures. The applicable units have been added and the updated table is attached on pages 22-24. Please note it is marked as CONFIDENTIAL BUSINESS INFORMATION.

6) On page 6 of your petition, you write "Moreover, the EPA's approval of these fuel pathways will result in near-immediate introduction of a monthly volume of 310,725 gallons (466,088 million ethanol-equivalent gallons[1]) of grain sorghum oil biomass-based diesel and advanced biofuels into the stream of commerce. " Please clarify how this figure was calculated. This was calculated by multiplying the cumulative monthly volume of sorghum oil produced by the six dry mill ethanol production facilities discussed in this petition multiplied by the biofuel yield per pound of oil divided by the number gallons of biofuel per pound. This note of clarification has been added. See attached for a copy of the applicable page and highlighted note on page 25.

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December 2, 2016

Nutrient Profile of Reduced-Oil Sorghum Distillers' Grains

Submitted by Ryan A. Mass, PhD
ICM Feed Business Manager

There exists in the scientific literature no information about the feeding value and nutrient profile of reduced-oil sorghum distillers' grains for livestock. However, data exist about the effect of reducing the oil in corn distillers' grains. It is the professional opinion of ICM, Inc that sorghum and corn behave similarly in terms of the way nutrients flow through an ethanol plant and deposit in the distillers' grains. Therefore, it is logical to apply the ratios taken from the corn distillers' grains data to the sorghum distillers' grains data. Please find below. Only refereed sources of data are used in this analysis.

Nutrient	Full-Oil Sorghum DDGS*	Reduced-Oil Sorghum DDGS**
Dry Matter, %	89.84	89.94
Crude Protein, %	30.80	31.36
Crude Fat, % (a.k.a. Ether Extract)	9.75	3.91
Net Energy- beef growing, kcal/kg^	2144	1924
Net Energy- beef finishing, kcal/kg^	2011	1830
Net Energy- dairy, kcal/kg^^	1855	1873
Net Energy- swine, kcal/kg	2394	2053
Net Energy- poultry, kcal/kg^^^	2283	2135
Neutral Detergent Fiber (NDF), %	33.60	37.23
Acid Detergent Fiber (ADF), %	22.68	31.91
Ash, %	6.62	7.60
Calcium, %	0.12	0.08
Phosphorus, %	0.76	0.96
Lysine, %	0.82	0.62
Methionine, %	0.54	0.47
Cystine, %	0.53	0.61
Tryptophan, %	0.25	0.23

*Data (unless noted) taken from Nutrient Requirements of Swine, 2012 National Academies Press, Washington DC, pg 329

**Data calculated using the ratio of 1) corn DDGS, >6 and <9% Oil; and 2) corn DDGS, <4% Oil from Nutrient Requirements of Swine, 2012 National Academies Press, Washington DC, pp. 266 and 267

^Nutrient Requirements of Beef Cattle, 2016 National Academies Press, Washington DC, pg 295

^^ Mjoun et al., 2010 Journal of Dairy Science 93:288-303. Lactation performance and amino acid utilization of cows fed increasing amounts of reduced-fat dried distillers grains with solubles.

^^^Barekatain et al., 2014 Poultry Science 93:2793-2801. Effect of sorghum distillers' dried grains and microbial enzymes on net energy values of broiler diets.

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Ryan A. Mass

EDUCATION – ANIMAL SCIENCE

2002	**Doctor of Philosophy**	**University of Nebraska**
1998	**Master of Science**	**University of Nebraska**
1995	**Bachelor of Science**	**Iowa State University**

PROFESSIONAL EXPERIENCE

Oct, 2016 – Present **ICM Ventures, Incorporated** **Colwich KS**

Recruited to lead their new feed business, I evaluate the commercial viability of new ingredients through the design and supervision of research and development. I will lead the launch of ingredients deemed to be commercially viable into the marketplace. I also support the sales and marketing team of this ethanol equipment manufacturing firm as it continues to be the market-leading provider of new technologies.

Jan, 2010 – Sep, 2016 **XF Enterprises** **Pratt KS**

Recruited to lead the consulting division of Nutrition Service Associates in Pratt Kansas, I supervised one nutritionist and all custom formulas. I also served as the consulting nutritionist for the Anipro / Xtraformance Feeds division of the company.

