April 24, 2017

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

Diana,

National Sorghum Producers is providing the supplemental information you requested via email dated March 15, 2017, on our renewable fuel pathway petition for sorghum oil, which we submitted on July 29, 2016, and the supplemental information we submitted on January 18, 2017. Please note this includes the additional technical information provided by ICM after our initial April 6 submission.

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

We appreciate your work on the petition and hope this submission will allow you to move toward expeditious approval of the pathway. We believe this can be accomplished quickly via letter and with little additional modeling as the Agency has several precedents for doing so.

These precedents include Diamond Green Diesel's straightforward 2013 pathway approval utilizing the assumptions and models applicable to the already approved hydrotreating process and corn as well as *Camelina sativa* oil feedstocks; Duonix Beatrice's 2014 approval that did not even require a new fuel pathway petition because of its similarity to existing approved pathways; and EPA's 2014 approval of corn kernel fiber along with other grain fibers, including sorghum.

Although electricity use when adding oil extraction increases per the RFS2 regulatory impact analysis, based on table VI.C.1–2 of the RFS2 proposed rule, adding oil extraction nets a 3-8 percent reduction in emissions depending on the percentage of DGS dried. Given this prior modeling work and the information provided in our petition and supplemental submissions showing no material differences in de-oiled coproduct composition (and thus no changes to the coproduct credit), we believe sorghum oil qualifies as a biodiesel and renewable diesel feedstock eligible for D4 and D5 RIN generation.

Please do not hesitate to call me at (806) 638-5334 or contact me via email at john@sorghumgrowers.com if you have questions.

Thanks,

John Duff
National Sorghum Producers
(806) 749-3478

Dear Mr. Duff,

Thank you for replying to our request for additional information. We went through your provided documents and had several further questions to clarify.

1) On page 4 of your response, in your reply to our prompt "Please provide the following information on the market value of SDGS with and without oil extraction" you note:

> 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.

We have three follow-up questions on this information:

a) On pages 13-14 you provide SDG pricing for WDGS and DDGS. Can you clarify which columns and prices are for oiled DGS and which ones are for de-oiled DGS? WDGS and DDGS with and without oil are not marketed as separate products. Refer to pages 22-24 of the response for the dates each facility began extracting oil. This information is also attached on pages 6-8 of this document. Note these data are marked as CONFIDENTIAL BUSINESS INFORMATION.

b) In your response b) you note that no public datasets reflect prices for separate sorghum DGs from corn DGs. Can you provide this information from private sector data? Similar to WDGS and DDGS with and without oil, corn-based distillers grains and sorghum-based distillers grain are not marketed separately, so private data do not exist. Refer to figure 1 of the grain sorghum oil pathway petition which shows no significant price shift occurred as a result of initiating oil extraction. This figure is also attached on page 9 of this document. Note it is marked as CONFIDENTIAL BUSINESS INFORMATION.

c) Can you provide prices for de-oiled corn and sorghum DGS blends and, for comparison, the corresponding prices of de-oiled corn DGS? Because corn-based distillers grains with and without oil and sorghum-based distillers grains with and without oil are not marketed separately, no pricing data on these blends or comparisons exists in public or private datasets.

2) We asked for clarification on whether it was necessary to add sources of additional fat to Sorghum DGS in order to sell this feed product to the livestock market. In your response to question 2b, you note:

> Dr. Mass outlines these minor 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 distiller's grains.

We would like to clarify this statement in regards to the net energy implications on livestock:

a) For the ration charts you cite on page 11 and 12 of your response (copied below), can you clarify which ration is for corn and which is for sorghum? See pages 10-11 for Dr. Mass's clarifications.

b) In that same chart, can you explain what the shadow price represents? See pages 10-11 for Dr. Mass's clarifications.

c) In these two charts, we see that the chart on page 11 has Sorghum DGS composed of 9.75% fat, while the chart on page 12 includes Sorghum DGS composed of 3.91% fat. However, the price for the higher fat DGS is $174/ton compared to $151. Since the chart on page 8 showing SDG displacement rates indicates that the displacement rate is the same for all livestock save beef, why is there a price differential shown in the rations chart? See pages 10-11 for Dr. Mass's clarifications.

d)

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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

12

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

3) We also require additional clarification for the charts on page 6 and page 8 (copied below). On page 6, you indicate that there are differences in net energy for swine and dairy cattle when they are fed Full-Oil SDDGS versus when they are fed Reduced-Oil Sorghum DDGS. However, on page 8, the chart on displacement ratio indicates that de-oiled and oiled Sorghum Distillers' Grains show no differences in displacement ratios for swine and dairy cattle. Why are the differences in net energy not reflected in the grain displacement ratios? See pages 10-11 for Dr. Mass's clarifications.

a) Secondly, the chart on page 6 has an entry for poultry, while the chart on page 8 does not. Can you clarify whether sorghum DGS is suitable for poultry feeding and, if so, what displacement ratio is suggested by the available literature (corresponding to the data in the chart on page 8 for cattle and swine)? See pages 10-11 for Dr. Mass's clarifications.