In addition, I served as the sales and technical representative of Westway Feed Products for Kansas and adjoining areas from July 2012 to July 2015. I set gross margins on liquids and pellets, quoted prices, and delivered customer service.

Major Accomplishments

-9% annualized sales growth during my tenure
-Sold over 2,000 tons of rock pellets (Westway's new technology)
-Added 22 consulting clients

Sep, 2006 – Dec, 2009 **Lallemand Animal Nutrition** **Milwaukee WI**

Recruited to lead all beef technical consultation globally for their yeast and bacterial DFM products, my time was split equally among applied research projects, technical support, and sales.

Major Accomplishment- Impact of a new direct-fed microbial on intake and ruminal pH. Nebraska Beef Report MP92, pp. 99-101.

Apr, 2003 – Aug, 2006 **XF Enterprises** **Pratt KS**

Marketed and provided technical services to a diverse clientele as an associate member of Nutrition Service Associates. Clients included feed ingredient companies, beef and dairy producers, an independent feed store, and an analytical laboratory. I also developed new cattle nutrition products.

Major Accomplishments

-Invented the technology used for QualiTech Precision Micronutrients
-Co-invented U.S. Patent #8,048,457- "Saponin and Preservative Compositions"

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Displacement of Commodities by Sorghum Distillers' Grains

December 5, 2016

Ryan A. Mass, PhD, ICM Feed Business Manager

An ingredient displacement model developed previously (Arora et al, 2008) requires expansion for sorghum distillers' grains. It is the professional opinion of ICM, Inc. that the only application of reduced oil sorghum distillers' grains which would result in reduced feeding value for livestock is for beef cattle in the feedlot. Opheim et al. (2016) demonstrated recently that all types of distillers' dried grains (whether from corn or sorghum, with or without full-oil) have the same feeding value for cattle when the diets were formulated to have the same amount of fat. Therefore, because oil had to be added at the expense of corn when reduced-oil sorghum distillers' dried grains were fed in that experiment, the corn displacement ratio for beef cattle has been lowered in the table commensurately for reduced oil sorghum distillers' grains by 1.89% compared to the full-oil option (see attached example rations which demonstrate how this concept is applied in a practical setting).

No effect of oil reduction in sorghum distillers' grains on the displacement of the feed ingredients listed would be observed for the other species. This phenomenon is explained by the fact that the oil itself provides little marginal benefit in those applications (over and above that of the energy and protein otherwise present). Ramirez et al. (2016) demonstrated recently that feeding reduced oil distillers' grains is beneficial to dairy cows because there is less likelihood for the onset of milk fat depression, which is caused by a fat-induced change in the rumen microbial community of those animals. Kerr et al. (2016) described several studies which have "have shown that increased concentrations of free fatty acids have a negative impact on lipid digestion and energy content" of cereal grains oils for swine and poultry.

	Sorghum Distillers' Grains Displacement Ratio (lb of ingredient / lb of SDGS, dry matter basis)							
	Beef Cattle		Dairy Cattle		Swine		Poultry	
Ingredient	Full-Oil	Reduced Oil	Full-Oil	Reduced Oil	Full-Oil	Reduced Oil	Full-Oil	Reduced Oil
Corn	1.196	1.173	0.731	0.731	0.890	0.890	-	-
Soybean Meal	-	-	0.633	0.633	0.095	0.095	-	-
Urea	0.056	0.056	-	-	-	-	-	-

Literature Cited

Arora et al., 2008. Argonne National Laboratory. Update of distillers grains displacement ratios for corn ethanol life-cycle analysis.

Kerr et al., 2016. Journal of Animal Science 94:2900-8. Lipid digestibility and energy content of distillers' corn oil in swine and poultry.

Opheim et al., 2016. Journal of Animal Science 94:227. Biofuel feedstock and blended coproducts compared with deoiled corn distillers grains in feedlot diets: Effects on cattle growth performance, apparent total tract nutrient digestibility, and carcass characteristics.

Ramirez et al., 2016. Journal of Dairy Science 99:1912-28. Reduced-fat dried distillers grains with solubles reduces the risk for milk fat depression and supports milk production and ruminal fermentation in dairy cows.

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October 31, 2016

Dear Sir or Madam,

I am writing to clarify a statement made on page 11 of the consulting report referenced in the sorghum oil petition. The plant in question, Plant A, had a fat requirement in its individual feed tag that required it to extract less oil than most plants. This was not a reflection of a problem but rather a specific matter related to Plant A's individual feed tag that was negotiated with that individual customer.

Feed tags are documents provided to customers detailing the composition of feed products, and these can vary by facility and feed type (wet, dry, partially dry, etc.). Thus, there is no single standard for distillers grains composition. This is the reason for the special feed tag requirement that led Plant A to extract less oil.

Thank you for the opportunity to comment, and please let me know if you have any questions.

Thanks,

Jeff Scharping
Director – ICM, Inc.

310 N. First Street | P.O. Box 397 | Colwich, Kansas 67030 USA | Phone: +1.316.796.0900 | Fax: +1.316.796.0570

www.icminc.com

Dear Sir or Madam,

Conestoga Energy Partners and White Energy, through a joint venture known as C&W Commodities, market wet and dried sorghum and corn distillers grains with oil and without oil produced in six dry mill ethanol facilities in Kansas and Texas.

We market these products to livestock producers without any additional non-mechanical treatments. The only added step after the coproduct exits the facility is rotary drying for the feed we market on a dry matter basis. This process is identical for sorghum distillers grains with oil and without oil and corn distillers grains with oil and without oil.

The coproducts are segregated based on their moisture content and stored in staging facilities. Just prior to delivery or pickup, an auger or belt is used to load the coproduct onto a trailer for transport to livestock producers.

Thank you for the opportunity to comment, and please let me know if I can answer further questions.

Matt Durler
Vice-President of Marketing
C&W Commodities, LLC

Ration Analysis

DALEX CONNECT

Ryan Mass

Bluebird Feeders

Prepared on:December 05, 2016

Pricing Sorghum DDGS - Ingredient Detail

Ingredient Name	AF lb	% of AF	% of DM	Ingredient AF $/ton	AF Shadow Price (ton)
Corn Grain - Flaked - 24 lb	1,325.21	66.26	63.81	142.86	
Sorghum DDGS- 9.75% fat	461.65	23.08	25.01	174.00	
Alfalfa Hay 17 - 46 NDF	108.75	5.44	5.89	100.00	
Molasses - Cane	60.00	3.00	2.64	200.00	
Limestone - Ground	22.00	1.10	1.32	52.00	
Distillers' Corn Oil	14.61	0.73	0.87	588.00	
Salt - White	4.15	0.21	0.25	56.00	
Vitamin ADE Premix 1	3.07	0.15	0.18	5,555.00	
Trace Mineral Premix	0.57	0.03	0.03	4,444.00	
Sorghum DDGS- 3.91% fat				1,000.00	165.07
Total	2,000.00	100.00	100.00		

Costs($/Formula)

Ingredient Cost	161.03

Pricing Sorghum DDGS - Nutrient Analysis (DM %)

Protein	%	15.30	Salt	%	0.25
Net Energy Gain / NRC96	Mcal/cwt	68.79	Selenium	ppm	0.30
Calcium	%	0.60	Sodium	%	0.12
Chlorine	%	0.24	Sulfur	%	0.13
Cobalt	ppm	0.80	Zinc	ppm	10.71
Copper	ppm	12.59	NDF	%	8.88
Iodine	ppm	0.73	Fat	%	6.00
Iron	ppm	92.35	Vitamin A	IU/lb	2,000.00
Magnesium	%	0.13	Vitamin D	IU/lb	199.41
Manganese	ppm	40.96	Vitamin E	IU/lb	92.32
Phosphorus	%	0.23	TDN / NRC96	%	70.47
Potassium	%	0.48	Moisture	%	16.93

Ration Analysis

DALEX CONNECT

Ryan Mass

Bluebird Feeders

Prepared on:December 05, 2016

Pricing Sorghum DDGS - Ingredient Detail

Ingredient Name	AF lb	% of AF	% of DM	Ingredient AF $/ton	AF Shadow Price (ton)
Corn Grain - Flaked - 24 lb	1,300.30	65.02	62.44	142.86	
Sorghum DDGS- 3.91% fat	462.85	23.14	25.00	151.00	
Alfalfa Hay 17 - 46 NDF	108.75	5.44	5.87	100.00	
Molasses - Cane	60.00	3.00	2.63	200.00	
Distillers' Corn Oil	38.31	1.92	2.28	588.00	
Limestone - Ground	22.00	1.10	1.31	52.00	
Salt - White	4.15	0.21	0.25	56.00	
Vitamin ADE Premix 1	3.07	0.15	0.18	5,555.00	
Trace Mineral Premix	0.57	0.03	0.03	4,444.00	
Total	2,000.00	100.00	100.00		