Pg. 6 chart:

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

Page 8 chart:

	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	-	-	-	-	-	-

Thank you for your help in clarifying these questions.

Sincerely,
Diana Galperin

Month	Kansas Ethanol Oil Production (pounds)	Kansas Ethanol Grain Sorghum Use (percent of total bushels used)	White Energy Hereford Oil Production (pounds)	White Energy Hereford Grain Sorghum Use (percent of total bushels used)	White Energy Plainview Oil Production (pounds)	White Energy Plainview Grain Sorghum Use (percent of total bushels used)	Western Plains Energy Oil Production (pounds)	Western Plains Energy Grain Sorghum Use (percent of total bushels used)	Conestoga Energy Partners Bonanza Oil Production (pounds)	Conestoga Energy Partners Bonanza Grain Sorghum Use (percent of total bushels used)	Conestoga Energy Partners Arkalon Oil Production (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	CBI / Ex. 4
March 2014	
February 2014	
January 2014	
December 2013	
November 2013	
October 2013	

CBI / Ex. 4

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April 23, 2017

Answers to questions from the EPA
Submitted by Ryan A. Mass, PhD
ICM Feed Business Manager

Thank you for your questions. I will answer them in turn:

Questions 2a, 2b, 2c (related to rations on pages 11 and 12):
"Which ration is for corn and which is for sorghum?"
"What does a shadow price represent?"
"Why the price discrepancy between the two types of distillers' grains?"

Both of these cattle rations are intentionally identical in nutrient composition (as designed by Opheim et al, 2016). They both use sorghum distillers grains as a main ingredient for cattle. The intention is to demonstrate that the partial removal of oil from sorghum distillers grains impacts the net energy of that ingredient for cattle in a small way. The computer is programmed to keep fat and net energy the same and to calculate the least cost ration. The shadow price indicates 1) that ingredient option was not selected because of price; and 2) that if the ingredient is priced below the shadow price in alternative scenarios, it would be selected. However, that does not mean that simply lowering the shadow priced ingredient by $1 (for example) would result in a total replacement of one sorghum distillers grains option for the other; rather, the computer would choose to use both sources to maintain least cost. Because it is not practical to inventory both options, the second ration was calculated to show that, at a certain price, a total replacement of one for another is made. In this case, the fair market value for the full oil distillers grains is $174 per ton and the fair market price for the reduced oil distillers grains is $151 per ton. The difference in oil content between the two ration options is made up by the distillers corn oil option. It is important to note that "ingredient displacement" and the aforementioned "fair market value" have little to do with each other. Ingredient displacement simply means that one ingredient (sorghum distillers grains) replaces another (corn) in the ration because it is a better alternative nutritionally; this is independent of how much oil is in it. On the other hand, cattle producers want to keep their ration costs as low as possible and utilize consulting nutritionists to tell them (using the example method) a fair price to pay for the ingredient. This price arbitrage occurs daily nationwide and the example price differential is a real phenomenon; in other words, cattle producers do pay less for reduced oil distillers grains whether from sorghum or corn.

Question 3:
"Why are calculated net energy values for dairy cattle and swine and actual displacement values of grain in the rations of these species unrelated?"
Please recall the methodology used to calculate net energy (as described). There are no data in any scientific publication for net energy of reduced oil sorghum distillers grains; however, there are data for reduced oil corn distillers grains. Using ratios, I calculated these missing values as requested.
In a real world sense, swine and dairy producers do not use less reduced oil distillers grains (independent of whether it comes from corn or sorghum) when compared to full oil distillers grains. There are two reasons for this:

1. Animal performance in these species is not diminished (see the citation of Kerr et al., 2016 and Ramirez et al., 2016). This is in stark contrast to the slightly diminished performance of beef cattle (see above discussion of how this managed in the real world).

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

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2. Other animal parameters may actually be enhanced (better bacon from swine, better butter fat from dairy cows)

Question 3a:
"Are sorghum distillers grains suitable for feeding to poultry? Suggested displacement ratio?"
Sorghum distillers grains are most certainly suitable for feeding to poultry (or any species of animal for that matter) *at the proper level*. In his classic text entitled, Feeds and Feeding (copyright 1915), Morrison describes "the excellent composition of grains from ethanol distilleries as a protein source for all animal species". When sorghum distillers grains are fed to poultry, they are fed in combination with other protein sources such as soybean meal. Based on empirical data from the Ag Marketing Resource Center of Iowa State University, the suggested rate of corn by sorghum distillers grains (all types) is 0.292 lbs of corn displaced per lbs of distillers grains. There are no data available for feeding reduced oil sorghum distillers grains to poultry but it is expected to have the same effect in poultry as it does in swine (which is zero).