Costs($/Formula)	
Ingredient Cost	161.02

Pricing Sorghum DDGS - Nutrient Analysis (DM %)

Protein	%	15.17	Salt	%	0.25
Net Energy Gain / NRC96	Mcal/cwt	68.76	Selenium	ppm	0.30
Calcium	%	0.60	Sodium	%	0.12
Chlorine	%	0.24	Sulfur	%	0.12
Cobalt	ppm	0.81	Zinc	ppm	10.51
Copper	ppm	12.55	NDF	%	8.74
Iodine	ppm	0.74	Fat	%	6.00
Iron	ppm	91.71	Vitamin A	IU/lb	1,995.98
Magnesium	%	0.13	Vitamin D	IU/lb	199.01
Manganese	ppm	41.03	Vitamin E	IU/lb	92.13
Phosphorus	%	0.23	TDN / NRC96	%	71.58
Potassium	%	0.47	Moisture	%	16.70

CONFIDENTIAL BUSINESS INFORMATION HIGHLIGHTED IN YELLOW

	Hereford	Plainview	Russell		Western Plains Energy		Arkalon		Bonanza		Kansas Ethanol	
Month(Year)	WDGS	WDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS
November(11)												
December(11)												
January(12)												
February(12)												
March(12)												
April(12)												
May(12)												
June(12)												
July(12)												
August(12)												
September(12)												
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March(14)												
April(14)												
May(14)												
June(14)												

CBI / Ex. 4

CONFIDENTIAL BUSINESS INFORMATION HIGHLIGHTED IN YELLOW

CONFIDENTIAL BUSINESS INFORMATION HIGHLIGHTED IN YELLOW

	Hereford	Plainview	Russell		Western Plains Energy		Arkalon		Bonanza		Kansas Ethanol	
Month(Year)	WDGS	WDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS	WDGS	DDGS
July(14)												
August(14)												
September(14)												
October(14)												
November(14)												
December(14)												
January(15)												
February(15)												
March(15)												
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April(16)												
May(16)												
June(16)												
July(16)												
August(16)												
September(16)												

CBI / Ex. 4

CONFIDENTIAL BUSINESS INFORMATION HIGHLIGHTED IN YELLOW

United States Department of Agriculture

Agriculture Marketing Service
Livestock, Poultry, & Seed Program
Livestock, Poultry & Grain Market News

http://www.ams.usda.gov/LPSMarketNewsPage

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Email: stjoe.lpgmn@usda.gov

November 29, 2016

John Duff
Strategic Business Director
National Sorghum Producers
4201 North Interstate 27
Lubbock, TX 79403

To Whom It May Concern:

The USDA's Agricultural Marketing Service is responsible for the National Daily Ethanol Report. This is a bioenergy report that includes price data for dry, modified, and wet distillers grain, corn oil, and ethanol for the following states: Eastern Corn Belt (Illinois, Indiana, Ohio, Michigan), Iowa, Kansas, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin. Information included in this report is collected daily.

Corn and sorghum grain bids are collected and included on this report; however, corn-based and sorghum-based distillers grain prices are not separated on the report, as current industry practices are to blend corn and sorghum distillers grains and market as one product.

Thank you for the opportunity to comment.

Regards,

Russ Travelute

Russ Travelute,
Field Chief, LPGMN

Data Submission Template for Petitions Involving Fuel Production Processes Not Previously Modeled

Requested Pathway

Fuel Produced	Ethanol	
Feedstock	Grain Sorghum	
Process	Dry Grind	
D-Code Request (see Table V.C-7-D-Code Designations)	D-5	

Scenario: Expected performance of a processing plant based on past data from numerous plants. Yields are in accordance with the evaluation provided. The energy use constants are from estimations based on numerous reported plant data, and averaged. This plant is not operating any oil separation equipment and is drying 100% of it's DDGS.

	Mass		Volume		Lower Heating Value (LHV)		Data Source	
Mass and Energy Balance Information	Value	Units	Value	Units	Value	Units	Source (Required)	Year
Mass								

CBI / Ex. 4

[1]Energy balance information should include a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
[2]Energy input information should include fuels used by type, including purchased electricity. Indicate the source, type of fuel required, efficiency, and temperature/pressure for any steam or hot water purchased for the fuel production process.
[3]The extent to which excess electricity or other heat sources are generated and distributed outside the production facility should be described.

Data Submission Template for Petitions Involving Fuel Production Processes Not Previously Modeled

Requested Pathway

Fuel Produced	Ethanol	
Feedstock	Grain Sorghum	
Process	Dry Grind	
D-Code Request (see Table V.C-7-D-Code Designations)	D-5	

Scenario:

Expected performance of a processing plant based on past data from numerous plants. Yields are in accordance with the evaluation provided. This plant is operating oil removal equipment, and drying all DDGS co-product. The energy use constants are from estimations based on numerous reported plant data, and averaged. The increase in electricity from the equipment to remove corn oil is usually less than 2% of the plants total connected horsepower. The decrease in natural gas usage is due to less DDGS product overall being dried.

	Mass		Volume		Lower Heating Value (LHV)		Data Source	
Mass and Energy Balance Information	Value	Units	Value	Units	Value	Units	Source (Required)	Year
Mass								

CBI / Ex. 4

[1]Energy balance information should include a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
[2]Energy input information should include fuels used by type, including purchased electricity. Indicate the source, type of fuel required, efficiency, and temperature/pressure for any steam or hot water purchased for the fuel production process.
[3]The extent to which excess electricity or other heat sources are generated and distributed outside the production facility should be described.

the energy of innovation™

To Whom It May Concern,

The attached EPA Pathway Sheets are an estimation based on ICM Inc.'s knowledge of the first generation ethanol process. The estimates were calculated on a number of different inputs which are to the best of our knowledge industry equivalents.

Sincerely,

Jeremy E. Javers, PhD

Director of Technology Development—St. Joseph

Phone: 316.977.8507

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Jeremy.Javers@IcmInc.com

Data Submission Template for Petitions Involving Fuel Production Processes Not Previously Modeled

Requested Pathway

Fuel Produced	Biodiesel
Feedstock	Sorghum Oil
Process	Enzymatic
D-Code Request (see Table V.C-7-D-Code Designations)	

Scenario: Based on data for a 2.5MMGPY biodiesel facility utilizing corn oil as the feedstock. There is no fundamental difference between corn oil and sorghum oil as a feedstock for the biodiesel process.

	Mass		Volume		Lower Heating Value (LHV)		Data Source	
Mass and Energy Balance Information	Value	Units	Value	Units	Value	Units	Source (Required) - See cell C8	Year
Mass								

CBI / Ex. 4

[1]Energy balance information should include a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
[2]Energy input information should include fuels used by type, including purchased electricity. Indicate the source, type of fuel required, efficiency, and temperature/pressure for any steam or hot water purchased for the
[3]The extent to which excess electricity or other heat sources are generated and distributed outside the production facility should be described.

Saola Energy LLC
209 E William St, Suite 340A
Wichita, Kansas 67202

January 9, 2017

To Whom It May Concern,

Saola Energy LLC provides project management and process engineering support to clients on diverse projects in market sectors such as ethanol, renewable diesel, biodiesel and oil refining. The attached spreadsheets were completed based on Saola's expertise in these areas. Please do not hesitate to contact us if you have any questions.

Thank you,

Ben Root

Ben Root
Process Engineer

Data Submission Template for Petitions Involving Fuel Production Processes Not Previously Modeled

Requested Pathway

Fuel Produced	Renewable Diesel
Feedstock	Sorghum Oil
Process	Hydrodeoxygenation and Isomerization
D-Code Request (see Table V.C-7-D-Code Designations)	

Scenario: Based on data for a 4.5MMGPY renewable diesel facility utilizing corn oil as the feedstock. There is no fundamental difference between corn oil and sorghum oil as a feedstock for the renewable diesel process. Yield values are simulated and can vary with changing process conditions.

	Mass		Volume		Lower Heating Value (LHV)		Data Source	
Mass and Energy Balance Information	Value	Units	Value	Units	Value	Units	Source (Required) - See cell C8	Year

CBI / Ex. 4

[1]Energy balance information should include a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
[2]Energy input information should include fuels used by type, including purchased electricity. Indicate the source, type of fuel required, efficiency, and temperature/pressure for any steam or hot water purchased for
[3]The extent to which excess electricity or other heat sources are generated and distributed outside the production facility should be described.

Month	Kansas Ethanol Oil Production (millions of pounds)	Kansas Ethanol Grain Sorghum Use (percent of total bushels used)	White Energy Hereford Oil Production (millions of pounds)	White Energy Hereford Grain Sorghum Use (percent of total bushels used)	White Energy Plainview Oil Production (millions of pounds)	White Energy Plainview Grain Sorghum Use (percent of total bushels used)	Western Plains Energy Oil Production (millions of pounds)	Western Plains Energy Grain Sorghum Use (percent of total bushels used)	Conestoga Energy Partners Bonanza Oil Production (millions of pounds)	Conestoga Energy Partners Bonanza Grain Sorghum Use (percent of total bushels used)	Conestoga Energy Partners Arkalon Oil Production (millions of pounds)	Conestoga Energy Partners Arkalon Grain Sorghum Use (percent of total bushels used)
May 2016	CBI / Ex. 4											
April 2016												
March 2016												
February 2016												
January 2016												
December 2015												
November 2015												
October 2015												
September 2015												
August 2015												

July 2015
June 2015
May 2015
April 2015
March 2015
February 2015
January 2015
December 2014
November 2014
October 2014
September 2014
August 2014
July 2014
June 2014
May 2014

CBI / Ex. 4

April 2014
March 2014
February 2014
January 2014
December 2013
November 2013
October 2013

CBI / Ex. 4

1. Fuel Pathway Description (No information claimed CBI)

Through this petition, we are asking the EPA to approve renewable fuel pathways for the production of certain biofuels from grain sorghum oil. Our proposed pathways meet and exceed the regulatory requirements for approval as advanced biofuels and will have no adverse impact on the number of acres planted for the production of food, nor on the use of the de-oiled, dry grain sorghum distiller's grains as animal feed. Moreover, the EPA's approval of these fuel pathways will result in near-immediate introduction of a monthly volume of 310,725 gallons (466,088 million ethanol-equivalent gallons[1]) of grain sorghum oil biomass-based diesel and advanced biofuels into the stream of commerce. This was calculated by multiplying the cumulative monthly volume of sorghum oil produced by the six dry mill ethanol production facilities discussed in this petition multiplied by the biofuel yield per pound of oil divided by the number of gallons of biofuel per pound. See section B(4) for a detailed explanation of this and related calculations.

Comment [j1]: Note of clarification added at EPA's request.

With the exception of the feedstock used, the pathways described in this petition for the production of biodiesel, renewable diesel, jet fuel, heating oil, naphtha and LPG (collectively referred to as "biofuels" in this document) are *identical to the pathways used in the production of biofuels from non-food grade corn oil ("NFGCO")*.[2] The greenhouse gas benefits of grain sorghum oil and its co-products are comparable to those for NFGCO. Accordingly, we are seeking RIN D-codes identical to those approved for NFGCO.

The feedstock in this petition is grain sorghum oil derived from dry mill ethanol production. The oil is separated from the distillers' grains with solubles ("DGS") by a process identical to that used to separate the NFGCO from DGS in a dry mill ethanol facility using corn as a feedstock. Separation involves centrifuging the DGS to remove the sorghum oil, which is then used for the production of biofuels onsite or at a separate facility. The de-oiled DGS is sold as animal feed.

The separation process is powered by electricity, and this petition presents no new energy-saving technology for the separation of grain sorghum oil compared to that of NFGCO.[3] The key differences between NFGCO and grain sorghum oil are modest lifecycle and marketing distinctions for the ethanol co-products produced when using the alternative plant feedstocks.

The EPA has previously approved grain sorghum as a feedstock for both conventional (D-code 6) and advanced (D-code 5) RINs. In those pathway approvals; however, the greenhouse gas ("GHG") lifecycle analysis ("LCA") was based on "whole DGS"; i.e., with oil included.

The EPA previously considered livestock feed replacement rates for de-oiled corn DGS. (See section 5.1.2.3 of the RIA.) The RIA did not analyze feed replacement rates for de-oiled grain sorghum DGS, however.

[1] See section D(2)(iii) for discussion of equivalence values.
[2] The NFGCO biofuel pathways were discussed at length in the RFS2 Regulatory Impact Analysis ("RIA") (EPA-420-R-10-006).
[3] Individual producers are free to obtain the necessary electricity from renewable sources, like solar or wind, but we do not assume such sourcing for purposes of this petition.